

CITY OF OCEANSIDE



ENGINEERS DESIGN AND PROCESSING MANUAL

CHAPTER 2

PLAN PREPARATION GUIDELINES

Revised 9/26/2017

CHAPTER II

PLAN PREPARATION GUIDELINES

1.0 SUBMISSION REQUIREMENTS

1.1 GENERAL:

- A) Improvement plans shall be prepared under the direction of and signed by a Registered Civil Engineer licensed by the State of California, and shall conform to this manual and details of the City. Improvement plans shall include, but not be limited to, grading, water, sewer, storm drains, landscaping, streets, street lighting, traffic channelization/ striping and related facilities.
- B) Each sheet of plans shall be wet signed and stamped by a Registered Civil Engineer qualified for the design proposed and by the Engineer of Work (where different).
- C) No stick-ons shall be allowed on Final Grading, Erosion Control and Improvement Plans submitted for final approval.
- D) All plans are to be checked by the Engineer of Work for consistency, accuracy, clarity and conformity with City standard specifications, drawings and design criteria before submittal for approval. If during initial review by the City the plans are found to be incomplete, they will be returned unchecked to the Engineer of Work for completing.
- E) The form of all plans shall conform to additional requirements as may be established by the City Engineer. The final form of all plans shall be approved by the City Engineer.

1.2 INITIAL SUBMITTAL REQUIREMENTS

Submittal of the following is required:

- A) For all Plans
 - 1. Plan checking fee/deposit.
 - 2. Copy of reference maps/documents tentative map and conditions of approval (when applicable).
 - 3. Five sets of complete plans (including plot plans when applicable).

4. Estimate of quantities and cost of improvements.
- B) Grading Plans
1. Preliminary soils investigation and geology reports (2 copies).
 2. Refer to the latest version of the City's Grading Ordinance for other requirements.
- C) Improvements Plans
1. Water, sewer and drainage - submit all pertinent backup calculations.
 2. Surface Improvements.
 - a) Streets
 - b) Traffic signal, signing and striping
 - c) Street lights and conduit/wiring
 3. Additional as required by the Conditions of Approval.
- D) Landscape (per Landscape Manual)
1. Additional as required by the Conditions of Approval.
- E) Erosion Control (per Grading Ordinance)
- F) Cost Estimates

Estimates of quantities and costs of improvements are required for all plans. One of the following statements shall be included on all cost estimates:

1. This project is eligible for credits/reimbursements against:
 - Master Drainage Fees: List Master Drainage Facility and all items eligible.
 - Thoroughfare Fees: List streets eligible and all eligible construction items.
 - Traffic Signal Fees: List eligible traffic signal locations.
2. This project is not eligible for credits/reimbursements against any City fees.

Fees paid in conjunction with a project will not be refunded unless the creditable items are identified prior to the approval of the cost estimate.

G) Supplementary Plans and Calculation

Hydrology, hydraulic plans and calculations, bond or other security estimates, fire flow calculations, sewer flow calculations and any structural calculations as may be required, shall be submitted with the improvement plans to the City Engineer. All calculations shall be legible, systematic and signed and dated by a Registered Civil Engineer licensed by the State of California and in a form approved by the City Engineer.

H) Review by the City Engineer

The subdivider shall submit the improvement plans and all computations to the City Engineer for review. Upon completion of the review, one set of the preliminary plans, with any required revisions indicated, will be returned to the subdivider.

If the creditable items are not identified prior to the approval of the cost estimate, the project may be eligible for reimbursement as provided by the particular ordinance, upon completion of the improvements.

1.3 SECOND OR SUBSEQUENT CHECKS OR SUBMITTAL

All necessary corrections and requirements shall be resolved and satisfied at the time of the second check.

Submittal of the following is required:

- a) Three sets of prints showing corrections and/or additions as noted on first check.
- b) Previous check prints.
- c) Updated construction estimate using City's adopted unit prices.
- d) Letters granting permission to enter and/or drain on adjacent property where encroachment may be required for grading and/or when concentrating drainage onto adjacent property.

1.4 FINAL CHECK SUBMITTAL

At final check time all corrections necessary should have been completed by the Engineer of Work.

If at the time of the final check, it is determined by the checker that additional checking will be necessary, an additional checking fee will be required prior to proceeding with the checking process.

- A) Submittal of the following is required:
1. Plan's originals.
 2. Payment of all fees including Plan Check and Inspection.
 3. Posting of Improvement Bonds (amount to be approved by City Engineer).
 4. Dedication of right of way and easements as required.

1.5 SHELF LIFE

The checking fee for all plans is good for one year from the date of initial submittal. If final approval is not obtained within this period, processing shall terminate, and new fees shall be required, at the discretion of the City Engineer.

1.6 FINAL REVIEW

After the final checking of the plan has been completed and all the administrative requirements are complied with, the plan is submitted to the City Engineer or designee for final review.

If there are no further comments, the plans will be forwarded to the appropriate official for approval.

All securities shall be posted prior to final approval of the plan.

Approval of the improvement plans shall not be construed as approval of the gas, electric, telephone and cable television service construction plans which shall obtain subsequent approval.

Approval by the City Engineer shall in no way relieve the subdivider or the subdivider's engineer from responsibility for the design of the improvements and for any deficiencies or omissions resulting from the design or from any required conditions of approval of the tentative map.

1.7 REQUIREMENTS OF ENGINEERING DEPARTMENT PRIOR TO ISSUANCE OF A BUILDING PERMIT

- a) Submittal of a mylar, and four bluelines of the recorded Subdivision Map, and a copy of the recorded Certificate of Compliance, if any.
- b) Payment of all deferred fees.
- c) Approval of Precise Grading and Landscape Plans.
- d) Soils or Geotechnical Certification.
- e) Rough Grading shall be complete and an approved Pad Certification shall be on file with the City Engineer.

1.8 EFFECTS OF CHANGE IN ENGINEERING STANDARD

Improvement plans may be affected by changes in the City's Engineering Design Standards; the change could occur at least once a year.

When the City approves changes in the City's Engineering Design Standard, there will be a compliance time of 120 days.

- A) Effects of changes in standard on different stages of processing of plans.

- 1. New Submittals

Improvement plans, for tentative maps or development plans approved prior to the change in standard, shall comply to new standard, if submitted for first check 60 days or more after the change in standards.

All improvement plans submitted, for tentative map or development plans approved after the date of approval for the change on standard, shall comply with the new standard.

- 2. In-Process

Final Map and corresponding improvement plans which are in-process under the old standard, shall be completed and finally approved within 120 days from the date of approval of the change in standards. Otherwise the plans shall be required to comply with the new standard.

3. Extension

Where an extension of the tentative approval or improvement agreement of the development is necessary, the corresponding plans may be required to comply with new standard.

4. Approved Plans

Approved plans shall be completed and As-Built under the old standard unless an extension is necessary as described in Section 1.8.A.3 above.

It is anticipated that only one extension of the subdivision agreement would be considered. This would allow a two year period to complete the improvements. At the end of that time, the Council could, if it desired, order the work done or revert the land to acreage as provided in the State Map Act. The Council could also continue to extend the agreement if it so desired.

2.0 GENERAL REQUIREMENTS FOR ALL IMPROVEMENT PLANS

- A) Form. Plans, profiles and details shall be legibly drawn, printed or reproduced on 24-by-36-inch sheets. A border shall be made on each sheet providing ½ inch at top, bottom and right side, and 1½ inches on the left side.
- B) A City-approved suitable title block shall be placed in the lower right corner and provide adequate space for approval by the City Engineer and for approval of up to twelve plan revisions.
- C) A vicinity map shall be shown on the first sheet of all sets of plans.
- D) Details shall be drawn to such scale (Engineer's scale only) that clearly shows the facility being constructed. The scales for various portions of the plans shall be shown on each sheets.
- E) All lettering shall be 1/8" minimum.
- F) A north arrow shall be shown on each sheet.
- G) Approval blocks for signature by Water Utilities Department, Traffic Division and Fire Marshall shall be provided on cover or title sheet.
- H) An index or key map drawn at a scale of 1"=100'; showing overall layout of water, sewer, storm drain, fire hydrants lots, streets, easements and street lighting systems, on site and within 100' of the project boundary.
- I) Profiles shall be shown on the top of sheets. Vertical lots, streets, easements curves shall show curve length and P.I. elevation in addition to normal stationing and elevations. Data for the centerline and curb lines shall be shown. A three line profile shall be provided for all streets.
- J) Single line cross sections shall be provided as required by the City Engineer. The cross sections shall include elevations at property lines, top of curb, flow line, existing pavement, proposed elevations at the existing pavement, proposed join and centerline.
- K) Plans and profiles shall be draw to the scale of 1"=40' for the horizontal and 1"=4' for the vertical. The vertical scale may be changed to 1"=8' or other appropriate scale where grades are steep. For complex plans, the scale shall be 1"=20' or larger as necessary for clarity.
- L) Street Improvement Plan and profile sheets shall be separate from the water and sewer plan and profile sheets. Storm drain plan and profiles may be

shown on street improvement plan and profile sheet or, where private, on the grading plans.

- M) The Engineer of Work shall be required to certify all improvements to be within acceptable tolerances of the design elevations, as shown on the approved plans. Any deviations will require a revision to the approved plans. Acceptable tolerances shall normally be .1' vertically and .5' horizontally.
- N) All improvements are to be designed and constructed in accordance with design criteria as indicated in the City of Oceanside Standard Specifications and relevant standard drawings and the San Diego Regional Standard Drawings and the most recent edition of the Standard Specification for Public Works Construction with supplements (A.P.W.A. Specification).
- O) A City benchmark shall be used and listed on each sheet with a City field book reference.
- P) The cover sheet or first sheet of a plan set shall have all required general construction notes, location and key or index map, legend, typical street sections and construction details as may be required, and a list of standards used. The key map or index map shall clearly delineate the sheet number and locations.
- Q) Plans shall be in substantial conformance to approved tentative maps and development plans and shall reflect all conditions of approval.
- R) Plans which include private improvements shall have a note on each sheet stating who will be responsible for the maintenance of those improvements.
- S) Street monuments shall be per San Diego County Regional Standard Drawing M-10.
- T) Notes to be shown on the title sheet shall include, where applicable, but not to be limited to those provided for in this manual. Provisions of said notes shall be strictly complied with.
- U) North arrow shall point to the top of the sheet whenever possible.
- V) A structural section table shall be shown on the title sheet listing all streets, (or each section where different), design TI and designed structural section based on an assumed R-Value of 5.

2.1 ORIGINAL PLANS

The original plans are to be submitted to the City on mylar (Min. 4 Mil thickness) sheets. All of the original (wet) signatures will be on this plan. Once signed by the City Engineer, the particular plan become(s) the property of the City of Oceanside. The City will make a photo mylar of each sheet for its own use. The original plan will be returned to the Engineer of Work (or architect). The Engineer of Work will retain the original plan in a custodial capacity.

Upon request of the City Engineer, the Engineer of Work shall have 10 calendar days to return the originals to the City of Oceanside Engineering Department. Original plans shall not be revised until mark-up submittals have been reviewed and conceptually approved (See Section 2.4).

2.2 PHOTO MYLAR COPY

The photo mylar copy will remain in the Engineering Department through the life of the project. It will be available to make copies from or examine as required. This photo mylar copy will only be checked out to bonded blueprint companies for the purpose of reproduction.

2.3 REVISIONS TO ORIGINAL PLANS

By Subdivider. Request by the subdivider for revisions to the approved plans appearing necessary or desirable during construction shall be submitted in writing to the City Engineer or authorized representative and shall be accompanied by redline drawings showing the proposed revision. If the revision is acceptable to the City Engineer and consistent with the tentative map, the originals shall be submitted to the City Engineer's office for initialing.

After the City Engineer has approved the revision(s), the City will make a new photo mylar copy of the revised sheet, which will replace the photo mylar copy on file. The original will again be returned to the Engineer of Work/Architect.

The construction of any proposed revisions will not be permitted to commence until reprints are received by the appropriate City field personnel.

By City Engineer. When revisions are deemed necessary by the City Engineer to protect the public health and safety, or as field conditions may require, a request in writing shall be made to the subdivider. The subdivider shall revise the plans and transmit the originals to the City Engineer for initialing within the time specified by the City Engineer.

Upon receipt of the initialized originals, the subdivider shall immediately transmit revised drawings to the City Engineer. Construction of all or any portion of the improvements may be stopped by the City Engineer until revised drawings have been submitted.

The subdivider may appeal revisions required by the City Engineer to the City Council by filing an appeal with the City Clerk within seven working days following receipt of the request to revise the plans.

After the City Engineer has approved the revision(s), the City will make a new photo mylar copy of the revised page, which will replace the original photo mylar copy on file. The original will again be returned to the Engineer of Work/Architect.

Significant numbers or unusually large revisions may necessitate additional printing charges to the Engineer/Developer.

2.4 AS-BUILTS

When the work shown on the plans is completed, the Engineer of Work (or architect) is required to "As-Built" the plans. This is done initially on a set of prints with any changes shown in red-lines. When the "As-Built" prints are conceptually approved, the Engineer/Architect will enter those changes onto the original plan that he has kept in his possession and turn in those original plans, with all of the original "wet" signatures, back to the City.

2.5 STATEMENT OF RELEASE FROM LIABILITY

The following statement shall be placed on the title sheet of all original plans. The certificate shall be properly executed prior to the plan's submittal to the City for approval.

"DECLARATION OF ENGINEER OF WORK"

I hereby declare that the design of the improvements as shown on these plans complies with professional engineering standards and practices. As the engineer in responsible charge of the design of these improvements, I assume full responsible charge for such design. I understand and acknowledge that the plan check of these plans by the City of Oceanside is a review for this limited purpose of ensuring the plans comply with City procedures and other applicable policies and ordinances. The plan check is not a determination of the technical adequacy of the design of the improvements. Such plan check does not, therefore, relieve me of my responsibility for the design of these improvements.

As Engineer of Work, I agree to indemnify and save the City of Oceanside, its officers, agents, and employees harmless from any and all liability, claims, damages or injuries to any person or property which might arise from the negligent acts, errors or omissions of the Engineer of Work, my employees, agents or consultants.

Engineer

License No.

Date

2.6 TRANSFER OF RESPONSIBILITY FOR APPROVAL

If the civil engineer, the soil engineer, the engineering geologist, the testing agency, or the contractor of record are changed during the course of the work, the work shall be stopped until:

1. The owner submits a letter of notification verifying the change of the responsible professional; and
2. The new responsible professional submits in writing that he has reviewed all prior reports and/or plans [specified by date and title] and work performed by the prior responsible professional and that he concurs with the findings, conclusions, and recommendations, and is satisfied with the work performed. He must state that he assumes all responsibility within his purview as of a specified date. All exceptions must be justified to the satisfaction of the City Engineer.

Where clearly indicated that the firm, not the individual engineer and/or geologist, is the contracting party, the designated engineer or geologist may be reassigned and another engineer and/or geologist within the firm may assume responsibility.

3. The new responsible professional shall be required to process a revision to the approved plans. The revision shall include striking out the name of the previous engineer, etc. and signing the plans at the required locations. The "Declaration of Engineer of Work" per Section 2.5 shall also be resigned in the event of a change of Engineer.

3.0 STREETS-DESIGN CRITERIA

All designs shall conform to the provisions of the latest edition of the Standard Specifications for Public Works Construction (APWA), Local Ordinances of the City of Oceanside and the State of California Highway Design Manual.

3.1 GENERAL

3.2 CIRCULATION DESIGN REQUIREMENTS FOR STREET NAME ASSIGNMENTS

A) Thoroughfare Type Designations

When thoroughfares are proposed, they shall be given a "thoroughfare type designator" corresponding to certain physical and functional characteristics of the thoroughfare. The following are the only designators which are standard and must be applied as follows:

1. BOULEVARD, PARKWAY, and EXPRESSWAY - Major collector thoroughfares with planted or other physically separated medians.
2. DRIVE (CALLE) - A meandering, curvilinear or diagonal thoroughfare usually longer than 1000 feet and most always connected to other right-of-ways.
3. ROAD - Limited thoroughfares that may run in any direction, are most always longer than 1000 feet and usually connect with United States or California State primary highways.
4. STREET and AVENUE - Straight thoroughfares matching principally the axes of the Countywide Grid System. (Avenida)
5. LANE and ROW - Short collector or minor thoroughfares which are usually less than 1000 feet in length and may not always connect other right-of-ways. (VIA)
6. CIRCLE, PLACE, COURT, BAY and COVE - Permanent dead end thoroughfares or cul-de-sacs usually less than 600 feet in length and containing three (3) or more lots or separate dwelling structures. May be used effectively in planned unit developments, or other conditioned use developments where thoroughfares with short branching configurations are proposed.
7. CENTER, MALL, and SQUARE - Designations reserved for high density commercial developments with multiple structures and occupancies that can be substituted for the thoroughfare type

designator in an assigned address. When commercial development type designators are used in the address format, the thoroughfare name is also substituted with the development name.

8. ALL private streets shall end in "way".

3.3 WIDTHS

- A) Public and private street widths shall be in accordance with the City of Oceanside Street Design Table on page 87 and the following:
 1. Where buildings or portions of buildings are located more than 150 feet from the public street, a 28' unobstructed drive shall be provided and shall end with an approved cul-de-sac.
 2. A 35 foot unobstructed driveway shall be provided where buildings or portions of buildings are more than 35 feet in height.
- B) Where half street improvements are called for, improvements shall be one-half street width, plus 12 feet, with minimum construction of 2"x 6" redwood header at the edge of paving. An asphalt berm or PCC curb and gutter may be required in place of the 2"x 6" redwood should the City Engineer deem necessary in order to control drainage.

3.4 GRADES

- A) Grade rates shall be in accordance with Table A. Local or private streets shall not exceed 12% grade without approval of the City Engineer.
- B) Vertical curves are required when grade breaks exceed 1.0%.
 1. For local collector streets, local streets, cul-de-sac streets and private streets the minimum vertical curve length is 100 feet.
 2. For street classifications above local collector, vertical curves shall be designed to the current Caltrans design manual stopping sight distance charts based on design speed, with 250 feet being the minimum. The appropriate design tables shall be submitted for all vertical curves verifying the design meets the minimum standards.
- C) Normal cross slope on A.C. pavement shall be 2.0%.
- D) All street plans shall extend beyond the property boundary to show the feasibility of future extension and existing conditions and improvements. The extension shall be 200 feet for local streets and 500 feet for collector streets and classifications above.

- E) Crossfall from T.C. to T.C. shall not be more than 1 foot for warped/tilted intersections.
- F) Maximum approach grades shall be 5% for 50 feet from the cross street right-of-way line measured along the centerline thereof or unless otherwise approved by the City Engineer. This includes major access approaches and driveway approaches.

3.5 ALIGNMENT

- A) Streets shall normally intersect at right angles. Where feasible, local streets shall have at least 50 feet of tangent adjacent to an intersection, measured from B.C.R. or as approved by the City Engineer.

Collectors and above should have at least 100 feet measured from the B.C.R. Arterials will require special design. An angle of intersection more than 10 degrees from a right angle requires special approval and design. Hillside terrain will require special design.

- B) Cul-de-sacs shall not exceed 500 feet in length without special approval and shall have a 40-foot minimum curb line radius at the turn-around. For cul-de-sacs exceeding 500' in length, approved turnarounds shall be provided at 300' intervals.
- C) Minimum length of tangent between reversing horizontal curves shall be 100 feet. A lesser length may be used for local streets with the approval of the City Engineer.
- D) Acceleration and deceleration lanes shall be designed to conform to Caltrans criteria or as approved by the City Engineer.

3.6 ADDITIONAL DESIGN CRITERIA

- A. Access to Major Streets and Primary Arterials
 - 1. Median breaks for intersections shall be per City of Oceanside Street Design Criteria as shown on Page 87 of this manual.
 - 2. No driveway access is normally permitted to a major or primary arterial. Should a lot have frontage only on a major or primary arterial, driveway access shall be limited only to right turns in and out. Driveway access will be permitted at locations and under conditions specified by the City Engineer and may require widening to accommodate an additional lane. Should a lot have frontage on a minor arterial or collector and frontage on a major or primary arterial,

driveway access will be permitted only from the minor arterial or collector street.

3. Parking at critical locations will be controlled by the City Engineer.
4. Median breaks for driveway access to major streets will not normally be permitted unless all the following conditions exist:
 - a) The property to be served is a major traffic generator and has a continuing frontage of 1,200 feet or more along the major street and is situated between streets which intersect the major street from the side occupied by the property.
 - b) The median opening is not less than 600 feet from an intersection with a major or collector street.
 - c) The median opening is not less than 400 feet from an intersection with a local street. The need for left-turn storage may require a greater distance.
 - d) The median opening is not less than 600 feet from any other existing or proposed midblock median opening.
 - e) All costs; i.e., base material, surfacing, safety lighting, traffic signals, reconstruction or utility relocation, required by a midblock opening will be borne by the requesting party. Continuous maintenance of the traffic signals shall be borne by the requesting party on a percentage basis.
5. Access along major streets at critical locations will be controlled by the City Engineer.

3.7 TRANSITIONS

- A) When reducing the number of through travel lanes or transitioning travel lanes through intersections, the pavement width shall undergo a transition as follows:

$$V \geq 40 \text{ mph} \quad L = WV_2$$

$$V < 40 \text{ mph} \quad L = \frac{WV}{60}$$

V = Design Speed, mph

W = Width of Roadway Transition, feet

L = Transition Length, feet

3.8 STRUCTURAL SECTION

- A) Design shall be in accordance with the California Department of Transportation stabilimeter method.
- B) Initial design shall be based on an "R" value of 5 and the design section shall be shown on the plans. If changes are to be requested, the "R" value will be verified after rough grading and prior to paving. Final design shall be based on the R Value of the subgrade as determined by the Soils Engineer. The structural section shall then be modified if necessary. Preliminary Traffic Index shall be based on Table A. Final Traffic Index shall be based on the Traffic Index indicated on the approved improvement plans. If the structural section is to be modified from the initial design, a plan revision shall be required. See the "Construction Guidelines and Requirements" section of this manual for the City of Oceanside Pavement Design Guidelines. The pavement design guideline table may be used to determine the actual structural section constructed.
- C) Traffic index for each street section shall be as shown on Table A and/or on the approved project improvement plans and shall be used unless specific traffic considerations requires a higher value. Other values require the approval of the City Engineer. (Private streets shall be designed under the same criteria as public streets.)
- D) Local or private streets shall not exceed 12% grade without prior written approval of the City Engineer. Those grades exceeding 12% shall be required to have a 4 inch minimum , Asphaltic pavement section or 6" Min. Portland Cement Concrete pavement over Class II base respectively. Asphalt pavement thickness shall be increased by 1 inch for each percentage of street grade exceeding 12%, with no decrease in the required base section.
- E) Local streets, private streets, drives and driveway grades shall not exceed 15%, without prior written approval of the City Engineer. 6" Min. PCC pavement over Class II base is required for streets with grades equal to or greater than 15%. In no event shall grades exceed 18%.
- F) Minimum asphalt concrete pavement sections are as follows:
 - 1) Local street, parking areas, all weather access roads for residential areas, commercial or mixed-use developments including residential. 3 inches
 - 2) Collector streets 4 inches
 - 3) Secondary arterials 5 inches
 - 4) Major arterials 6 inches
 - 5) Prime arterials 6 inches
 - 6) Alleys 4 inches

The field density of compacted asphalt concrete shall be determined by provisions contained in the latest A.P.W.A. Standard Specifications Section 302-5.5.2.

- G) The minimum total structural section shall be 9 inches and may be in accordance with the pavement design guideline table in the "Construction Guidelines and Requirements" section of this manual.
- H) The minimum P.C.C. pavement thickness shall be 6 inches within public streets.
- I) The Aggregate base shall not be less than 6 inches in thickness where required and shall conform to the latest provisions of Caltrans Standard Specifications Section 26-1.02B, Class II aggregate base or the latest provisions of A.P.W.A. Standard Specifications for Public Works Construction Section 200.2.2, as approved by the Engineering Department. All concrete pavement shall be underlain by a minimum of 6" of Class II Base.
- J) When pavement, base or subbase is to be placed directly on subgrade material, the top 12 inches of subgrade material shall be scarified and compacted to a relative compaction of 95 percent.
- K) Driveways shall conform to the design criteria as shown in City Drawing T-2.
- L) **All weather access roads for residential developments, commercial, or mixed-use development including residential, shall conform to the requirements set forth in 3.8.F. All weather access for industrial developments designed to store non-flammable items (e.g. Stone, rock, machines, etc.) can be 6" of 3/4' rock, asphalt grindings, pavers, or compacted existing material as approved by the City Engineer. Surface must be capable of handling fire vehicle loading. Revised 9/26/17**
- M) Lime treatment of subgrade soils is acceptable as a means of stabilizing subgrade materials to facilitate the placement of base and pavement. The following restrictions apply to this method.
 - 1. The use of lime treatment will not allow any decrease in the design section for the street. The design section will reflect the R-value of the existing subgrade. (assume R=5)
 - 2. The subgrade will be tested for sulfate content. If concentrations of sulfates are encountered, lime treatment will not be approved.
 - 3. The lime will be applied with a "pug-mill" or similar type machinery to assure uniform application.
- N) Driveway approaches shall be constructed with a minimum 5-1/2" concrete section.

3.9 CURBS

- A) No mid-block cross gutters shall be allowed. Any variation will require the special approval of the City Engineer. Cross gutters shall not be permitted when storm drains exist or are proposed, within 200 feet.
- B) All cross gutters shall be a minimum width of 8 feet and conform with Drawing M-8 in this manual.
- C) Private drain lines/weed lines shall be drained to the gutter via a sidewalk underdrain with a maximum 3 inch diameter pipe under sidewalk.
- D) Curbs (including median curbs) for street classifications of major arterial and above shall be 8 inches.
- E) Pedestrian ramps shall be installed at all curb returns per City Drawing M-11 of this manual and at all intersecting points at tee intersections.
- F) Compaction of Class II base and subgrade under curbs shall be per Chapter II, Section 9.4(B) of this manual.

3.10 CURB AND GUTTER REPLACEMENT

- A) Patching or repair of gutter sections is not permitted.
- B) Patching of cracks in curbs or gutters is not permitted.
- C) Patching of gouges or chipped curbs exceeding 6" long x 2" wide x 1/2" deep is not permitted.
- D) Patched curb must match existing curb in strength, texture and color and it must be a permanent patch. Curb replacement will be required for failed patches.
- E) All replacements will be from joint to joint (15 foot sections). There shall be no exceptions.
- F) Compaction of Class II base and subgrade under curbs and gutter shall be per Chapter II, Section 9.4(B) of this manual.

3.11 SIDEWALKS

- A) Sidewalks shall be installed along both sides of all streets and shall be located contiguous with the curb unless an alternate location is approved by the City Engineer.

- B) The minimum width for sidewalks in any zone shall be 5 feet not including the top of the curb unless otherwise approved by the City Engineer.
- C) Commercial and industrial areas and schools may require additional width as required by the City Engineer.
- D) Minimum thickness: 4 inches
- E) Pedestrian ramps shall be required at all intersections where sidewalks are required, per Standard Drawings (M-11) of this manual. Where modifications to Standard Drawing M-11 are required, the plans shall show a detail of each modified pedestrian ramp. All pedestrian ramps shall comply with the Section 2-7103 of the Disabled Access Regulations (Title 2A) as printed by the State Architect's office.
- F) No monolithic curb, gutter and sidewalk construction is allowed.
- G) The Soils Engineer shall evaluate subgrade materials under curbs, gutters and sidewalks for expansion properties and shall provide appropriate recommendations to mitigate damages. Subgrade soils are considered expansive if they have an expansion index of greater than 20 (UBC Std. 29-2). In lieu of a recommendation, the curb and gutters shall have a minimum of 6 inches of Class II base beneath the curb and gutters extending at least 12 inches behind the back of the curb. All sidewalks shall have a minimum of 6 inches of Class II Base.
- H) Walks adjacent to private streets and drives shall comply with all requirements of Sections 2-3306 and 2-3323 and related requirements of the Disabled Access Regulations (Title 24) as printed by the State Architect's office.
- I) Compaction of Class II base and subgrade under sidewalks shall be per Chapter II, Section 9.4(B) of this manual.

3.12 SIGHT DISTANCE

- A) All sight distances shall be in accordance with the "California Department of Transportation Design Manual" and Fig. T-1 or as approved by the City Engineer.
 - 1. Caltrans "Corner Sight Distance" criteria shall be used for the design of all intersections including private streets and drives with public streets.
 - 2. The appropriate design tables shall be submitted for all horizontal curves verifying the design meets the minimum standards.

- B) For local streets, maintain a triangular area at the intersection, measure 25 feet back of B.C.R.'s, free of any obstructions in excess of 30 inches in height. A variation will require the specific approval of the City Engineer.
- C) Truck turn templates shall be used at intersections and driveways to ensure proper geometric design of medians, curb returns, and driveways. The minimum size design vehicle shall be a semi-trailer truck with a 48' turning radius.
- D) Clear space markers, in accordance with San Diego Regional Standard Drawing DS-16, shall be placed and the appropriate clear space easements dedicated for all intersections including private streets and drives with public streets.

The markers as required by San Diego Regional Standard Drawing DS-16 shall be modified to reflect City of Oceanside easement.

3.13 STREET LIGHTS

Street light plans shall be included with and bonded for along with the project's improvement plans. For full design and construction information, see the City of Oceanside Engineering Department Traffic Division, Street Light Design Policy Manual for new street light installations.

- A) All street lights shall be high pressure sodium vapor type, located per City of Oceanside Standard Drawing Number M-4.
- B) Street lights shall be installed by the developer. A detailed set of plans shall be submitted including, but not limited to the following:

- Street light location
- Service points (identify type)
- Service Run
- Conductors
- Pull boxes
- Lamp size and type
- Fixture and pole type (including catalogue number)
- Single line Diagram
- Street names of Streets shown
- Conduit size and type
- Wire size and type
- Legend defining symbols used
- Voltage of the system
- Ballast type
- Pole installation cross-section

- C) All street light hot leg wires shall be black or have the same color throughout the circuit.
- D) Street lights shall normally be located on the outside of curves. Lights shall be located behind the sidewalk when the curb and sidewalk are contiguous.
- E) Payment of energy fees shall be paid prior to occupancy.
- F) All street light plans must include a wet stamp by a professional electrical engineer as well as the Design Engineer of Record.

3.14 TRAFFIC SIGNALS

The developer shall submit a design and pay the cost for the construction and/or modification of traffic signals adjacent to the development which are required as a condition of the development. Traffic signal design shall be in accordance with the City of Oceanside Traffic Signal Design Manual, and be included with and bonded for along with the project's improvement plans.

3.15 DRIVEWAYS

- A) Driveways shall conform with City specifications. Industrial-commercial driveways, shall include a minimum 20 foot radius curb return with spandrel drive approach.
- B) Radius driveway returns shall incorporate pedestrian ramps.
- C) Driveway approaches shall conform to Drawing T-2.
- D) Driveway widths and locations shall be in conformance with San Diego Regional Standard Drawings G-14, G-15 and G-16. Driveways shall be located in a manner to maximize on-street parking.
- E) San Diego Regional Standard Drawing G-16 shall be modified as follows:
 1. There shall be a minimum 3' horizontal clearance between the driveway and any obstruction less than 30" in height. This shall include water meters, utility pedestals and transformers.
 2. There shall be a minimum 10' horizontal clearance between the driveway and any obstruction greater than 30" in height. This shall include power poles, trees, etc.
 3. Driveway widths and stations shall be shown on the public improvement and precise grading plans for the project.

F) Private Drives

1. Private drives serving one dwelling unit, or two dwelling units within 150' of the street, shall be constructed with a minimum 16' wide pavement section.
2. Private drives serving three dwelling units, or (2) units more than 150' of the street, shall be constructed with a minimum 20' wide pavement section.
3. Private drives serving more than three to a maximum of 9 dwelling units, shall be constructed with a minimum 24' wide pavement section.
4. Private drives serving more than 9 dwelling units shall be considered and meet the criteria for private streets.
5. Drives for commercial and industrial uses shall be 28' minimum, unless otherwise approved by the City Engineer. An additional 3' shall be provided in all cases where drives are directly adjacent to buildings and any obstructions greater than 30" in height.
6. For properties within agriculturally zoned areas, the following pavement standards may apply:
 - a) Private drives/driveways shall be paved with the appropriate asphalt or concrete pavement section for a minimum of 100' from the public street. The structural section shall be in accordance with Section 3.8 above.
 - b) The surface of the remainder of the drive to the garage or similar structure, may be 6" of Class II or 6" of 1" minus gravel. The Class II or gravel shall be placed over properly compacted base material.
 - c) Where private drive grades equal or exceed 10%, the drive surface shall be paved with the appropriate asphalt or concrete section. The structural section shall be in accordance with Section 3.8 above.
 - d) A concrete swale or other approved drainage device shall be included in all cases where drainage is conveyed along or across the private drive.

7. In no event shall an "Arizona" type crossing be permitted along a private drive/driveway.
- G) Compaction of Class II base and subgrade under driveways and private drives shall be per Chapter II, Section 9.4(B) of this manual.

3.16 CONCRETE DRIVEWAY REPLACEMENT

- A) Patching of driveways shall not permitted.
- B) Removal and replacement will be required for gouged, cracked, chipped, or graffiti-marked sections.
- C) Replacement will be from centerline score to score of upper portion of the roll down. Five (5) foot section replacement is not permitted.

3.17 PAVEMENT MARKINGS

- A) Pavement markings shall be in conformance with the criteria as presented in Chapter 6 of the latest edition of the "State of California Department of Transportation Traffic Manual."
- B) Raised pavement markers are required for all streets with projected daily traffic volumes of 3,000 or greater, and shall be installed by the developer.
- C) Where required by the City Engineer, signing and striping plans, signed by a Registered Traffic Engineer, shall be submitted with the project's improvement plans.

3.18 STREET NAMES AND TRAFFIC SIGNS

- A) The developer shall install street name signs and other related signs per Drawing T-3 and as follows:
 1. Two street name signs at every new four way intersection;
 2. "Stop" signs on local streets intersecting with collector streets and classifications above, or where required by the City Engineer;
 3. "Not a Through Street" sign when the end of the street cannot be seen.
- B) Other signs as required shall be paid for by the developer and installed by the City. These signs shall be shown on the improvement plans.

3.19 EXISTING PAVEMENTS

- A) Where new improvements are to join existing pavement, the construction drawings shall specify details calling for a vertical cut at the edge of the existing full structural section, with a 3 foot overlap of a ground section of the existing pavement, to provide a capped joint. The sawcut joint shall be a minimum cut of 1 foot off the existing edge of pavement.
- B) Where existing pavements to be joined by new improvements are found to be in poor condition or are found to provide adverse grade conditions the plans shall be detailed sufficiently to repair such conditions. New structural section calculations to be provided for repair of existing pavements.
- C) Single line cross sections shall be provided as required by the City Engineer. The cross sections shall include elevations at property lines, top of curb, flow line, existing pavement, proposed elevations at the existing pavement, proposed join and centerline.

3.20 BARRICADES

A "Street End" barricade shall be to the full width of the right-of-way, per Regional Standard Drawings.

3.21 GUARDRAILS AND SAFETY DEVICES

- A) Guardrails are required per Caltrans standards on all streets other than local streets.
- B) For local streets, guardrails are required on the outside of curves with a radius of less than 400 feet and a delta of over 25 degrees where the adjacent dropoff is over 10 feet.
- C) Guardrails may be required at other locations for safety purposes, such as "T" intersections.
- D) Guardrail approaches shall be flared and end anchors are required at terminal.
- E) Reflectors and other safety structures may be required when necessary for public safety.

3.22 TRAFFIC CONTROL PLANS

Traffic Control Plans must be developed for all projects to assure that adequate consideration is given to the safety and convenience of motorists, pedestrians, and

workers during construction. Plans should be submitted to the Traffic Division a minimum of five (5) working days before commencement of work.

3.23 STRIPING PLANS

- A) Striping Plans shall be required on all arterial streets to ensure pavement widths are adequate for the intended design. Striping Plans shall accompany and be part of the Street Improvement Plans submitted for plan check.
- B) Detour plans may be required prior to or concurrent with the approval of the improvement plans if determined necessary by the City Engineer.

3.24 MAIL BOXES

- A) All mailbox locations shall be approved by the City Engineer prior to installation. Mail box locations and construction details shall be shown on improvement plans and precise grading plans. The plans shall indicate all lots served by the mailboxes.
- B) The following standards shall be maintained when locating mailboxes:
 - 1. A minimum of 4' clear sidewalk shall be maintained behind the mailbox when the mailbox is located at the curb. (In some cases, additional parkway width and right-of-way may be required).
 - 2. When located behind the sidewalk, the mailbox shall be set back a minimum of 6' from the curb face. For behind sidewalk locations, there shall be a minimum of 4 boxes to a post, or be the post-office-supplied Neighborhood Box Units.
 - 3. A letter from the postmaster indicating approval of mailbox locations shall be filed with the City Engineer prior to plan approval.

3.25 SUBDRAINS

- A. Subdrains shall be installed at the toe of all slopes where the slope equals or exceeds 30 feet in height or when the slope equals or exceeds 8 feet in height and 300 feet in length.
- B. Subdrains shall be installed a minimum of 30" deep and be discharged into a storm drain system.
- C. The subdrain pipe shall be a minimum 4 inches diameter, perforated, thick-walled, PVC schedule 40 or equivalent, and sloped to drain at 1 percent minimum. The pipe shall be encased with 1 inch, open graded, crushed

rock, 2 cubic foot/foot, enclosed in an approved filter fabric (Mirafi 140N or equivalent). A minimum of 6 inches of relatively impermeable soil shall be placed over the rock to prevent surface infiltration into the subdrain. A non-perforated collector pipe (or pipes) shall direct the subdrain to the closest storm drain system. The storm drain system may need to be extended to provide an outlet for the subdrains.

- D. Alternate designs which will eliminate the possibility of seepage problems may be submitted for the City Engineer's review and approval.
- E. Subdrain details shall be shown on the project grading plans and improvement plans when located with or adjacent to the public right-of-way.

CITY OF OCEANSIDE STREET DESIGN TABLE

DESIGN CRITERIA	PRIME ARTERIAL	6-LANE MAJOR ART.	4-LANE MAJOR ART.	SECONDARY ARTERIAL	COLLECTOR/ IND. STREET	LOCAL COLLECTOR	LOCAL STREET	CUL-DE-SAC STREET	PRIVATE STREET
Estimated Ultimate 24-hour traffic (volume)	30,000 to 54,000	30,000 to 45,000	24,000 to 36,000	7,000 to 24,000	2,500 to 7,000	1,500 to 2,500	200 to 1,500	Less than 200	Less than 500 ⁹
Design Speed	60 MPH	55 MPH	55 MPH	45 MPH	35 MPH	30 MPH	25 MPH	25 MPH	25 MPH (min)
Stopping Sight Distance	580'	500'	500'	360'	250'	200'	150'	150'	125'
Minimum Spacing of Intersections	2,600'	1,200'	1,200'	600'	300'	300'	200'	N/A	200'
Right-of-Way	124' ²	124' ²	100' ²	84'	60' – 72'	60'	60'	56'	VARIES
Curb to Curb Distance	104' 16' median	104' 16' median	80' 16' median	64'	40' – 50'	40'	40'	36'	40' – 36' ⁸ 32' – 28'
Minimum Traffic Index	10	10	9	8	7	6	5	5	5
Minimum Structural Section	6AC/8AB	6AC/8AB	6AC/6AB	5AC/6AB	4AC/6AB	4AC/6AB	3AC/6AB ⁷	3AC/6AB ⁷	3AC/6AB ⁷
Access to Adjoining Property	None	None	None	Where no other access is possible	Where no other access is possible	LIMITED ACCESS	O.K.	O.K.	O.K.
Minimum Horizontal Radius w/o Superelevation	1,000 2,200	1,000 1,800	1,000 1,800	750 1,100	500 600	350 N/A	200 N/A	200 N/A	200 N/A
Maximum Grade	6%	8%	8%	8%	8%	10%	12% ⁴	12% ^{4,5}	12% ^{4,5}
Minimum Grade	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Maximum Intersection Grade	3%	3%	3%	4%	5%	5%	5%	5%	5%
Curb Return Radii	35'	35'	35'	35'	30"	30"	25"	40"	25' - 35'
Street Lights Location per Standard Drawing No. M-4	30,000 lumen – 200' staggered	30,000 lumen – 200' staggered	30,000 lumen – 200' staggered	30,000 lumen – 200' staggered	9,500 lumen – 250' one side or staggered	9,500 lumen – 250' one side or staggered	9,500 lumen at all intersections - 250' spacing one side of street	9,500 lumen at mid block if less than 200'	9,500 lumen at all intersections - 250' spacing one side of street

1. Stopping sight distance shall not be used for intersection sight distance. Refer to Caltrans Design Manual for intersection sight distance criteria (Corner Sight Distance).

2. Additional Right-of-Way at intersections shall be required to accommodate turning lanes as necessary.

3. Minimum sections allowed. Actual sections are to be based on R-value tests

4. Greater grades allowed only with written approval of the City Engineer prior to approval of the tentative map or development plan.

5. Cul-de-sac turnarounds shall not exceed 5% maximum grade.

6. Measured BCR to BCR.

7. Minimum total structural section to be 9".

8. 28' no parking either side; 32' parking one side only.

9. Private streets with greater than 500 ADT to be designed to public street standards.

4.0 WATER SYSTEMS – DESIGN CRITERIA

4.1 GENERAL

A. All water works construction shall conform to the most recent edition of the City of Oceanside Engineer's Manual. If the standard that is sought does not appear in this manual, then the following standards shall be utilized in the order listed:

1. State of California Department of Health Services
2. American Water Works Association (AWWA) Standards
3. San Diego County Regional Standard Drawings
4. APWA Specifications (Green Book)

Exceptions to this and all other guidelines appearing in this manual may be allowed only upon the approval of the City Engineer and the Water Utilities Director.

B. Pipe shall be ductile iron per AWWA C151 with inside mortar lining per AWWA C104 and outside polyethylene encasement per AWWA C105 or PVC per AWWA C900 and C905.

C. The City Engineer and Water Utilities Director shall determine transmission line construction materials.

D. This section shall govern the construction of all water systems from the main line to the post indicator Valve/Fire Department connection. The City of Oceanside Fire Department shall review, approve and inspect underground fire systems from the post indicator valve to the building.

E. Telemetry and Control equipment is required for:

1. Water Booster Stations
2. Disinfecting Facilities
3. Regulator Stations
4. Pressure Relief Stations
5. Check Valve Stations
6. Reservoirs
7. Wells

4.2 FIRE FLOWS

1. Fire flow requirements shall be 1000 GPM for single-family residential areas, and duplexes, maximum 3000 GPM for commercial and industrial areas, apartments and condominiums and in accordance with the "Oceanside Guide for Determination of Fire Flows" as outlined under Section III B of the latest City Fire Code Ordinance.

4.3 PRESSURES

- A. Minimum residual pressure shall be 25 PSI at design fire flow plus peak day domestic demand.
- B. Minimum residual pressure shall be 35 PSI at peak hour domestic demand.
- C. When static pressures exceed 80 PSI at property line, pressure-reducing valves will be required at the building. The pressure regulator shall be Class 150 or greater.
- D. Every single-family residential water service in each pressure zone shall be provided with a minimum static pressure of 50 PSI, unless otherwise appointed by the City Engineer and Water Utilities Director.

4.4 MAINS

- A. Minimum diameter shall be 8 inches.
- B. All lines are to be looped - variations shall only be approved by the City Engineer and Water Utilities Director.
- C. Minimum depth of cover required:
 1. 36 inches for 12-inch mains and smaller.
 2. Mains over 12 inches require special design.
- D. Design shall be based on peak day requirements plus fire flow. Maximum velocity shall be 7.5 FPS not including fire flow.
- E. Thrust blocks shall be installed in accordance with Standard Drawing W-4. When water pressures exceed 200 PSI and/or soil-bearing pressures are less than 2000 PSF, a special design shall be required by a Registered Engineer.
- F. All mains shall be shown in profile on the improvement plans.

- G. All water mains not located within the public right-of-way shall be provided with a minimum 20-foot wide water easement. In some special cases, a wider easement may be required; size shall be determined by the City Engineer or Water Utilities Director.
- H. Where water and sewer mains are located within the same easement, the minimum easement size shall be 30 feet wide.
- I. Easements shall be easily accessible to City maintenance equipment.

4.5 VALVES

- A. Maximum valve spacing:
 - 1. 500 feet in residential areas and high valve areas.
 - 2. 1,000 feet on arteries and secondary feeders, supply lines and combination arteries and supply lines.
- B. Valve locations: as required by the City Engineer and Water Utilities Director.
- C. Butterfly valves shall normally be used for mains 14 inches and larger if operation pressures do not exceed 250 psi. Valve types for pressures over 250 psi need special approval by the City Engineer.
- D. All dead ends shall be equipped with blow-off assemblies 4 inches in diameter.
- E. All tee intersections and cross intersections shall have a valve at each branch.
- F. Valve locations shall be designed so that no more than three valves have to be operated to shut down line.
- G. Mueller 2 inch (screw by screw) A-2 380-8 is the acceptable gate valve for 1½ inch and 2 inch meter service taps.
- H. Gate Valves sizes 3 inches through 12 inches shall conform to the “Standard for Resilient Wedge Gate Valves for Water and Sewerage Systems”, per AWWA, C-509, as last revised.
- I. Butterfly valves shall conform to the “Standard for Rubber-Seated Butterfly Valves” per AWWA C-504 as last revised.

4.6 FIRE HYDRANTS

- A. Fire Hydrants shall be installed per requirements of most current Fire Code, "Requirements for Protection Facilities".
- B. Hydrant locations:
 - 1. On the prolongation of the BC radial or property line.
 - 2. Near side of the main.
 - 3. Off the largest main at the intersection of mains.
 - 4. Spacing shall be 300 feet along streets, driveways, or designated fire lanes.
 - 5. All portions of commercial or industrial buildings shall be within 150 feet of an approved fire hydrant accessible to fire department apparatus.
 - 6. A fire hydrant shall be required on cul-de-sac streets where the cul-de-sac is long enough so that the front door of the last house on the back of the cul-de-sac is over 150 feet from the nearest fire hydrant, as provided by State law.
 - 7. All fire hydrant lines shall be provided with a shut off valve at the main.
 - 8. All fire hydrants shall be painted yellow per Standard Drawing W-2.

4.7 HOUSE SERVICES

- A. One separate service shall be installed to each lot and a "W" will be stamped on the curb face at the lateral location.
- B. Minimum size shall be ¾ inch copper. 1-inch copper shall be used where available pressure is less than 50 PSI.
- C. No service shall be installed in a driveway.
- D. Where site improvements or building pad orientation for a lot are not known at the time of street construction, a service lateral shall be installed to the back of the curb for meter connection. Location of the service lateral should be located 5 feet off the lot line to preclude conflict with future driveways.

- E. Minimum separation between water and sewer laterals shall be 10 feet, unless otherwise approved by the City Engineer.
- F. Unless otherwise approved, all services shall be normal to the main.

4.8 PRESSURE BOOSTING STATIONS

Shall not be permitted unless otherwise indicated in the City Master Plan or unusual circumstances make one necessary. Approval shall be obtained from the City Engineer and the City Water Utilities Director.

4.9 CONNECTIONS TO EXISTING LINES

All connections to existing lines by hot tapping or cutting in a tee, etc., shall be made by the City forces at the contractor's expense or by a City approved contractor.

4.10 WATERLINE PLACEMENT

Waterlines shall be situated 10 feet south or 10 feet east of the centerline of the street. A 10-foot minimum separation shall be maintained from the sewer, unless otherwise approved by the City Engineer and Water Utilities Director.

4.11 BACKFLOW PROTECTION

The type of protection that shall be provided to prevent backflow into the City of Oceanside's water supply shall be commensurate with the degree of hazard that exists on the consumers' premises. The protection shall comply with the State of California Title 17 requirements. (Refer to W-17, W-22 and W-23).

- A. An approved double-check, detector-check assembly shall be provided for all private fire services. The double-check, detector check shall be provided with a by-pass meter purchased from and set by the Water Utilities department.
- B. All irrigation services shall be provided with reduced pressure principle assemblies.
- C. City of Oceanside shall approve the type of assemblies for various other applications.
- D. All double-check, detector-check and reduced pressure principle assemblies shall be approved by the "Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California."
 - 1. The entire assembly shall be factory assembled.

2. Assemblies shall be tested upon installation by a City certified backflow device tester. A written test report shall be submitted to the City of Oceanside Water Utilities Department prior to use. Thereafter, annual testing is required at the owner's expense.
 3. The assembly shall be located above ground, on private property, at the right-of-way within eighteen inches (18") of the meter.
- E. The Fire Department connection/post indicator valve shall be located within 40' of a fire hydrant or as approved by the Fire Marshall.

4.12 LIST OF AUTHORIZED MATERIALS USED IN THE CITY WATER SYSTEM

- A. Air Release Valve – All air release valves shall be Valmatic Model 100 equipped with a Model 22 air release or an air release valve manufactured by ClaVal (Model #33). Coating shall be factory approved flame spray zinc applied inside and outside with stainless steel trim.
- B. Blow-off:
1. Four (4) inch shall be standard size. The head will be a James Jones J-344 H.P. with a 4-inch threaded inlet and a 2½-inch fire hose thread outlet. All blow-offs shall be painted yellow per Standard Drawing W-15.
- C. Bolts:
1. Fire Hydrant Nuts and Bolts – Base bolts on fire hydrants are to be cadmium plated break-off bolts with non-oxide grease applied to the threads on the bolt and nut. (W-2)
 2. Flange Nuts and Bolts – Cadmium plated bolts with non-oxide grease applied to the threads on the bolt and nut. (W-5)
- D. Check Valves – ClaVal with factory fuse coated epoxy on the inside and outside of the body with stainless steel trim.
- E. Corporation Stops – to be used on ¾ inch and 1 inch meter services only – ¾ inch and 1 inch James Jones J-15000. (See W-14)
- F. Fire Hydrants – Fire hydrants shall be type James Jones #J-3700 for residential and James Jones #J-3765 for commercial and industrial. Hydrants shall be bronze cast and the flange drilling shall have 6 holes. The valves shall have a 1½" operating nut and the hydrant shall be painted fire hydrant yellow.

- G. Fittings – All fittings, tees, 90’s, 45’s, bury ells, grooved breakaway fire hydrant spools, etc., are to be cast iron with cement lining or ductile iron conforming to AWWA C-110.
- H. Hydraulic valves – ClaVal with factory fuse coated epoxy coating inside and outside of the body with stainless steel trim.

I. Pipe

1. Water house connections:

- a) ¾ and 1” – Type “K” seamless soft copper tubing with no joints from corporation stop to curb stop. (W-14)
- b) 1½” thru 4” – Type “K” rigid copper pipe with all joints silver soldered. (W-9)
- c) Silver solder shall be type 1/8” x 36” Engle Hard Silver “0”.

2. Water Mains:

- a) Ductile Iron – D.I.P. shall be per AWWA C151 and shall conform to Section 207.9 of the Standard Specifications for Public Works Construction as last revised. All pipe shall be lined inside with cement mortar per AWWA C104. All pipe shall be encased in 8-mil thick min, polyethylene per AWWA C105. Pipe class shall be shown on the plans and is subject to the approval of the City Engineer and Water Utilities Director.
- b) The maximum deflection for D.I.P. shall be 2½ degrees per joint (4” thru 12”).
- c) PVC – The pipe shall conform to AWWA C900 and C905 pipe with rubber ring bell end or plain end with rubber ring coupling. Solvent welded joints are not permitted. Provide pipe with cast iron equivalent outside diameter and class 150 or 200 pressure rating as shown on the drawings.

NOTE: 2” minimum width detector tape marked “**WATER**” shall be placed on the compacted and graded sand bedding one foot above and centered over the PVC water main prior to backfilling the trench.

- d) For 4" thru 12" PVC, deflections at the joints shall not be permitted. Curves and deflections shall be made only with the use of high deflection C900 PVC couplings or the approved ductile iron fittings. A maximum of 5 degrees per coupling shall be permitted. The improvement plans shall clearly indicate the location of the couplings and the pipe lengths.
- e) Minimum allowable radius for PVC pipe, using deflector couplings shall be as follows (less than 10' pipe length shall not be permitted):

<u>Pipe Length</u>	<u>Minimum Allowable Radius</u>
20'	250'
10'	125'

- J. Pressure Reducing Valve/Relief Valve – ClaVal with factory fused coated epoxy coating on the inside and outside of the body with stainless steel trim.
- K. Service Saddles – Used for 2" Taps – James Jones J-979 N.P.T. on the outlet. Saddle must be completely encased in neutral sand before backfilling. Threads on bolts and nuts must be coated with non-oxide grease prior to fitting.
- L. Valves:
 1. ¾ inch and 1 inch Meter Service Angles Stop – James Jones J-1525. The center flow line is to be 10 inches below the finished grade. (W-14).
 2. ¾ inch and 1 inch Meter Service Valve – James Jones J-1908 ball valve. To be set by City forces on house-side of meter. Provided by the City when meter is set at contractor's expense.
 3. 1½ inch and 2 inch Meter Service Valve (Street-side Meter) – James Jones J-1912. The center of the flow line to be 10 inches below finished grade. (W-9)
 4. 1½ inch and 2 inch Meter Service Valve (House-side of Meter) James Jones J-1913. To be set by City forces on house-side of the meter. Provided by the City when meter is set at contractor's expense.

5. 2 inch Tapping Valve – Mueller #2380-8 with 2” square operating nut. Used for all 1½ inch and 2 inch meter services in conjunction with the James Jones J-979 service saddle.
6. 3 inch to 12 inch Gate Valves will be used – 1 Clow or American-80 resilient wedge gate valve with a fully encapsulated gate, low zinc stem with factory fuse coated epoxy coating inside on the Clow and inside and out on the American-80.
7. 14 inch or larger Butterfly Valves will be used – the only acceptable valve shall be a Pratt Groundhog valve.
8. Butterfly valves, including operators, shall be protectively coated. Exterior surfaces shall be coated for buried service in accordance with Section 4.2 of AWWA C504.

All interior ferrous surfaces, including contiguous flange faces shall be protectively coated with Keysite No. 750, a product of the Soc-Co Plastic Coating Company of Cucamonga, California, Three-M Company No. 302, or equal.

Said coating shall be applied in not less than three (3) coats to a dry-film thickness of not less than ten (10) or more than twelve (12) mils and shall be “holiday” free.

All surfaces to receive epoxy coating shall be thoroughly cleaned of all contaminants (i.e., oil, grease, wax, etc.) by solvent washing or steam cleaning. Surface projections shall be removed and sharp edges rounded to assure proper application of the epoxy coatings. Immediately prior to applying epoxy coating, surfaces to receive this coating shall be blast cleaned to white metal in accordance with Steel Structures Painting Council Surface Preparation specifications for “No. 5 White Metal Blast Cleaning (SSPC– SP5-63).”

To assure a thorough “Keysite” or “Three M” coating, an epoxy paste-type filler shall be used to fill any crevices and to modify any sharp inside corners. Said epoxy filler shall be “Keysite No. 742.” A & B Epoxy Filler No. 2098”, as manufactured by Wyndham Chemical, Inc., Santa Fe Springs, California; or an approved equal.

During application of “Keysite” coating, the seating surfaces shall be masked. However, all junctions between dissimilar metals shall be covered by the coating.

If any epoxy coating material other than Keysite No. 750, or Three-M Company 320 is proposed to be used to coat the valves furnished hereunder, it shall be so noted on the bid form, and fully detailed information on the alternate material and the application thereof shall be included with the bid. All epoxy lining shall be applied by the valve manufacturer.

M. Valve Cover:

Manufactured by South Bay Foundry, San Diego, California, #G-V-8 with "Water Oceanside" stamped on the cover. Private line covers shall be stamped "Water Private."

N. Valve Riser:

6" SDR-35 PVC gravity sewer pipe (per Standard Drawing W-6).

O. Vault Lids (Per Standard Drawing W-1):

Aluminum Bilco lid appropriately sized for vault.

P. Fitting – Ductile Iron Only – Cast Iron Not Permitted.

Use ductile iron Tyler Grip-Tite or Nappco Push-on fittings conforming to AWWA C 110 or C 153 with a minimum rated working pressure of 250 PSI. Provide fittings with bells and Rubber O-Ring gaskets specifically designed for cast iron equivalent outside diameter PVC pipe. Substitution of mechanical joint fittings not permitted.

Q) Flanges

Flanges on ductile iron fittings shall conform to AWWA C 110 or ANSI B 16.42 Class-250.

R) Bedding and Backfill

Pipe bedding and trench backfill shall conform to San Diego Regional Standard Drawing W-21. Where neutral materials, sand or native materials are specified, they shall meet the testing specification requirements of the "Construction Guidelines and Requirement" section of this manual.

4.13 CHLORINATION AND BACTERIA TESTING

See "Construction Guidelines and Requirements" section of this manual for details.

4.14 HYDROSTATIC TESTING

See “Construction Guidelines and Requirements” section of this manual for details.

4.15 RECLAIMED WATER SYSTEM

The City is developing a water reclamation system. Therefore, during the design process there may be a requirements to install a dual reclaimed water system for landscape irrigation.

The Water Utilities Department may set these requirements on developments as the reclaimed water becomes available throughout the City of Oceanside. Developers may be required to do offsite improvements to bring reclaimed water to their development as necessary.

4.16 REQUIREMENTS FOR FIRE PROTECTION SYSTEMS

A) General

The City of Oceanside Fire Department shall inspect underground fire mains, for fire sprinkler or standpipe systems on private property, from the post indicator valve to the building.

All systems shall be designed and installed as per City of Oceanside standards and the latest editions of Uniform Fire Code, N.F.P.A pamphlet 13, 14 and 24, AWWA Standards, San Diego County Regional Water Standards and manufacturer’s installation specifications.

B) Plan approval process

Developers shall submit the following information to the fire prevention bureau prior to installation of systems for plan review.

1. Set of specifications governing materials and installation.
2. Size of piping and type of material.
3. Plans to be to scale.
4. Show location of post indicator valve, fire department connections, key valves, and check valves.
5. PVC pipe to be at least C900 Class 150 specifications.

NOTE: 2" minimum width detector tape marked "**WATER**" shall be placed on the compacted and graded sand bedding one foot above and centered over the PVC water main prior to backfilling the trench.

6. Valves (MFG, model and listing information).
7. Joining methods-thrust blocks, concrete pads, and depth of bury. (Thrust restraints Tables-N.F.P.A. 24)
8. NOTE: Post indicator valve is required to be equipped with tamper switch and monitored by a central station.

C. Test procedures for all underground systems

The following inspections shall be required by Oceanside Fire Department for all fire sprinkler or standpipe mains.

1. Visual inspection of installation in trench prior to burial:
 - a) Installation of listed and approved pipe, fittings, valves and connections.
 - b) Thrust blocks and concrete pads (required under post indicator valves and fire department connection fittings).
 - c) Depth of burial (36" minimum).
 - d) Rods, nuts, bolts, washers, clamps, and other restraining devices cleaned and coated with approved corrosion-retarding material.
 - e) Neutral sand on site.
 - f) Post indicator valve installed so to insure 18" clearance from all obstructions and 36" minimum height from final grad.
2. Inspections after burial (piping may be center loaded during hydrostatic test).
 - a) Backfilling.
 - b) Pressure test.
 - c) Underground flush (to be done prior to connecting to riser.)
 - d) Final inspection.

3. Test procedures and inspections.
 - a. Pressure test - Pressure test to be conducted for a period of 2 hours at a pressure of 200 PSI from the building, through the post indicator valve, prior to connection to City main.
 - b. Underground flush: flushing of underground systems to be conducted with a minimum of 2-2½ inch hoses, properly anchored to insure safety.
4. Acceptance procedures - The installer shall perform all required acceptance tests above, under the supervision of the Oceanside Fire Department.

5.0 SEWER SYSTEMS – DESIGN CRITERIA

5.1 GENERAL

The sewer facilities listed below will require telemetry and control equipment to be incorporated into the design of the facility. The Water Utilities Department will provide specific design requirements when improvement plans are submitted for Plan Check.

1. Treatment Facilities
2. Sewer Lift Stations
3. Metering Stations

5.2 MAINS

- A. Minimum size shall be 8 inches.
- B. For diameters 10 inches and smaller, maximum depth of flow shall not exceed $\frac{1}{2}$ the diameter. For diameters 12 inches and larger, depth of flow shall not exceed $\frac{2}{3}$ the diameter.
- C. No vertical or horizontal curves shall be permitted, unless otherwise approved by the City Engineer and Water Utilities Director.
- D. The maximum grade rate of sewers shall be 14% unless otherwise approved by the City Engineer.
- E. Locations:
 1. Alley: Mains shall be offset a minimum of 3 feet from the centerline to clear alley gutter. Separation from waterlines shall be per Drawing S-2.
 2. Street: Sewer main locations shall be located in center of the street. A minimum 10-foot separation outside of pipe to outside of pipe from waterlines shall be maintained.
 3. Streets with 84 feet of right-of-way or more may require special location as approved by the City Engineer or Water Utilities Director.
 4. Minimum cover for sewer pipe shall be 6 feet below the finished grade, unless otherwise approved by the City Engineer and Water Utilities Director.
- F. Minimum Slopes:

A minimum velocity of 2 FPS shall be maintained at peak flow. Where 2 FPS is not attainable, a minimum slope of 1.6% shall be used. When velocities are 2.0 FPS or greater the following design criteria will govern:

<u>Pipe Diameter</u>	<u>Minimum Slope</u>
8 Inch	0.50%
10 Inch and larger	0.40%

G. Demands:

1. Average daily sewer demands shall be:
 - a. Single Family: Residential = 280 GPD per unit
 - b. Multi-Family: Residential = 200 GPD per unit
 - c. Commercial = 1,750 GPD per net acre
 - d. Industrial = 2,450 GPD v per net acre
 - e. School = 20 GPD per student
 - f. Park & Open Space = 170 GPD per net acre

2. Peak daily flows for residential developments, shall be based on a ratio of peak to average flow as shown below:

<u>Population</u>	<u>Ratio of Peak to Average Flow</u>
Less than 500	3.5
500 to 1,000	2.75
1,000 to 5,000	2.50
Greater than 5,000	2.00

3. Peak daily flows for all other uses shall be based on the following formula:

$$Q_p = 1.84 Q_a^{.92}$$

where Q_p = peak flow in CFS
 Q_a = average flow in CFS

H. All sewer mains not located within the public right-of-way shall be provided with a minimum 20-foot wide sewer easement. In some special cases, a wider easement may be required; the City Engineer and or Water Utilities Director shall determine size. All easements shall be easily accessible to City maintenance equipment.

- I. Where water and sewer mains are located within the same easement, the minimum easement size shall be 30 feet wide. All easements shall be easily accessible to the City's maintenance equipment

5.3 MANHOLES

- A. Minimum drop through manholes shall be 0.20 feet.
- B. Manholes shall be required:
 1. At all changes of slope.
 2. At all changes of direction.
 3. At all intersections of mains – match soffits
 4. At all ends of lines and beginning of lines.
- C. All manholes shall be numbered on the plans and on the sewer table calculations.
- D. Manhole spacing shall be a maximum of 300 feet, or as approved by the City Engineer or Water Utilities Director.
- E. For all industrial uses, an inspection manhole shall be provided immediately behind the property line. For all residential uses, a cleanout shall be provided within 2 feet of the property line.

5.4 LATERALS

- A. Size - Minimum 4 inches.
- B. Sewer laterals 6 inches and larger shall be connected to an existing manhole or a new manhole shall be constructed.
- C. An inspection manhole shall be provided behind the property line for industrial projects per City of Oceanside Standard Drawing S-1.
- D. All laterals are to be shown on improvement plans by stationing or a lateral table. On "As-Built" plans, all laterals shall be shown in plan view to scale and dimensioned from the nearest sewer manhole.
- E. Locations:
 1. Right angle or radial to street right-of-way.
 2. Standard is from the center of lot to 5 feet above downstream lot line (shown on "As-Built" plans).

3. Service shall not be located in the driveway.
 4. An "S" shall be stamped on the curb face directly above the lateral location.
 5. Separation between sewer and water laterals shall be per Drawing S-2.
 6. Sewer laterals shall be at right angles to the sewer main, except in a cul-de-sac.
- F. Cover: 5 feet minimum at property line.
- G. Any lot with a finish pad elevation lower than the top of the finish street grade where the sewer main is located and services this lot, must install a City approved sewer backflow preventer valve on private property. The valve must be installed in a valve box for easy access and be visible from the public right-of-way. The property owner shall be responsible for the installation and maintenance of the sewer backflow preventer. The sewer backflow preventer shall be shown on the precise grading and improvement plans.
- H. Each parcel or lot shall be a separate connection to public sewer main.

5.5 PUMP STATIONS

Pump Stations shall not be employed unless deemed essential by the City Engineer and Water Utilities Director. The City of Oceanside Water Utilities Department will provide design criteria.

5.6 LIST OF AUTHORIZED MATERIALS USED IN THE CITY SEWER SYSTEM

- A. Manhole Steps: ½ inch round grade 60 steel with plastic copolymer propylene coating on the steel.
- B. Pipe:
1. Sewer House Laterals – cast iron, or PVC schedule 40 pipe shall be used in public right-of-way or public easement.
 2. Sewer Mains:
Preferred material for mains shall be PVC. However, extra-strength vitrified, DIP, and other alternative material may be approved by the City Engineer and Water Utilities Director.

- a. Ductile Iron Pipe – shall be polyethylene lined inside.
- b. PVC Pipe - Minimum size of 8 inches is required. PVC shall be minimum SDR-35.
- c. Vitrified Clay Pipe – pipe shall be made of extra strength clay. This pipe shall not be used when the sewer line is in the ground water table.
- d. For depths less than 6 feet or greater than 12 feet, within easements, and for pipe slopes greater than 6%, PVC, SDR-26 (non-IPS) shall be used (PVC C900 may be used in some cases).
- e. PVC pipes shall not have slopes less than 2%. The maximum diameter shall be 15 inches. A PVC application may be allowed for a slope of less than 2% provided that the length of each section does not exceed 12½ feet, a minimum 2 FPS velocity is maintained, or as approved by the City Engineer and Water Utilities Director. The size of pipes and maximum spacing of manholes to be the same as required for V.C.P.
- f. Joints shall be plastic compression joints unless otherwise specified.
- g. Design calculations shall be submitted to verify line size and bedding design. Normally a Manning “n” = 0.013 will be satisfactory.
- h. Plastic sewer pipe made of solid PVC is an acceptable alternative to VCP sewer pipe. All pipe placed between manholes shall be the same material.
- i. Plastic sewer pipe shall meet the applicable material specifications of Sections 207-15, 207-16, or 207-17 of the Standard Specifications for Public Works Construction, most recent edition.
- j. A seal, water-stop or coupling shall be placed or grouted into the manhole to accept plastic sewer main, per Standard Drawing S-3.

C. Backfill and Bedding Materials

Bedding standards are contained in this Manual's Standard Drawing S-3. Both PVC and VCP sewer mains shall meet this requirement.

Where sand or native materials are specified for Type "A" material, they shall meet the testing specification requirements of the "Construction Guidelines and Requirements" section of this manual.

5.7 PRIVATE SEWER SYSTEMS

All private sewer systems shall be governed by and permitted through the Building Department. A manhole shall be set at the property line and at the mainline if required.

The sewer system upstream of the inspection manhole at the property line shall be considered private.

In the event that a private sewer system is proposed to be converted to a public system, the entire system must be upgraded to meet the public standards as presented in this manual.

6.0 DRAINAGE SYSTEM DESIGN CRITERIA

6.1 GENERAL

1. Compliance shall be maintained with all requirements of the latest Master Plan of Drainage. Drainage design shall be subject to the review and approval of the City Engineer.
2. All buildings shall be protected from flooding from a 100-year frequency storm. Construction shall comply with the City's Floodplain Ordinance when applicable and all pad elevations shall be a minimum of 1 foot above the floodplain elevation, as designated by the latest Flood Insurance Rate Maps on file with the City Engineer.
3. Drainage basins with tributary areas of greater than one square mile are considered flood facilities, are subject to the Floodplain Ordinance, and must comply with FEMA regulations.
4. All drainage systems shall be designed, such that the flows from a 100-year storm will be contained within streets and/or underground storm drains. The maximum depth of street flow shall be below the top of curb elevation.
5. The use of underground storm systems, in addition to standard curb and gutter, shall be required:
 - a) When flooding or street overflow will cause damage to facilities.
 - b) When existing drainage facilities discharge into the proposed development.
 - c) When the water level in streets based on a "100 year storm" exceeds the top of the curb.
 - d) When the depth-velocity product of flow in the street (expressed in feet and feet per second) exceeds six.
 - e) To minimize the installation of cross gutters.
6. Permanent open drainage ditches will not be permitted in the right-of-way of a public street.
7. Permanent drainage facilities and right-of-way shall be provided from development to a point of satisfactory disposal and must include a maintenance road with a minimum 12-foot wide all-weather access.

8. The type of drainage facility shall be selected on the basis of physical adaptability to the proposed land use. Environmental channels will be approved only in areas where substantial open space can be preserved. A low-flow pipe or swale shall be included. Maximum design velocity shall be 6 F.P.S. in the channel.
9. Concentrated drainage over 10 c.f.s. shall not be discharged to City streets.
10. Improved open channels shall be fenced. A 12-foot wide access road shall be provided on one side with ramps to the facility at each street intersection or at 1000' intervals, whichever is less.
11. Storm drain easements shall be 20 feet. Additional width may be required depending upon pipe size, depth and design.
12. Storm drain shall be located along the centerline of the easement.
13. On secondary arterial streets and above, one (1) 12-foot lane each direction should be clear of water, with a 100 year storm.
14. Once water is picked up in an underground storm drain, it shall remain in the system until discharged into an acceptable water course or storm drain.
15. All sump conditions shall be provided with a secondary surface outlet.

6.2 HYDROLOGY

- A. Offsite: submit a plan for the entire drainage area on a topography map having a scale of 1"=1000 feet or greater enlargement. Show existing culverts, cross- gutters and drainage courses based on a field review. Indicate the direction of flow, clearly delineate each drainage basin showing the area and the points of concentration and discharge.
- B. Onsite, submit a plan for the project area having a scale of 1"=200' or greater enlargement. Show all proposed and existing drainage facilities and drainage courses. Also show the location and grades of proposed streets. The direction of flow should be indicated. Clearly delineate each drainage basin showing area, runoff from each area, the flow on each side of streets, flow intercepted by catch basins, and flows in pipes and other structures.
- C. Submit all calculations with reference to charts, tables and/or methods used (Note: Q_{100} shall be used in all cases).
- D. Runoff may be calculated by the methods presented in the County of San Diego Hydrology Manual with the following modifications:

- a) Appendix X-C, "urban areas overland time of flow curves", shall not be used.
- b) The 10 minutes shall not be added to the time of concentration, when using Appendix X-A, "nomograph for determination of time of concentration (Tc) for natural watersheds". A maximum of 5 minutes may be added to the time of concentration for the initial basin only.

6.3 HYDRAULICS

A. Street

Provide:

- 1. Depth of gutter flow calculations;
- 2. Inlet calculations;
- 3. Show gutter flow Q, inlet Q, and bypass Q on a plan of the street.

B. Storm Drain Pipes and Open Channels - Provide hydraulic grade line calculations including:

- 1. Loss calculations for: entrance, friction, junction, manholes, bends, angles, reduction, and enlargement;
- 2. Analyze existing conditions upstream and downstream from proposed system, to be reviewed and approved by the City Engineer on a case-by-case basis;
- 3. Calculate critical depth and normal depth for open channel flow conditions.
- 4. Show the both the HGL and EGL plotted on a scale drawing of the pipe or channel profile;
- 5. Design for a non-silting velocity of 4 F.P.S. in a 2-year frequency storm;
- 6. The ratio of normal velocity to critical velocity should be less than 0.9 or greater than 1.2.

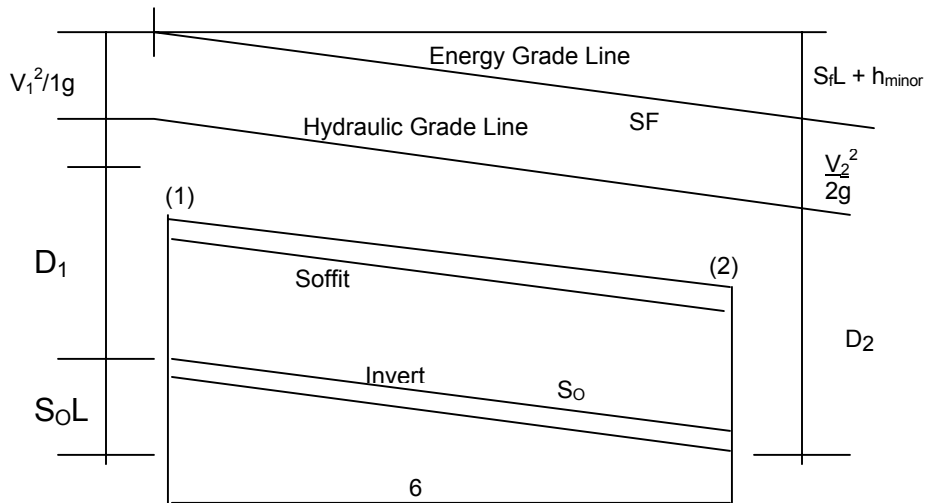
C. Storm drain facilities to the San Luis Rey River shall be designed based upon:

1. 100 year, 24-hour storm on-site versus a 50 year, 24 hour storm in the river; and,
2. A 10 year, 24-hour storm on-site versus a 100 year, 24 hour storm in the river.

6.4 INSTRUCTION FOR HYDRAULIC CALCULATIONS

A. Most procedures for calculating energy grade line profiles are based on the Bernoulli equation. This equation can be expressed as follows:

$$\frac{V_1^2}{2g} + D_1 + S_oL = \frac{V_2^2}{2g} + D_2 + S_fL + h_{\text{minor}}$$



In which:

- D = Vertical distance from Invert to H.G.L.
S_o = Invert slope
L = Horizontal projected length of conduit
S_f = Average friction slope between Sections 1 and 2
V = Average velocity (Q/A)
h_{minor} = Minor head losses

Minor losses have been included in the Bernoulli equation because of their importance in calculating hydraulic grade line profiles and are assumed to be uniformly distributed in the above figure.

When specific energy (E) is substituted for the quantity $V^2/2g + D$ in the above equation and the result rearranged,

The above is a simplification of a more complex equation and is convenient for locating the approximate point where pressure flow may become unsealed.

B. Head Losses:

1) Friction Loss

Friction losses for closed conduits carrying storm water, including pump station discharge lines, shall be calculated from the Manning equation or a derivation thereof. The Manning equation is commonly expressed as follows:

$$Q = \frac{1.486 A(R)^{2/3} (S_f)^{1/2}}{n}$$

In which:

- Q = Discharge, in c.f.s.
n = Roughness coefficient
A = Area of water normal to flow in ft.²
R = Hydraulic radius
S_f = Friction slope

When rearranged into a more useful form,

$$\text{In which } S_f = \left[\frac{Qn}{1.486 AR^{2/3}} \right]^2 = \left[\frac{Q}{R} \right]^2$$

$$R = \frac{1.486 AR^{2/3}}{n}$$

C. Hydraulic Losses

1. Friction

$$h_f = L \times S_f$$

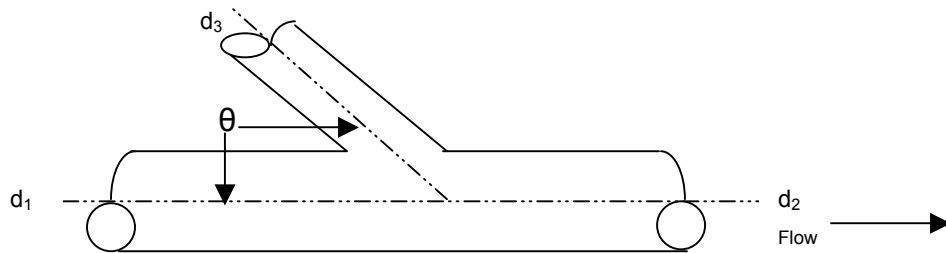
Where:

h_f = friction head in feet.

L = length of conduit in feet.

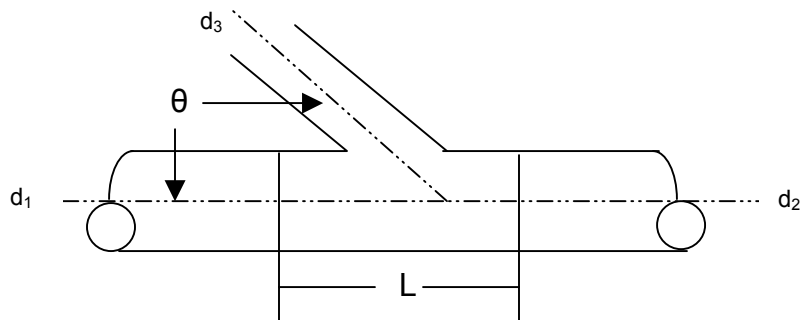
S_f = slope of hydraulic gradient in ft/ft.

2. Junction: ($d_1 = d_2$)



$$h_j = \frac{V_2^2}{2g} - \frac{V_1^2}{2g} - \frac{2 A_3}{A_2} \times \frac{V_3^2}{2g} \times \cos \theta$$

3. Junction: ($d_1 \neq d_2$)



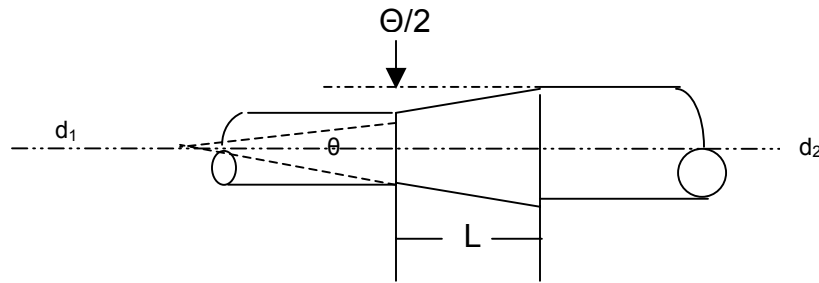
$$H_j = Y + h_{y1} - H_{y2} + h_e \text{ (Ignoring Transition Losses)}$$

Where - $Y = \text{Change in hydraulic gradient}$
 $= \frac{Q_2 V_2 - Q_1 V_1 - Q_3 V_3 \cos \theta}{\frac{g}{2} \frac{A_1 + A_2}{2}}$

$H_v = \text{Velocity head}$

$H_e = \text{entrance loss (where applicable)}$
 $= 0.20 \frac{V_2^2}{2g}$

4. Transition: (Pipe or Box Section)



$$k_t = \frac{V_2 - V_1)^2 + h_f}{2g}$$

Where - $k_t = \text{head loss coefficient from Table 2-4}$
 (Double the head loss for decreasing velocity)

$H_f = \text{friction loss} = L (S_{f1} + S_{f2})$

TABLE 9

Head Loss coefficient “ k_t ” for Transitions

0°	2	3	4	5	6	7	8	9	10	11	12
K_t	.033	.036	.039	.042	.046	.050	.055	.066	.078	.090	.10
0°	15	20	25	30	35	40	45	50	60	75	90
K_t	.16	.31	.40	.49	.55	.60	.64	.67	.72	.72	.67

5. Sudden Enlargement

$$h_E = \frac{(V_1 - V_2)^2}{2g}$$

6. Sudden Contraction

$$h_c = K_c \frac{V_2^2}{2g}$$

Where – V_2 is highest velocity
 K_c = coefficient from Table 2-5

TABLE 10

Head Loss Coefficient “ K_c ” for Sudden Contractions

$\frac{A_2}{A_1}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
K_c	.46	.41	.36	.30	.24	.18	.12	.06	.02	0

7. Manholes

The following head losses at manholes for conduits under pressure are in addition to transition or junction head losses.

- (1) Manhole shaft on rectangular conduit – head loss negligible
- (2) Manhole shaft on circular or arch conduit:

$$h_m = 0.05 \frac{V_2^2}{2g}$$

Where

V_2 = downstream velocity

- (3) Rectangular structure with manhole shaft joining circular conduits without (with) shaped invert:

$$h_m .40 (.10) \frac{V_2^2}{2g}$$

8. Bend Loss

Bend losses shall be calculated from the following equations:

$$[\quad]$$

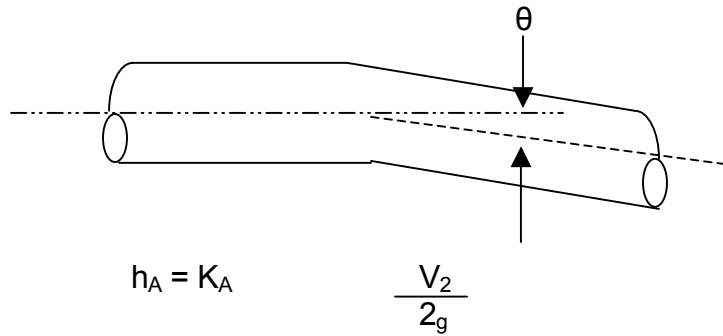
$$h_b = K_b \frac{V_2}{2g}$$

In which

$$K_b = 0.20 \sqrt{\frac{\Delta}{90^\circ}}$$

Where Δ = Central angle of bend in degrees

9. Angle Point



Where - K_A = head loss coefficient from Table 11.

TABLE 11

Head Loss Coefficient " K_A " for Angle Points

0°	1	2	3	4	5	6	7	8	9
K_A	.005	.008	.011	.014	.017	.020	.022	.024	.027
0°	10	12	15	20	25	30	35	40	45
K_A	.03	.037	.047	.067	.09	.115	.146	.184	.236

NOTE: Angle points greater than 6° are not to be used in design.

10. Debris Barriers

$$h_0 = K_0 \frac{V_{net}^2}{2g}$$

Where - $K_0 = 1.45 - 0.45 R - R_2$

and - $R = \text{Ratio of Net to Gross area at the barrier section}$

$V_{net} = \text{Velocity at the barrier section.}$

1. Entrance:

$$h_e = k_e \frac{V^2}{2g}$$

Where - $k_e = \text{head loss coefficient from Table 12.}$

TABLE 12

Head Loss Coefficient k_e for Entrance

Entrance Shape		k_e
Headwall or C.6. Outlet	Rounded Edge	0.20
	Square Edge	0.40
Headwall and 45° Wingwalls	Rounded Edge	0.20
	Square Edge	0.35
Headwall and Parallel Wingwalls	Rounded Edge	0.30
	Square Edge	0.40
Mitered	2:1 Slope	0.60
Projecting	Rounded Edge	0.25
	Thick Edge	0.50
	Thin Edge	0.90
End Section	Concrete	0.50
	C.H.	0.50

TYPE MATERIAL	"n" Value
PIPES & BOXES	
PVC	0.012
R.C. Pipe	0.013
P.C.C. Box & Arch. Sections	0.014
P.C.C. Cast in Place Pipe	0.015
STREETS & CHANNELS	
Asphalt Pavement	0.016
P.C.C. Pavement	0.015
P.C.C. Gunite (Smooth)	0.016
UNIFORM CHANNEL	
Trapezoidal Channel With Pipe & Wire	0.025
Cobbles Flush Grouted	0.020
Sand-Fine, Silt or Loam	0.020
Average River Sand and Gravel	0.025
Gravel – Coarse	0.030
Gravel – Coarse with Boulders	0.035
Rip Rap – Medium Wt.	0.035
Rip Rap – Jetty Type	0.050
NATURAL STREAMS	
Valley with Light Vegetation and Gravel	0.040
Mountain with Moderate Brush, Trees & Boulders	0.045
Mountain with Heavy Brush, Trees & Boulders	0.070

6.5 STORM DRAIN DESIGN

- A. Storm drains shall be designed in accordance with the following criteria:
1. Minimum pipe slope is 0.5%. A flatter slope may be approved if a minimum non-silting velocity of 4 f.p.s. can be maintained in a 2-year frequency storm:
 2. Provide cleanouts at 300 feet maximum spacing at angle points and at breaks in grade. For pipes 48" in diameter and larger, a maximum spacing of 500 feet may be used. Note: Inlets may not be used as cleanouts.
 3. The material for storm drains shall be reinforced concrete pipe.

4. All pipes and conduits laid parallel to the roadway shall be placed at least 30 inches below the roadway surface (measured from top of pipe to finished grade). However, when pipe depth is in excess of 10 feet (measured from top of pipe to ground surface), the City's approval is required prior to the initial design of the system.
5. Pipe size may not be decreased downstream.
6. Branching of flow is not allowed without prior City Engineer's approval.
7. The minimum diameter of pipe shall be 18 inches.

In cases where the conduit may carry significant amounts of debris, the minimum diameter of main line pipe shall be 36 inches.

8. Inlet Structures - An inlet structure shall be provided for storm drains located in natural channels. The structure shall generally consist of a headwall, wingwalls to protect the adjacent banks from erosion, and a paved inlet apron. The apron slope shall be limited to a maximum of 2:1. Wall heights shall conform to the height of water upstream of the inlet, and be adequate to protect both the fill over the drain and the embankments. Headwall and wingwall fencing and a protection barrier to provide public safety shall be provided where determined necessary by the City Engineer.
9. The pipe invert elevations, slope, length, material, D-Load, Q_{100} , V_{100} and pipe profile shall be shown on the improvement plans.
10. Access shall be available, or provided for maintenance of all drainage facilities.
11. The strength classification or gauge of any pipe shall be shown on the plans. RCP shall be 1350-D minimum. For depths greater than 14 feet, manufacturers data shall be submitted for approval.
12. Where velocity exceeds 20 f.p.s. or where pipe slopes exceed 10%, a special wall R.C.P., with a minimum of 1½-inch steel clearance on both the inside and outside surfaces shall be used.
13. Maximum velocity in special wall R.C.P. shall be 45 f.p.s.
14. A pressure manhole shaft and a pressure frame and cover shall be installed in a pipe or box storm drain whenever the design water

surface is above the ground surface and it shall be approved by the City Engineer.

15. A manhole shaft safety ledge shall be provided in all instances when the manhole shaft is 20 feet or greater in depth.
16. Horizontal curves may be per the manufacturer's specifications or as approved by the City Engineer.
17. Storm drains may not be placed in parkway strip.
18. Storm drain crossings shall at all times be normal to street centerline, unless otherwise approved by the City Engineer.
19. Lugging into pipes less than 36 inches in diameter shall not be permitted. For pipes greater than 36 inches, a 50% rule shall apply (i.e., 24 inch may lug into 48 inch, 30 inch may lug into 60 inch, etc). Lugs on opposite sides of pipes, at the same location, shall not be permitted.
20. Maximum water surface in catch basins for design conditions shall be 0.5 feet below the inlet (F.L.) elevation except for the basin in a sump condition where the maximum ponding depth is the top of the curb.
21. Provide a work copy of the drainage system that shows the following:
 - a) Q_{in} , Q_{by} street flow arrows at all inlet structures on the improvement plan;
 - b) Show hydraulic and energy grade line on work copy of improvement plan; and,
 - c) Show improvement plan elevation in and elevation out of each structure.

6.6 CATCH BASINS AND INLETS TO CATCH BASINS AND OTHER DRAINAGE STRUCTURES

- A. Locations:
 1. At natural drainage courses.
 2. At low points in street grades.
 3. Where the quantity of flow in the street becomes excessive or undesirable.

4. Upstream from sump conditions to reduce ponding.
5. At reverses in the cross slope of the street section to prevent water from crossing the street.
6. At changes in alignment to prevent water from spreading laterally due to centrifugal force.
7. At points of reduced grade to prevent sedimentation.
8. Upstream of any intersection where a storm drain is available catch basins/curb inlets should be so located that the curb transition does not fall within the curb return, if possible).
9. At maximum intervals of 1000 feet.
10. In medians at the beginning of transitions from superelevated to crown sections, at median openings in a superelevated section, and in the outer curb at the beginning of transitions from crown to superelevated sections.
11. Each catch basin shall have a separate connector to the main line.
12. When located in an area with sidewalk the Type B curb inlets per San Diego Regional Standard Drawing D-2 shall be modified to extend the full width of the sidewalk.

B. Catch Basin and Design Considerations

1. The three basic types of catch basins are the side opening, the grating, and a combination of both. The San Diego County Regional Standard Drawing contains plans and specifications for catch basins to be used.
2. Inlet sizing calculations must meet the provisions as presented in:

Drainage of Highway Pavements
Hydraulic Engineering Circular No. 12
U. S. Dept of Transportation
Federal Highway Administration

Copies of the manual are available to the public through The National Technical Information Service, Springfield, Virginia 22161.

- a) Unless otherwise approved by the City Engineer inlets on grade shall be sized to intercept 100% of flow.
- b) Inlets in sag locations shall be designed as weirs. At no time shall water pond to depths at which the inlet will act as an orifice.

7.0 GRADING PLANS

7.1 GENERAL

No person shall conduct any grading, clearing or grubbing on natural or existing grade without first having obtained a grading permit from the City Engineer, except as provided for in the City of Oceanside Grading Ordinance 81-20, Section 201. As provided for in Section 202 of said ordinance, pavement in excess of 6,000 square feet on natural or existing grade for the purpose of private road or commercial, industrial or multi-residential parking lot or travelway requires a grading permit.

7.2 PRELIMINARY GRADING PERMIT

Issued on the basis of approved plans which need not show a structure location but must show interim building pad drainage to the degree required by the City Engineer. Preliminary grading plans shall be completed in accordance with the City's Grading Ordinance, Section 509 and shall include a title "Preliminary Grading Plan" in the title block. No building permits shall be issued for sites graded under preliminary grading permits.

7.3 PRECISE GRADING PERMIT

Issued on the basis of approved plans which show the precise structure location, finish elevations and all on-site improvements including water services and sewer laterals for reference utility vaults, meter boxes, etc. Precise grading plans shall be completed in accordance with the City's Grading Ordinance, Section 510 and shall include a title "Precise Grading Plan" in the title block.

7.4 SURCHARGE GRADING PLANS

Surcharge grading plans shall provide permanent erosion control measures including, but not limited to site planting mixes and watering schedules.

7.5 CERTIFICATION

The Engineer of Work shall certify all work to within .1' of the design elevations. Any deviation will require a revision to the approved plans.

- A. Rough Pad and Finish Grade Certifications shall include the following information:
 - 1. Engineer's name, address and telephone number.
 - 2. Owner's name, address and telephone number.

3. Project name and file number (Ex: Blueridge Estates, T-47-88).
4. Lots to be certified, both final map and grading plan lot numbers, if applicable.
5. Grading plan number.
6. A statement by the project engineer certifying the following information:
 - a) That all grades are in conformance with the approved plans. Specific pad elevations (blue tops) are needed for rough pad certifications.
 - b) That you have verified line and grade for all drainage structures.
 - c) That the property corners or building corners have been staked for proper building locations at the time of pad certification.
 - d) That slopes are in the locations shown and at the inclinations shown on the approved plans.
 - e) That earthen berms as shown on the approved plans have been constructed.
 - f) Preliminary Grading will require that pads are graded to drain towards an approved drainage system or street at a minimum of 1%. Final grading inspection will require lot drainage to conform with the approved grading plan and/or that swales drain at a minimum of 1%.

7.6 PREPARATION REQUIREMENTS

- A. The Engineer of Work shall submit a grading plan that conforms with the City of Oceanside Grading Ordinance 81-20, the latest edition of the Standard specifications for Public Works Construction together with its supplement (A.P.W.A. Specifications) and the San Diego Area Regional Standard Drawings as amended by the City Supplements and earthwork specifications attached to the Preliminary Soils Report.
- B. Grading Plan, approved and signed by a Civil Engineer, the Soils Engineer and the Engineering Geologist shall accompany each application for a grading permit, unless waived by the City Engineer.

The submittal shall include a general set of plans, showing the original and designed finish contours, spot elevations of building pads and public improvements, slope ratios, proposed drainage facilities, protective fencing, retaining walls, and any structures of buildings on adjacent properties within fifteen (15) feet of the common property lines.

- C. Unless waived by the City Engineer, each application for a grading permit shall be accompanied by supporting data consisting of a soils engineering report, an engineering geology report, a landscape and irrigation plan, and a hydrology study and the grading plans specifications. All such plans shall be drawn to engineering scales as approved by the City Engineer. The title sheet of the general plans shall show the names, addresses and phone numbers of the site owner, the Civil Engineer responsible for the plan's preparation, the project Soils Engineer and Engineering Geologist, (project paleontologist and archeologist when required) including registration numbers, and a locality sketch of the proposed site. The Landscape and Irrigation Plan shall be prepared by a practicing landscape architect. The plans shall indicate the areas, type, and method of slope planting to be done, and irrigation systems with types of controls.
- D. A statement of quantities shall be furnished, giving the estimated cubic yards of excavation, embankment, and the shrinkage or swell factor. Also, type of ditches and down-drains, the lineal feet and sizes of the various types of pipe, the amount of rock to be used for rip rap or slope protection, a list of the structures such as headwalls and energy dissipators, the lineal feet of fencing, and any pertinent information useful in determining the extent of the proposed work.
- E. The grading plans shall show scaled sections of all stabilization fills, buttress fills, keyways, and benching for fill placement, surcharge and rock disposal areas.
- F. Concrete ditches shall be used where velocities exceed 5 feet per second.
- G. All grading shall conform to Federal National Pollution Discharge Elimination System (NPDES) Standards. Compliance with all NPDES permitting requirements shall be demonstrated prior to the issuance of grading permits.

7.7 SUBDRAINS

Subdrains shall be installed at the toe of all slopes where the slope equals an exceeds 30 feet in height, or when the slope equals an exceeds 8 feet in height and 300 feet in length. See Section 3.25 for construction requirements.

8.0 EROSION CONTROL PLANS

8.1 GENERAL

As provided for in Section 1501 of the City of Oceanside Grading Ordinance, erosion control plans shall be submitted to the City Engineer for approval concurrent with the grading permit application. No grading permit shall be issued unless an erosion control plan has been approved by the City Engineer. The erosion control plan may be waived for grading on single residential lot projects, provided that an erosion control system approved by the City Engineer is installed, placed, planted, or constructed before October 15. An erosion control and/or sediment control plan is required if the City Engineer determines that erosion or sediment discharge adversely affects adjacent properties. The approved erosion control plan shall be updated if necessary by October 15 each year, for projects under a grading permit.

8.2 PLAN REQUIREMENTS

The erosion control plan shall include details of protective measures, including desiltation basins or other temporary drainage or control measures, or both, as may be necessary to protect adjoining public and private property from damage by erosion, flooding, or mud and/or debris deposits which may originate from the site or result from the grading operations.

The erosion control plan shall include, but not be limited to, the following information:

- 1) A twenty-four (24) hour telephone number of the person responsible for performing emergency erosion control work.
- 2) The signature of the civil engineer who prepared the erosion control plan.
- 3) Identification of all desilting and erosion protection facilities necessary to protect adjacent property from sediment deposition.
- 4) Identification of the streets and drainage devices that will be completed and paved by October 15.
- 5) Provision for the placement of gravel bags, slope planting, or other measures to control erosion from all slopes above and adjacent to roads open to the public.
- 6) Provision for maintaining access to desilting facilities during wet weather.
- 7) A schedule for the construction and ongoing maintenance of all required erosion and sediment control facilities.

- 8) Identification of discharge points where concentrated runoff occurs.
- 9) A cost estimate for bonding purposes. The estimate shall include costs for all erosion control devices regardless of the state of completion.

Hydrology and hydraulic calculations shall be submitted with all erosion control plans.

8.3 TEMPORARY EROSION CONTROL MEASURE

The engineer of work shall submit an erosion control plan where required by the Grading Ordinance. The following temporary erosion control measures shall be incorporated in addition to those detailed in the Grading Ordinance.

- A. Provide sediment basins of adequate size to contain all anticipated sediment and runoff. The sediment basins shall be provided at the lower end of every drainage area producing sediment runoff. The basins shall be maintained and cleaned to design contours after every runoff producing storm. The basins should be semi-permanent structures that would remain until soil stabilization vegetation is established and any required improved drainage devices are installed. This shall include streets which are conductors of concentrated runoff. Specific sedimentation design guidelines are included in Section 8.4.
- B. Sewer or storm drain trenches that are cut through basin dikes or basin inlet dikes shall be plugged with sandbags/gravelbags from the top of the pipe to the top of the dike. The gravelbags shall be installed in a manner that will preclude toppling due to hydrostatic pressure or runoff momentum.
- C. All utility trenches shall be protected to prevent siltation which may cause damage or become a nuisance on public right-of-ways, public drainage courses, or downstream private properties. If gravelbags are used for this purpose, they shall be utilized in the following manner:

Trenches shall be blocked at the prescribed intervals below with a double row of gravelbags with a top elevation, two gravelbags below the graded surface of the street. Gravelbags are to be placed with lapped courses. The intervals prescribed between blocking shall depend on the slope of the ground surface, but not exceed the following unless otherwise shown on the erosion control plans and approved by the City Engineer.

- D. Rock riprap on curves and steep drops shall be provided in all erosion prone draining channels downstream from the development to prevent damage to downstream properties. This protection would reduce erosion caused by the

increased flows that may be anticipated from denuded slopes, or from impervious surfaces.

- E. Erosion shall be prevented at locations where runoff is concentrated. Where runoff will be discharged to natural ground or channels, appropriate energy dissipators shall be installed to prevent erosion at the point of discharge.
- F. Desilting basins constructed of compacted earth shall be compacted to a relative compaction of 90 percent of maximum density. A soils engineering report including the type of field testing performed, location and results of testing shall be submitted to the City Engineer for approval upon completing the desilting basins.

8.4 SEDIMENT BASIN DESIGN

A. A sediment basin collects and holds runoff to allow suspended sediment to settle out. A number of small basins are preferable to one large basin. They are used in conjunction with other measures to control runoff, erosion and sedimentation. They are particularly useful below construction operations that expose soil to erosion. Sediment basins remain in place until the disturbed area is permanently stabilized and serve to:

- preserve the capacity of reservoirs, ditches, canals, waterways and streams;
- abate or reduce pollution;
- prevent undesirable deposition on bottomland and developed areas.

B. Design Specifications

CLASSIFICATION OF TEMPORARY SEDIMENT BASINS

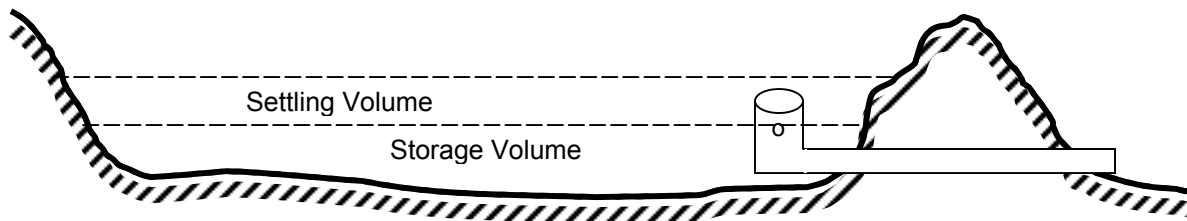
Size	Max. Drainage Area, acres	Max. Height* of Dam, ft.	Min. Embankment Top Width, ft.	Embankment Side Slopes
1	100	10	8	2:1 or flatter

*Height is measured from the low point of original ground along the centerline of dam to top of the dam.

1. The sediment basin shall be located to obtain the maximum storage benefit from the terrain and for ease of cleanout of the trapped sediment. It shall be located to minimize interference with constriction activities and construction of utilities.

2. The sediment basin shall be located to obtain the maximum storage benefit from the terrain and for ease of cleanout of the trapped sediment. It shall be located to minimize interference with construction activities and construction of utilities.
3. The volume of the sediment basin shall consist of two portions: a sediment storage zone and a settling zone.

SEDIMENT BASIN VOLUME REQUIREMENTS
(not to scale)



4. The sediment storage zone shall consist of sufficient volume to retain sediment expected to be captured by the basin between maintenance cleanouts. This volume is in addition to the settling zone volume of the basin.
5. The sediment-settling zone shall always be kept free of sediment. Within it, particles of sediment settle to the storage zone. The sediment settling volume shall be based upon a 60 second retention time for a 2-year storm with a minimum 2-foot depth to the storage zone.
6. The surface area of the sediment basin shall be calculated at the height of the rim of the riser as follows:

A (sq. ft.) = 1250 x Q

where: A is the surface area of the sediment basin, in square feet;

Q is the design overflow rate at the riser or spillway, in cubic feet per second;
7. The design overflow rate at the riser, Q, shall be calculated by the Rational Method, or other approved method, and shall be based upon a minimum rainfall intensity of the 10-year-frequency, 6-hour duration rainfall total, averaged over 6 hours, for the site in question. Runoff computation shall be based upon the soil cover conditions expected to prevail in the contributing drainage area during the anticipated effective life of this sediment basin.

8. The basin configuration shall be such that the length is greater than or equal to the width.
9. A concentric anti-vortex device and trash rack shall be securely installed on top of the riser.
10. A base with sufficient weight to prevent flotation of the riser shall be attached to the rise with a watertight connection. Two approved bases for risers 10 feet or less in height are
 - concrete base 18 inches thick with the riser imbedded 6 inches in the base;
 - 1/4-inch minimum thickness steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel or tamped earth placed on it to prevent flotation.

TABLE B
 Estimated Quantities of Silt and Debris
 (Cubic Yards)

Drainage Tract Area (Acres)	Soil Conditions	Slopes of the Streets (Average weighted by distance)					
		2%	5%	8%	10%	12%	15%
10	Loose Granular	270	350	370	400	450	500
	Compacted	100	170	200	240	270	300
15	Loose Granular	400	420	460	600	675	750
	Compacted	150	255	300	360	400	450
20	Loose Granular	540	700	740	800	900	1000
	Compacted	200	340	400	480	540	600
40	Loose Granular	1080	1400	1480	1600	1800	2000
	Compacted	400	680	800	960	1080	1200
80	Loose Granular	2160	2800	2960	3200	3600	4000
	Compacted	800	1360	1600	1920	2160	2400
100	Loose Granular	2700	3500	3700	4000	4500	5000
	Compacted	1000	1700	2000	2400	2700	3000
150	Loose Granular	4000	4200	4600	6000	6750	7500
	Compacted	1500	2550	3000	3600	4000	4500
200	Loose Granular	5400	7000	7400	8000	9000	10000
	Compacted	2000	3400	4000	4800	5400	6000

Note: Gravelbagging assumed 50% efficient.

Always use the value for granular material unless the project is finished and the utility trenches are filled with soil which has been compacted to 90% density.

The capacity required by the above table shall be in a pit or basin and shall be added to provide for water routing. The inlet to the pit or basin shall be protected against erosion. At the lower end of the basin, there shall be constructed an outlet dike. The size of the desilting basin may be reduced by constructing more than one basin. However, the total volume of basins constructed shall be equal to the estimated volume of runoff solids plus water capacity.

9.0 GEOTECHNICAL REPORT REQUIREMENTS

9.1 GENERAL PROVISIONS

- A. All geotechnical reports shall contain a copy of the grading plan, site location map and site map or plan showing contours or elevations. The site map shall show proposed structures or pad locations if known at the time of investigation. Deviations from this policy will require supplemental reports showing these data.
- B. All geotechnical reports shall include a scope of work description.
- C. All investigations shall include borings extending below the depth of proposed excavations where adjacent to existing developments.
- D. All reports shall contain test location or boring location maps at a readable scale, and shall contain results of all tests performed or measurements made in the field.
- E. All reports shall conform to the grading ordinance as well as these standards.
- F. All reports shall provide conclusions as to the adequacy of the site for the proposed grading with recommendations for corrective grading procedures. Recommendations contained in the approved reports shall be incorporated in and shown on the grading plans.
- G. Reports shall be signed and stamped by a Certified Engineering Geologist and a Soils Engineer.
- H. All Geotechnical Reports shall address site toxicity in accordance with:
 - 1. The requirements of the City of Oceanside, and/or other agencies.
 - 2. The requirements of the county of San Diego Health Department.

9.2 DEVELOPMENT PLANS, TENTATIVE MAPS, AND ENVIRONMENTAL IMPACT REPORTS

- A. Geologic reports for development plans, Tentative Maps and environmental impact reports shall include a geologic map.
- B. Geologic hazards, such as massive landslides, which may require redesign of the project shall be investigated to a sufficient degree that requirements for redesign may be provided.

- C. Seismicity, including liquefaction potential preliminary evaluation, shall be included.
- D. Soils Engineering shall evaluate the erosion potential of site soils shall be evaluated.
- E. General stability characteristics and possible compressible soils shall be described along with possible mitigation measures.
- F. All criteria for "Preliminary Investigations" shall also be submitted when deemed necessary.

9.3 PRELIMINARY INVESTIGATIONS

A. GEOLOGIC REPORTS

- 1) All geologic investigations shall include sufficient subsurface investigation to provide adequate information pertinent to the proposed development. All Geologic Reports shall provide classification and description of Major Geologic/Geomorphic Provinces; origin, mode of deposition, distribution, thickness of bedrock and surficial materials, formation names, geologic age, physical and chemical properties indicate areas to remain as natural ground or restricted use areas. Evidence of expansive soils or free draining soils. Any excavation difficulty areas from analysis of subsurface exploration, seismic properties.
- 2) All geologic reports shall contain a geologic map at a scale so that geologic contacts, proposed development grades and original topography is legible. The map shall show all geologic measurements including but not limited to bedding, fault, and joint attitudes and shall show test pit and boring locations. Locations of proposed keyways, buttresses, stabilization fills proposed or existing subdrains, seeps or springs, and any other mitigative areas as necessary.
- 3) All geologic reports shall show test pit and boring logs with depth and geological classifications of materials encountered and attitude measurements. Descriptions of units where such measurements cannot be obtained shall be shown on the logs. Where seepage or groundwater is encountered, the depth of such condition and, if pertinent, the origin (joints, fault zones, etc.) of seepage shall be described.
- 4) The geologic report shall show a site location map with respect to known active faults as defined by the California Division of Mines and

Geology and shall describe the site effects from such faults including but not limited to probable acceleration, liquefaction and vibrationally induced settlement. Faults encountered on site shall be described as inactive, potentially active or active. If a fault is classified as potentially active, an investigation must be conducted to establish whether movement may be Holocene in age unless mitigation provisions are recommended.

- 5) The geologic report shall furnish geotechnical cross sections which shall provide an interpretation of the geologic conditions in graphical form including but not limited to apparent attitudes and proposed grades.
- 6) The report shall provide conclusions and appropriate recommendations dealing with the geologic conditions encountered.
- 7) All materials used as reference shall be tabulated in a reference section in accordance with standard accepted practice (include base map and aerial photographs).
- 8) Adequacy of proposed development from an engineering geologic standpoint with conclusions regarding the effect on the proposed development. Geologic hazards located offsite but affecting the proposed development shall be described and evaluated.
- 9) All landslides within the proposed development boundaries shall be investigated. This is a requirement regardless of whether the actual grading will encompass those areas. The type of landslide, description and probability of future movement shall be indicated.
- 10) Both present and future groundwater conditions shall be evaluated. If parched or permanent groundwater levels will change due to attendant conditions of development (landscape irrigation, changed flow gradients, etc.) the potential should be discussed and corrective measures, if required, should be recommended. The need for subdrains or other groundwater drainage devices shall be provided.
- 11) Provisions for necessary inspections of excavations to competent material by the project engineering geologist.
- 12) Evaluation of natural conditions in areas to be loaded with fill or designated as cut (e.g. groundwater, land-slides, faults, dip slopes, compressible soil or rock material).

B. SOILS ENGINEER'S REPORT

- 1) Soils engineering reports shall show boring or test pit location on a map at legible scale, and shall contain boring or test pit logs with sample locations, type of sample, and depth of sample shown.
- 2) Include all test methods used, results of all tests and calculations. Test results reported shall show sample identification referenced to boring or test pit logs, test procedure or referenced test procedure by number and standard, and a statement of suitability of materials for the intended use.
- 3) Analysis for surficial slope stability in clay soils shall be based on shear tests performed with light loadings consistent with soil confining loads in the near surface. Samples shall be allowed to expand under those light confining loads prior to testing.
- 4) Assumed values for shear strength in slope stability are allowed so long as these are consistent with values found by back calculation to exist in shear planes of previously investigated landslides in similar soil types in the area. Test results shall be submitted for values not consistent with documentable failures.
- 5) Test borings in valleys shall be sufficiently deep that proposed fill loads would constitute no more than 10% of the effective overburden load at the bottom unless bedrock is encountered above this depth; deviation from this requirement requires thorough discussion and adequate approved analysis.
- 6) Gross and surficial stability shall be analyzed for all cut, fill and natural slopes and a written statement provided approving the slope stability with calculations. Slope stability analyses are required to be consistent with measurements shown on geotechnical cross sections prepared by the engineering geologist. Proposed temporary construction slopes shall also be evaluated.
- 7) Buttress fill stability calculations shall include analyses at and below the base of the buttress fill as well as through the fill, unless engineering characteristics of the materials are sufficiently different to justify omission of these analyses.
- 8) Seismic factors shall be included in slope stability analyses unless the analysis is at a failure on a plane of weakness with dip of less than 10. Minimum pseudostatic values are .15 G with a minimum factor of safety of 1.1. unless a lower pseudostatic value is

adequately justified or an acceptable alternative analysis is performed.

- 9) Where fills exceed 20 feet in depth, consolidation tests based on minimum compaction standards for the proposed fills may be required.
- 10) Where poorly graded sandy fills may be used, relative density tests may be required to verify proposed compaction standards.
- 11) All sites with canyons, require subdrain design criteria. Criteria shall be based on evaluation of both soil and proposed filter characteristics. Minimum subdrain design shall be nine cubic feet per foot of subdrain filter geologist with a minimum six inch perforated PVC pipe.

All sites with buttress fills or walls require backdrain design criteria. Minimum backdrain design shall be three cubic feet per foot of filter material with a minimum four inch perforated PVC pipe.

- 12) Retaining wall and crib type wall soil design parameters and testing requirements shall be provided.
- 13) Fill material shall have a maximum dimension of 12 inches, and in accordance with the specifications in the City's Grading Ordinance, except as permitted by the City Engineer.
- 14) Consolidation or settlement potential (total, differential and rate of settlement) shall be evaluated for all compressible material to be left in place. Any proposed surcharge areas with settlement monuments shall be shown on the surcharge grading plans.
- 15) Engineering justification shall be provided for suitability of insitu material. Recommendation shall be provided for the removal of all unsuitable materials. If densification, moisturization or dewatering is proposed for unsuitable material, engineering justification shall be required to the satisfaction of the City Engineer. Provide provisions for material by the Soils Engineer
- 16) Recommendations shall include evaluation of potential damage to existing utility lines including but not limited to water, sewer, and storm drain systems.
- 17) Representative grain size analyses shall be submitted where interim erosion control systems are required.

- 18) Preliminary expansion potential and foundation design criteria shall be presented.
- 19) Recommendations for suitability and precompaction or unsuitable materials (test results) and/or unsuitable material removal (canyon cleanout, overexcavation). Densification and moisturization or dewatering measures (equipment, surcharge areas and settlement monuments shall be shown on the approved surcharge grading plans).

Treatment of cut/fill or other differential transitions and expansive soils shall be presented.

9.4 PRELIMINARY AND/OR PRECISE AS-GRADED REPORTS

Both the geological and compaction reports shall be submitted and approved prior to the start of on-site improvements.

Approximate locations of all subdrains, buttresses, stabilization fills, keyways and areas of removals of unsuitable soil shall be shown on the approved plan.

A. GEOLOGICAL REPORTS (Can be included in compaction report)

- 1) All geological reports shall contain a map at a readable scale showing cuts as graded and all geologic data and measurements made during grading.
- 2) All cut slopes shall show attitude measurements on each slope or shall label slopes where such measurements cannot be made or are massive.
- 3) Bedding planes, joints and faults shall be measured.
- 4) Existing zones of seepage shall be shown and an evaluation made of possible zones of future seepage. Where such seepage may affect landscaping or buildings, recommendations for control shall be provided.
- 5) All geologic features deviating from those encountered during the preliminary investigation shall be shown and discussed. A statement shall be included attesting to the adequacy of the site for the intended use as affected by geologic factors.

B. COMPACTION REPORT REQUIREMENTS (Includes interim or phased compaction reports)

- 1) All compaction tests shall be shown on a reproduction of the approved grading plan.
- 2) Elevations based on the grading plan shall be tabulated for all compaction tests and the type of test taken shall be listed for each test. Re-tests shall be referenced.
- 3) Expansion tests shall not represent more than 5 lots per test unless capping of lots with non-expansive soils is utilized. If capping is used, representative tests of the capping material shall be provided. Location of surplus material for capping shall also be shown.
- 4) Trench compaction tests shall be taken at intervals not exceeding 500 lineal feet and two vertical feet of backfill. Twenty (20) percent of laterals shall be tested every two vertical feet.
- 5) Verification that subdrains have been installed in accordance with recommendations in the preliminary investigation or with detailed revised recommendation shall be included in the rough grade compaction report.
- 6) All berms shall be compacted and tested.
- 7) Overfilling and trimming back of fill slopes shall be verified in the rough grading reports. Statement that all slopes are grossly and superficially stable will be required.
- 8) Verification that the recommendation in the approved preliminary investigation has been followed shall be included in the rough grade compaction report. Provide changes made during grading and their affect on the recommendations made in the geotechnical report. Provide approval as to the adequacy of the site for the intended use as affected by soil engineering factors.
- 9) Details of buttress or stability fill installation shall be included in the rough grade compaction report.
- 10) If removal of expansive soils or transition undercuts is performed only within building areas, the potential for development of perched groundwater within those zones shall be evaluated.

- 11) When expansive soils are present, the report shall also address the following prior to construction of curbs, gutters and sidewalks:
 - The Soils Engineer shall determine the expansion index (UBC 29-2) of the soils beneath the curbs, gutters and sidewalks.
 - The subgrade soils are considered expansive if they have an expansion index of greater than 20 (UBC Std. 29-2).
 - The Soils Engineer shall provide recommendations for mitigation of the expansive soil condition.
 - The City of Oceanside will not accept the recommendations of presaturation of the subgrade soil or the recommendation that nothing be done to the subgrade.
 - In lieu of a recommendation from the Soils Engineer, the curb and gutters shall have a minimum of 6 inches of Class II base beneath the curb and gutters extending at least 12 inches behind the back of the curb. All sidewalks shall have a minimum of 6 inches of Class III base.
- 12) All subgrade areas located beneath curbs, gutters and driveway approaches shall be compacted to 95% relative compaction in the upper 12-inches. Only 90% relative compaction will be required for the subgrade materials beneath sidewalks.
- 13) When Class II base is utilized beneath curbs, gutters, driveways and driveway approaches the Class II base shall be compacted to a minimum of 95% relative compaction. Class III base or non-expansive materials placed beneath sidewalks are to be compacted to a minimum of 90% relative compaction.
- 14) Details of fill placement, canyon cleanouts, keys, areas of over excavation and subdrains shall be included. Elevations for remedial cleanouts shall also be shown.
- 15) Foundation and pavement design criteria shall be presented.
- 16) Exterior flatwork design and drainage recommendations shall be presented.

9.5 FINAL COMPACTION REPORT (Precise Grading and/or Improvement Plans)

- A) All final compaction tests including walls, utility lines, subgrade, base and pavement shall be provided.

- B) All tests shall be located and shown on the approved plan.
- C) Provide any changes made during the final grading and their affect on the recommendations made in the Geotechnical Report. Provide approval as to the adequacy of the site for the intended use as affected by Soil Engineering and/or geologic factors.