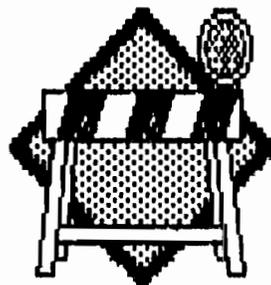


**CITY OF YACHATS  
LINCOLN COUNTY  
OREGON**



**GENERAL ENGINEERING REQUIREMENTS  
AND STANDARD SPECIFICATIONS FOR  
STREET, STORM DRAIN, SEWER AND  
WATERLINE CONSTRUCTION**

**JANUARY 1991**

Division 1  
Engineering Requirements  
for Construction Plans

DIVISION 1 -- ENGINEERING REQUIREMENTS FOR CONSTRUCTION PLANS  
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1A. GENERAL

01. No improvement work shall be commenced until construction plans have been reviewed for adequacy and approved by the Public Works Commission. All plans shall be prepared by or under the direction of an Engineer registered as a Professional Engineer in the State of Oregon.
02. All plans shall be prepared in a manner which is acceptable to the Oregon State Health Division, the Oregon Department of Environmental Quality, or other applicable State or Federal regulatory agencies. All approvals required by State or Federal authorities shall also be obtained and submitted to the City of Yachats prior to commencing construction of improvements.
03. The intent of these Standard Specifications is to establish minimum standards that all development projects will conform to. However, all design must follow standards of excellence which should be expected from quality engineering of City improvements. All work must be provided in accordance with the recommendations of the design engineer, with the minimum level of standards provided in these standard specifications. The City of Yachats does not assume responsibility or liability for the recommendations of developers or engineering design.
04. Alternatives to Standard Specifications.
  - a. Alternatives to standard specifications for materials will be considered upon written request by the developer or his Engineer. Approvals of variances to standard specifications will be considered and, if appropriate, approved by the Superintendent of Public Works or his appointed designee.
  - b. The minimum sizing for recommended utilities and street standards will be to provide conformance with existing Comprehensive Plans and/or standards adopted by the City Council of the City of Yachats.
05. Drawings. Street utility constructions plans shall be drawn on 24 inch x 36 inch standard plan-profile sheets. Minimum horizontal scale is one (1) inch equals 50 feet and minimum vertical scale is one (1) inch equals one (1) foot.

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06. **General Information.** All construction plans shall contain the following information:
- a. A vicinity map and a general layout map of the proposal showing the location of existing facilities and the proposed improvements.
  - b. North point and scale.
  - c. A suitable title block shall be used showing name and address of the subdivider, title of sheet, date, drawing number, name and address and registration stamp of the Engineer.
  - d. Location of existing topography, including culverts, streams, pavement, surface obstructions and all above-ground and under-ground utilities.
  - e. Adjacent streets and right-of-way lines, easements, centerlines, street widths, adjacent utility lines and drainage ways.
  - f. A cross section trench detail showing underground utility line placement with respect to all other buried utility lines.
  - g. Street plans should be separate from utility plans, but all plans should retain the same plan and profile configuration for ease of comparison. Utility profiles should show finished street centerline elevations, or other finished elevation profiles where utilities may be located out of street curb lines.

07. **Specific Information.**

- a. **Street(s) plan/profile** shall show at least the following information:
  - (01) Location of proposed street rights-of-way with respect to lot property lines, subdivision boundaries and existing streets.
  - (02) Street right-of-way widths, centerline (including bearings) with stationing, all horizontal and vertical curve data, street names, and curb locations.
  - (03) Profile of finished street centerline, with existing ground elevations. Both right and left top-of-curb profiles with top-of-curb elevations and existing ground elevations.

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- (04) Stationing for beginning and end of curb points on street centering and on face of curbs.
- (05) Required paving and/or repairs, notes and details.
- (06) A street cross-section detail showing proposed improvements.
- (07) Cross section at maximum intervals of 50 feet.

**b. Storm Drains.**

- (01) The size of storm sewers shall be designed on the basis of a flood frequency of ten (10) years.
- (02) Minimum diameter pipe for underground storm drains and storm drainage culverts shall be 12 inches.
- (03) Storm drain velocities shall be no less than three (3) feet per second nor more than ten (10) feet per second, flowing full.
- (04) A drop of 0.25 feet will normally be provided through every manhole invert.
- (05) Manholes shall be provided at the following locations:
  - (a) Every change in pipe grade or manhole.
  - (b) Every point of change in pipe size or elevation.
  - (c) Every intersection or junction of storm sewers.
  - (d) The upper end of all lateral storm sewers.
  - (e) Maximum distance between manholes shall be 500 feet.
- (06) Storm Drain Plan/Profile shall show at least the following information:
  - (a) Profile of proposed storm drain lines and manholes including diameter, slope, horizontal length and type of pipe between consecutive manholes.

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- (b) Elevation of finished grade and inverts of each storm drain manhole.
  - (07) Curb Inlets
    - (a) Curb inlets shall be used to collect storm water from curb gutters. Connections to the storm drain shall be of 12 inch pipe, and may be made by a tee fitting.
    - (b) The quantity of water received at the inlet shall not exceed the capacity of the inlet.
    - (c) Maximum height of curb inlet opening shall be six (6) inches.
  - (08) Dikes and pumping systems shall be installed if necessary to protect the subdivision against flooding or other inundation.
- c. Sanitary Sewer Plan/Profile shall show at least the following information:
- (01) Basic details in (06) (a) and (b) above.
  - (02) Location, elevation and details of all appurtenances and special equipment, such as lift-stations and wet-wells.
  - (03) Details of protective, heated buildings for housing any required electrical controls and/or standby generating facilities.
  - (04) Service or house lateral plan locations and stationing, plus a typical installation detail.
- d. Water line Plan/Profile shall show at least the following information:
- (01) Location of all proposed water lines, air-release valves, blow-offs, valves and other appurtenances.
  - (02) Profiles of proposed water lines including diameter, (no main water line shall be less than six (6) inches in diameter) slope, horizontal length and type of pipe.
  - (03) Elevation of finished grade and inverts at vertical changes of direction, appurtenances and connections. Appurtenance installation locations shall be stationed.

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- (04) House service and water meter plan location and stationing.
  - e. Electrical plans shall show at least the following information:
    - (01) Location of all proposed primary and secondary lines, transformers, pedestal-type connection points, conduit size and length, power source connections and street light circuits and controls.
    - (02) Location in trench section detail (including proposed telephone and/or television transmission lines).
  - f. Grading, clearing and excavating of street right-of-way, lot areas, and real estate parcels, when required by the Planning Commission or the City Council, shall be under the supervision of an engineer or geologist who is knowledgeable and skilled in the treatment of soils, soil stabilization and soil erosion. Due consideration shall be given to the existing terrain, cross-slope and vegetation. Approval of the grading, clearing and excavation plan by the City Council shall be given to any construction or work upon the premises.
08. **Start of Construction.** Work shall not be commenced until the City has been notified at least 48 hours in advance and until written Notice to Proceed is issued by the City of Yachats. If work has been discontinued for any reason, it shall not be resumed until the City has been notified.
09. **Inspection.** Required improvements shall be inspected under the direction of a Registered Professional Engineer, and constructed to the satisfaction of the City. The City may require changes in typical sections and details if unusual conditions arising during construction warrant such a change in the public interest. Sewer and water system improvements shall be approved by the Superintendent of Public Works or his authorized designee, prior to final hookup.
10. **House Services.** Underground utilities, sanitary sewers, and storm and storm drains installed in the streets by the developer shall be constructed prior to the surfacing of the streets. Stubs for service connections for underground utilities and sanitary sewers shall be placed at street or easement right-of-way lines, and to lengths that will avoid the need to disturb street improvements when service connections are made. A marker shall be placed by the stubs to indicate its location.

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11. **As-Built Plans.** As-built plans of subdivision, tracts of land and all land developments where public utilities, streets, curbs and sidewalks are built within the said project shall be furnished by the subdivider's Project Engineer to the City. The as-built plans shall contain three sets of plans, one being a reproducible copy and two being blueprint copies of the total project. The as-built plans shall be furnished to the City as soon as possible after completion of the construction, but not later than 60 days from completion of the project. The City will not allow hook-ups to the water or sewer system, until as-built plans are furnished.

Division 2  
Special Specifications

DIVISION 2 - SPECIAL SPECIFICATIONS

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2A. GENERAL

01. The contractor shall furnish all labor, materials and equipment necessary or required to complete the work in all respects as shown on the plans, as hereinafter specified, or both. Each major item is divided into sections conforming to "The Construction Specifications Institute". This method is employed to facilitate the work of the contractor in preparing his proposal and in following the specifications during construction.

02. All work shall conform to the latest City standards which include, but are not limited to, Zoning Ordinances, Subdivision Ordinance, Oregon APWA Standards, this document and versions thereof. Any work not meeting these standards is subject to removal and replacement at the contractor's expense.

2B. ABBREVIATIONS AND ACRONYMS

Whenever the following abbreviations are used in these specifications or on the plans, they are to be construed the same as follows:

AASHTO	American Association of State Highway & Transportation Officials
ACI	American Concrete Institute
AIA	American Institute of Architects
API	American Petroleum Institute
ANSI	American National Standards Institute
APWA	American Public Works Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing Materials
AWPA	American Wood Preserver's Association
AWS	American Welding Society
AWWA	American Water Works Association
CSI	Construction Specifications Institute
IEEE	Institute of Electrical and Electronics Engineers
NBFU	National Bureau of Fire Underwriters
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
SAE	Society of Automotive Engineers
SSPC	Steel Structures Painting Contractors
UBC	Uniform Building Code

Division 2  
Special Specifications

02. It shall be the responsibility of the contractor to locate and expose all existing structures and utilities in advance of the excavation. Any structures or utilities damaged by the work shall be repaired or replaced in a condition equal to or better than the conditions prior to the damage in accordance with the requirements of the affected utility. Such repair or replacement shall be accomplished at the contractor's expense. The contractor shall notify the owner of the damaged underground structure or utility, and repairs or replacements shall be made before backfilling takes place.

03. If interfering power poles, telephone poles, guy wires, or anchors are encountered, the contractor shall notify the affected utility at least seven (7) days in advance of construction to permit arrangements for protection or relocation of the structure. However, failure of utility to respond shall create no obligation on owner and contractor shall protect all utilities against damage, or shall stand all costs involved thereof.

If the contractor encounters existing structures which will prevent the construction of any portion of the project and which are not properly shown on the plans, he shall notify the engineer before continuing with the construction. If the contractor shall fail to so notify the engineer when an existing structure is encountered, but shall proceed with the construction despite this interference, he shall do so at his own risk. In particular, when the location of the new construction, as shown on the plans, prohibits the restoration of existing structures to their original conditions, the contractor shall notify the engineer so that a field relocation may be made to avoid the conflict.

2F. FIELD LOCATION

During the progress of construction, it is expected that minor relocations of line or grade may be necessary. Such relocations shall be made only by direction of the engineer.

Division 2  
Special Specifications

2G. CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTIES AND SERVICE

01. At points where the contractor's operations are adjacent to or cross property telegraph, telephone, power and water companies or are adjacent to other property (damage to which might result in considerable expense, loss, and inconvenience) no work shall be started until all arrangements necessary for protection thereof have been made.

02. The contractor shall be solely and directly responsible to the owners and operations of such properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage which may result from the carrying out of the work to be done under the Contract.

03. In the event of interruption of domestic water or to other utility services as a result of accidental breakage, or as a result of being exposed or unsupported, the contractor shall promptly notify the proper authority. He shall cooperate with the said authority in restoration of service as promptly as possible and shall bear all costs of repair. In no case shall interruption of any water or utility service be allowed to exist outside working hours unless prior approval is received.

04. Neither the owner nor its officers or agents shall be responsible to the contractor for damages as a result of the location of the underground utilities being other than that shown on the plans or for the existence of underground utilities not shown on the plans.

05. In the event the contractor encounters water or sewer service lines that interfere with trenching, he may, by obtaining prior approval from the Superintendent of Public Works, cut the service, dig through and restore the service with similar or equal materials at the contractor's expense.

06. The contractor shall replace at his own expense any and all other existing utilities or structures removed or damaged during construction, unless otherwise provided for in these specifications or ordered by the engineer.

07. In no case shall the contractor perform work on the City's streets, easements or right-of ways outside the City staff's normal working hours, weekends or holidays unless approved in writing by the Superintendent of Public Works.

Division 2  
Special Specifications

2H. PUBLIC SAFETY AND CONVENIENCE

The contractor shall comply with all rules and regulations of the City, State, and Federal authorities regarding the closing of public streets or highways to use of public traffic. No road shall be closed by the contractor to the public except by express permission of the Public Works Superintendent. Traffic must be kept open on all roads and streets where no detour is possible. The contractor shall, at all times, conduct his work so as to assure the least possible obstruction to traffic and normal commercial pursuits. The convenience of the general public and residents, and the protection of property, is of prime importance and shall be provided for by the contractor in an adequate and satisfactory manner.

2I. BARRICADES, WARNING SIGNS AND FLAGMEN

01. Contractor shall, at his expense, and without further or other order provide, erect and maintain, at all times during the progress or temporary suspension of the work, suitable barricades, fences, signs or other adequate warning or protection, and shall provide, keep and maintain such danger lights, signals, and flagmen as may be necessary or as may be ordered by the engineer to insure the safety of the public as well as those engaged in connection with the work.

02. He shall further use every reasonable precaution to safeguard the persons and property of the traveling public. Failure of the Public Works Superintendent to notify the contractor to maintain barricades, barriers, lights, flares, danger signals, or watchmen shall not relieve the contractor from his responsibility. All barricades and obstructions shall be protected at night by signal lights which shall be suitably distributed and kept burning from sunset to sunrise. Barricades shall conform to the Standard Specification for Highway Construction of the State Highway Department affecting the location of construction.

Barricades shall be of substantial construction and shall be suitably painted to increase their visibility at night.

03. Whenever the contractor's operations create a hazardous condition, he shall furnish flagmen and guards as necessary or as ordered by the Public Works Superintendent to give adequate warning to the public of any dangerous conditions to be encountered. He shall furnish, erect, and maintain approved fences, barricades, lights, signs, and any other devices that may be necessary to prevent accidents and to avoid damage and injury to the public.

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Special Specifications

Flagmen and guards, while on duty and assigned to give warning to the public, shall be equipped with approved red wearing apparel and a red flag which shall be kept clean and in good repair. Signs, flags, lights, and other warning and safety devices shall meet the requirements of the current safety manual of the State Highway Department affecting the location of construction.

04. The contractor will be required to confine construction operations within the public rights-of-way or property owned by the owner unless he has made special arrangements with other affected property owners in advance. The contractor will be required to protect stored materials, and other items located adjacent to the construction. Property owners affected by the construction shall be notified by the contractor at least 48 hours in advance of the time construction begins. During all construction operations, the contractor shall construct and maintain such facilities as may be required to provide access by all property owners to their property. No person shall be cut off from access to his place of business, unless the contractor has made special arrangements with the affected persons.

2J. EXPLOSIVES

01. In the use and storage of explosives, the contractor shall use every precaution to prevent injury to persons and damage to property. Secure storage places shall be provided and all such places shall be clearly marked with warning signs. Only State licensed persons experienced in the handling of explosives shall be allowed to use them on the work, and no explosion shall be put off until warning has been sounded and all persons within the radius of danger removed.

02. In the handling and storage of explosives, the contractor must comply with all Federal, State, and local laws and the owner and engineer will in no way be responsible for any noncompliance therewith or for damages to property or injury to persons resulting from accidental or premature explosions.

03. When explosives are used, particularly in proximity to buildings or other structures, care shall be taken to protect the surroundings from injury by the explosion, the resultant concussion or by flying rocks or debris. The quantities of explosives and the manner of their use shall be such that adjacent property will not be damaged. In case the vicinity of the work is accessible to the general public, the contractor shall, before any explosions are permitted, post men about the work in various directions to warn all persons of the danger existing and to prevent them from approaching closer than safety will permit.

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2K. PERMITS AND APPROVALS

Developer or engineer shall obtain and pay for all approvals, permits, and/or inspections required by regulatory agencies. Agencies shall include but not necessarily limited to Department of Environmental Quality, State Health Division, Water Resources Division, Department of Commerce, Building Codes Division, Department of Transportation, Highway Division, U.S. Army Corps of Engineers, Division of State Lands.

2L. PLAN SUBMISSION

Utility plans (plan and profile sheets) shall be submitted individually for each utility. The combining of more than one utility on the same plan and profile sheet will not be permitted.

Division 3  
Sitework

DIVISION 3 - SITEWORK

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3A. GENERAL

01. Division 2 of the Special Specifications are a part of this Division.

02. Carefully maintain bench marks, monuments, and other reference points. If disturbed or destroyed, notify engineer.

03. All construction within Oregon State Highway right-of-ways shall be in conjunction with the "General Provisions of the Oregon State Highway Commission."

04. All construction within Lincoln County right-of-ways shall be in conjunction with the Lincoln County General Provisions and Policy Guidelines.

05. All sanitary sewer design and construction shall be in conjunction with the Department of Environmental Quality, "Sewer Design Criteria", and as supplemented herein.

06. All domestic water system design and construction shall be in accordance with the Oregon State Health Division, "Administrative Rules", and as supplemented herein.

07. Acceptance of the completed right-of-way improvements will not be given until reproducible "as built" drawings have been submitted to and approved by the City Council.

08. Conditional Approval. Approval of construction materials other than what is specified herein will be on a job to job basis.

3B. COORDINATION

01. This item concerns parties involved with public utilities and personal property adjacent to proposed construction. Contractor shall coordinate his work with that of:

- a. City of Yachats.
- b. PUD.
- c. Cable television companies.
- d. Pioneer Telephone Cooperative.
- e. Private property owners.
- f. Other affected utilities or public agencies.

02. Maintain at least one-way traffic on all streets unless authorized by the Public Works Superintendent.

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03. The contractor shall coordinate with the City, public utilities and/or agencies during construction work to avoid damage to utilities and improvements. If there is any doubt as to the disposition of existing utilities or improvements, the contractor shall notify the City, who will instruct the contractor as to the disposition of said improvements or utilities.

04. The City's Public Works Superintendent shall be notified 24 hours prior to the different phases of construction for scheduling inspections.

05. The contractor shall further cooperate with the City and schedule his work to insure non-interrupted supply of water or availability of sanitary sewer facilities to City residences.

06. The location of existing improvements and related facilities shown on the plans may deviate from the actual location and may necessitate minor design revisions during the course of the project. In order to insure the protection of existing facilities the contractor shall verify their location.

3C. PROTECTION

01. All existing improvements, utilities and properties, whether inside or outside the street right-of-way, shall be protected against damage by the contractor. The contractor shall be responsible for the safety and stability of all existing structures and buildings in or adjacent to the work, where affected by his operations, and shall repair or make good any damage caused by his operations to mutual satisfaction of the City, public utilities and/or agencies.

02. All construction work shall be performed with the minimum disturbance to and interference with normal functioning of adjoining properties.

Where necessary, the contractor shall provide barricades for the protection of property and persons from damage and injury due to the execution of the work. The contractor shall, for the purpose of alleviation or prevention of dust nuisance originating within the construction site, apply water in locations designated by the Public Works Superintendent with pressure type water distribution trucks equipped with a spray system. The exact rate and number of applications will be determined by the local public agency or the Public Works Superintendent.

03. Job Conditions.

a. Environmental Requirements. If unfavorable weather conditions necessitate interrupting filling and grading

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operations, prepare areas of compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage.

b. Protection. Conduct earthwork operations so as to prevent wind blown dust and dirt from interfering with the owner's and adjacent property. Assume liability for all claims related to wind blown dust and dirt.

3D. CLEARING AND GRUBBING

01. General. This item shall include clearing and grubbing of all the right-of-way as necessary to complete the construction of the project. It shall include, but not be limited to, the following:

- a. Removal of all trees, stumps, debris, and plant materials.
- b. Disposal of all cleared materials by burning or hauling from site at contractor's expense. Contractor shall observe all City, County, State and Federal laws pertaining to fire permits and burning.
- c. All stumps, roots, and other embedded wood shall be completely removed to a depth of not less than one (1) foot below limit lines of clearing. This may require grubbing, blasting, or the use of a stump removing machine.
- d. All holes resulting from grubbing shall be filled with suitable material and compacted.
- e. No excavated materials shall be permitted to cover brush or trees prior to clearing and disposal.
- f. Removal and replacement of all improvements and/or other structures required to be removed and/or damaged during construction operations.

3E. MISCELLANEOUS SITEWORK

01. Scope. This work shall include all labor, materials, and equipment required for ditching, backfilling, grading, leveling, excavating, embankment construction and other earth moving work required in the construction of the project, excepting those items as covered and included under other section of Division 3 and 4.

02. Materials.

- a. Clearing and grubbing, as specified in 3D.

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b. Unclassified excavation shall include excavation of any materials encountered, irrespective of nature, character of conditions, complete as shown on the plans.

c. Embankment. Suitable excavated materials shall be utilized for embankment in conjunction with grading as required. Borrow materials utilized for general embankment construction shall be earth, sand or gravel or combination thereof, which shall be free of peat, humus, muck, vegetative matter, organic matter or other characteristics detrimental to the construction of firm, dense and sound embankments.

03. Workmanship.

a. Excavation shall be carried to lines and grades in accordance with approved plans. Special care shall be taken not to excavate below subgrade. Subgrade shall be finished within a tolerance of 1/10 of a foot of grades indicated on the plans.

b. All embankment shall be placed in twelve (12) inch layers, before compaction. Each layer shall be separately compacted by means of approved equipment, type subject to approval of the Public Works Superintendent. Finish grades shall be within tolerance of 1/10 of a foot of line, cross sections and grades shown on approved plans or approved by the local public agency. Compactive equipment must provide a density of not less than 95% of "maximum density" when tested according to AASHTO Standard Method T-180 Method A, in areas of embankment. Local public agency will have the right to perform periodic tests.

c. Moisture Content. Subgrade materials shall contain an optimum amount of moisture during compaction to stabilize and bind materials to produce densities specified. If sufficient moisture is not present, additional water shall be added by sprinkling.

d. The contractor shall:

- (01) Furnish access to site and facilities for inspection.
- (02) Notify the local public agency 48 hours prior to any fill or backfill operations.
- (03) Pay costs for additional inspections and tests due to non-compliance with Standard Specifications.

3F. TRENCH EXCAVATION AND BACKFILL

01. General. Unclassified excavation shall include all materials encountered, complete, including but not limited to the following:

- a. Protection of private property.
- b. Locating and protecting existing utilities.
- c. Maintenance of adequate barricades, lights and warning signs for protection of the public.
- d. Removal of all obstructions, including stumps, logs and rubbish.
- e. Pavement removal in improved streets. Pavement shall be sown to a uniform line, a maximum of six (6) inches on each side of excavated trench.
- f. Disposal of cleared trees.
- g. Foundation stabilization.
- h. Curb removal wherever required for construction.
- i. Clearing and shaping required for excavation.
- j. Excavation of trench for pipe and appurtenances.
- k. Shoring, cribbing, bracing, dewatering and sheet piling, if required.
- l. Hauling and disposal of excavated materials.
- m. Repair of public and private property damaged.
- n. All miscellaneous items of work to complete construction specified.
- o. Final cleanup and continuous cleanup during construction.
- p. Repair of damage to utilities.

02. Rock excavation shall infer solid rock which cannot be excavated with a "Caterpillar 235" or equivalent power shovel and requiring blasting for removal.

- a. The local public agency or the engineer will make determination of "Rock Excavation."
- b. Solid rock is defined as follows:

Solid rock, as referred to herein in connection with the classifying of excavation, shall comprise and include (1) boulders measuring 1/2 cubic yard or more in volume, (2) all rock material which is in ledges, bedded deposits and unstratified masses and which cannot be removed without drilling and blasting, and (3) conglomerate deposits which are so firmly cemented as to present all the characteristics of solid rock and which cannot be removed without drilling and blasting.

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When solid rock layers have an overburden of material of common classification which cannot practically be stripped and handled separately from the solid rock and/or are interspersed with a material of common classification, the entire mass will be classified as solid rock if the solid rock constitutes not less than 85 percent of the entire mass.

03. Conduits or Casings.

- a. Unless special permission is first obtained to open cut, pipe line or conduit which crosses under the surfaced portion of the highway or street, installation shall be either tunneled, jacked, driven or bored under the surface.
- b. The contractor shall make arrangements with applicable public agency and/or agencies before starting construction.
- c. Casing shall be one quarter (1/4) inch steel wall pipe, asphalt dipped.
- d. Contractor shall sand slurry pack voids around the pipe and casing for the full length of the casing prior to backfilling the access pits. Ends to be watertight.

04. Trench Backfill and Bedding.

- a. Foundation stabilization shall be utilized from approved sources as directed by the engineer, where it is necessary to stabilize the trench bottom. Materials shall be one and one half (1-1/2) inch minus gravel or crushed rock, reasonably evenly graded from coarse to fine.
- b. Granular material for pipe base and pipe zone shall be 3/4" minus pea gravel or crushed gravel, having reasonably even gradation from coarse to fine, installed in locations designated by local public agency or the engineer.
- c. Class III backfill material shall be 1-1/2"-0 pit run or bar run gravel, or bank or river sand, clean and free from organic and vegetative matter, sticks and debris.
- d. Gravel base under improved streets, surfaced roadways and driveways, shall be 1-1/2" minus crushed quarry rock.
- e. Gravel leveling course under improved streets shall be 3/4" minus crushed quarry rock.

f. Trench Backfill Methods.

- (01) Class I Backfill: Shall be backfilled with the excavated materials in layers not thicker than one foot layers. Each layer shall be thoroughly tamped by means of hand or mechanically operated tampers. Fill shall be compacted to 95 percent density when tested in accordance with AASHTO Modified Standards, and such that no settlement will occur under normal traffic loading. Trench above the pipe zone shall be backfilled to within ten (10) inches of finished surface for pavement areas and eight (8) inches for gravel improved roadways. Trench shall then be filled with six (6) inches of 1-1/2" minus crushed rock and two (2) inches of 3/4" minus crushed rock.
- (02) Class II Backfill: Following backfill in the pipe zone the excavated material may be pushed back into the trench by mechanical means. Where this method of backfill is allowed the earth shall be pushed first onto the slope of the backfill previously placed and allowed to roll down into the trench. The contractor will not be allowed to push the backfill material into the open trench. A windrow of excavated material shall be placed over the trench to allow for settlement. The contractor shall make his own estimate of the amount of settlement that will occur and will stockpile material to compensate for settlement. After the backfill has been completed, the entire working area, including the trench, shall be graded with a motor grader.
- (03) Class III Backfill: The trench above the pipe zone shall be backfilled with material as specified in 3F.04.d. to within ten inches of finished surface for pavement areas and eight inches for gravel improved roadways. Material shall be placed in the manner specified for Class I backfill. Trench shall then be filled with 6" of 1-1/2" minus crushed rock and 2" of 3/4" minus crushed rock. Trench shall then be compacted with at least six passes of a motor grader or other similar equipment.

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- g. Any area requiring rock excavation shall be bedded materials specified in 3F.04.b. Gravel shall extend six (6) inches above and below the installed pipe and run the full width of the trench. If Class I or II backfill is utilized, rock excavated may not be utilized for backfill material and must be disposed of by the contractor.

05. Workmanship.

- a. Grade. The flow line of pipe shall be to line and grade shown or established by the engineer.
- b. Shoring, sheeting, and bracing shall be used to prevent caving. All sheeting, shoring and bracing to conform to requirements of the State Industrial Accident Commission. Remove after completion.
- c. Locate all excavated materials so as to allow pedestrian and automotive travel.
- d. All streets and roadways shall be kept open to at least one-way traffic unless authorized by the local public agency or the Public Works Superintendent.
- e. Maintain means of removing and disposing of all water. No damage to adjacent property shall result. No water allowed through the pipe until authorization received from Public Works Superintendent. Adequate screening shall prevent objectionable objects from entering at all times. For public safety, all lines shall be plugged and backfilled to prevent unauthorized entry after working hours.
- f. All excess excavated materials shall be hauled and disposed of by the contractor and the contractor shall bear all costs and retain any profit incidental to such disposal.
- g. Blasting Procedures. Blasting for excavation will be permitted only after securing approval of engineer and only when proper precautions are taken for the protection of persons and property. The hours of blasting will be fixed by the engineer. Any damage caused by blasting shall be repaired by the contractor at his expense. The contractor's procedures and methods of blasting shall conform to State and local laws and to municipal ordinances, and shall be performed by competent, licensed personnel.

Division 3  
Sitework-Storm Drain

3G. STORM DRAIN

01. General.

- a. This item shall include furnishing and installing all pipe specified herein for all storm drain mains and catch basin laterals.
- b. All pipe installed to manufacturer's recommendations.
- c. All pipeline materials shall be American made.

02. Pipe Materials.

a. Polyvinyl Chloride (PVC) Pipe.

- (01) PVC pipe with nominal inside diameters between 4 and 15 inches shall meet the requirements of ASTM D 3034, SDR 35, Type PSM Polyvinyl Chlorine Sewer Pipe.
- (02) Pipe shall be furnished with an integral bell gasketed joint conforming to ASTM D3034. An integral bell shall be furnished with each length of pipe.
- (03) Rubber rings shall conform to the requirements of ASTM D1869.
- (04) Pipe shall be as manufactured by J-M Manufacturing Company, Inc., or approved equal.

b. Large Diameter Polyvinyl Chloride (PVC) Pipe.

- (01) PVC pipe with 18 and 27 inch nominal inside diameters shall meet the requirements of ASTM F679, SDR 35, T-1 wall thickness, Type PS 46 PVC Sewer Pipe.
- (02) Pipe shall be furnished with an integral bell gasketed joint conforming to ASTM D3212. An integral bell shall be furnished with each length of pipe.
- (03) Rubber rings shall conform to the requirements of ASTM F477.
- (04) Pipe shall be as manufactured by J-M Manufacturing Company, Inc., or approved equal.

c. Polyvinyl Chloride (PVC) Ribbed Pipe.

- (01) Pipe and fittings with 18 through 48 inch nominal inside diameters shall meet the requirements of ASTM F794, Type PS 10 PVC Storm Drain Pipe.

Division 3  
Sitework-Storm Drain

- (02) Pipe shall be furnished with an integral bell gasketed joint. An integral bell shall be furnished with each length of pipe.
  - (03) Rubber rings shall conform to the requirements of ASTM F477.
  - (04) Pipe shall be Perma-Loc as manufactured by J-M Manufacturing Company, Inc., or approved equal.
- d. High Density Polyethylene Gravity Pipe. (Large Diameter)
- (01) Pipe and fittings in size range 18 through 120 inch nominal inside diameters with integral bell joints, per ASTM F894 shall be made of high density, high molecular weight polyethylene pipe material meeting the requirements of Type III, Class C, Category 5, Grade P34, as defined in ASTM D1248.
  - (02) Gaskets. Rubber gaskets shall comply in all respects with the physical requirements in the non-pressure requirements of ASTM Specification F477. They shall be molded or produced from an extruded shape approved by the manufacturer and spliced into circular form.
  - (03) Lubricant. The lubricant used for assembly shall have no detrimental effect on the gasket or on the pipe.
  - (04) Pipe shall be Spirolite HDPE as manufactured by Chevron Chemical Company or approved equal.
- e. High Density Polyethylene Gravity Pipe. (Small Diameter)
- (01) Pipe and fitting in size range 12 through 24 inch nominal inside diameters shall be permitted of high density, high molecular weight polyethylene pipe material meeting the requirements of AASTO M-294. Smooth interior corrugated pipe required.
  - (02) Couplings shall be corrugated to match the pipe corrugations, and the width shall be not less than 1/2 the nominal diameter of the pipe and shall engage an equal number of corrugations on each side of the pipe joint.
  - (03) Rubber gasket joints will be required.
  - (04) Pipe shall be ADS N-12 HDPE as manufactured by Advanced Drainage Systems, Inc., or approved equal.

Division 3  
Sitework-Storm Drain

03. Workmanship.

a. All pipe installation shall include but not be limited to the following:

- (01) Materials shall not be distributed on the job faster than can be used to good advantage.
- (02) All pipe shall be inspected prior to installation. No cracked, broken, or defective pipe or fittings will be allowed. All pipes cleaned before installation.
- (03) Proper implements, tools, and construction operations will be maintained by the contractor for the safe and proper protection of the work.
- (04) Maximum deviation from line and grade shall not exceed 1/2 inch for line and 1/8 inch for grade. Batterboards required, if the contractor grade establishment is judged insufficient by the Public Works Superintendent.
- (05) Pipe base, if utilized, shall be placed and compacted in trench pipe installation.
- (06) All pipe shall be carefully lowered into the trench to prevent damage to the pipe. Contractor will be responsible for inspecting the pipe before installation and for the proper laying of materials to manufacturer's recommendations. He shall be responsible for all damage to the pipe before final acceptance by the local public agency or the engineer, and shall reinstall pipe that does not meet specifications or was damaged during installation.
- (07) No debris, tools, or other materials allowed in pipe.
- (08) All pipe sealed at night to provide public safety and provide foreign materials from entering pipe.
- (09) Gravel Pipe Base.
  - (a) Gravel pipe bedding shall be placed under all pipelines wherever ground conditions or existing materials may prove harmful to pipeline installation.
  - (b) Gravel bedding shall be provided to a depth of six (6) inches below the outside of the pipe. The top of the base shall terminate six (6) inches above the outside of the pipe and the pipe base shall be placed for the full width of the trench.

**Division 3  
Sitework-Storm Drain**

- (10) Foundation stabilization materials shall be placed under all pipelines wherever soft ground conditions are encountered that are not beneficial to proper installation, and in such quantity as is required to stabilize the trench bottom.
- (11) Bell holes shall be dug at each joint to permit the joint to be properly made; to permit easy inspection of the joint, and to provide uniform bearing for the entire pipe length.

**b. Storm Drain and Catch Basin Installation.**

- (01) End caps and pipe appurtenances shall be furnished by the pipe manufacturer and shall be the same class as main line to which they are installed.
- (02) Catch basin laterals shall be of twelve inch diameter of concrete, PVC or high density polyethylene pipe as specified herein.
- (03) All polyethylene or PVC storm drain pipes shall be installed with Class 3 backfill as specified. In addition, a deflection test shall be conducted as provided under testing of sanitary sewer pipes.

Division 3  
Sitework-Sanitary Sewer

3H. SANITARY SEWERS

01. General.

- a. This item shall include furnishing and installing all pipe specified herein for all sanitary sewer main, laterals and house service laterals.
- b. All pipe installed to manufacturer's recommendations.
- c. All pipeline materials shall be American made.
- d. All pipelines will be "TV'd" after installation with a copy of the tapes placed on file with the City.

02. Pipe Materials.

a. Gravity Mains.

(01) Polyvinyl Chloride (PVC) Sewer Pipe.

- (a) PVC pipe with nominal inside diameters between 4 and 15 inches shall meet the requirements of ASTM D3034, SDR 35, Type PSM Polyvinyl Chlorine Sewer Pipe.
- (b) Pipe shall be furnished with an integral bell gasketed joint conforming to ASTM D3034. An integral bell shall be furnished with each length of pipe.
- (c) Rubber rings shall conform to the requirements of ASTM D1869.
- (d) Pipe shall be as manufactured by J-M Manufacturing Company, Inc., or approved equal.

(02) Large Diameter Polyvinyl Chloride (PVC) Sewer Pipe.

- (a) PVC pipe with 18 and 27 inch nominal inside diameters shall meet the requirements of ASTM F679, SDR 35, T-1 wall thickness, Type PS 46 PVC Sewer Pipe.
- (b) Pipe shall be furnished with an integral bell gasketed joint conforming to ASTM D3212. An integral bell shall be furnished with each length of pipe.
- (c) Rubber rings shall conform to the requirements of ASTM F477.
- (d) Pipe shall be as manufactured by J-M Manufacturing Company, Inc., or approved equal.

Division 3  
Sitework-Sanitary Sewer

b. Pressure Mains.

- (01) Pipe shall be Class 50 ductile iron minimum and meet the requirements of AWWA Standards C151.
- (02) Pipe shall be made with nominal inside diameters as shown on the plans.
- (03) Pipe shall have 150 psi working pressure designed for five foot minimum depth of cover, lay condition Type 5.
- (04) Joints shall be mechanical joint or push on joints.

(a) Mechanical Joints.

- (aa) A bell, cast integrally with the pipe or fitting and provided with an exterior flange having bolt holes or slots and a socket with annular recesses for the sealing gasket and the plain end of the pipe or fitting.
- (bb) A pipe or fitting plain end.
- (cc) A sealing gasket.
- (dd) A follower gland with bolt holes.
- (ee) Tee-head bolts and hexagonal nuts.
- (ff) Shall meet the requirements of AWWA Standards C111.

(b) Push On Joints.

- (aa) The integral socket bell shall be rubber ring type "Tyton Joint" or approved, but shall meet the same strength requirements as that of the pipe. An integral socket bell shall be furnished with each length of pipe.
- (bb) Rubber rings shall conform to the requirements of AWWA Standard C111.

- (05) Ductile Iron Pipe shall be cement lined on the inside conforming to AWWA Standards C-104, outside coating shall be a bituminous coat of one mill thick, conforming to AWWA Standard C151.
- (06) All ductile iron piping shall be encased with polyethylene eight millimeter film, and shall meet the requirements of AWWA Standard C105.
- (07) Pipe shall be manufactured by U.S. Pipe and Foundry or approved equal.

Division 3  
Sitework-Sanitary Sewer

c. Fittings.

- (01) General. All fittings shall be of sufficient strength to withstand all handling and load stresses encountered. All fittings shall be of the same material as the pipe unless otherwise specified. Material joining the fittings to the pipe shall be free from cracks and shall adhere tightly to each joining surface. Use the same type of joints on all fittings that are used on the sewer main.
- (02) Gravity Mains.
  - (a) Tee-Wyes.
    - (aa) Provide tee-wye in the sewer main for service lateral connection. Tee-wye shall not be closer than 12 inches to any joint or bell of main line sewer main which is 12 inches or less in diameter.
    - (bb) Use push-on type fittings for joints conforming to same standards as the pipe.
    - (cc) Push-on type tee-wye fittings shall be as manufactured by GPK Industries, or approved equal, and be fabricated by the manufacturer before delivery to the site.
  - (b) Wyes.
    - (aa) Provide wye in the sewer main for cleanout construction. Wye shall not be closer than 12 inches to any joint or bell of main line sewer main which is 12 inches or less in diameter.
    - (bb) Use push-on type fittings for joints conforming to same standards as the pipe.
    - (cc) Push-on type wye fittings shall be as manufactured by GPK Industries, or approved equal, and be fabricated by the manufacturer before delivery to site.
  - (c) Elbows.
    - (aa) Use push-on type fittings for joints conforming to the same standards as the pipe.
    - (bb) Elbows shall be as manufactured by GPK Industries or approved equal.

Division 3  
Sitework-Sanitary Sewer

- (d) End Plugs.
  - (aa) Provide ends of all service laterals and fittings with approved watertight plug. Such plugs shall be removable and their removal shall provide a socket suitable for making a flexible joint lateral connection or extension.
  - (bb) End plugs shall be as manufactured by GPK Industries or approved equal.
- (e) Sand Collars.
  - (aa) Provide sand collars at all manhole connections to form a watertight seal at the manhole.
  - (bb) Sand collars shall be furnished by the pipe manufacturer.

(03) Pressure Mains.

- (a) Fittings shall meet the requirements for Class 250 cast iron pipe, Federal Specifications WW-P-421 or for Class D cast iron pipe and fittings conforming to ANSI Specifications A21.10 (AWWA C-110).
- (b) Cast iron fittings for use with ductile iron mechanical joint pipe shall be of the short body dimension type, (1) bell construction with an exterior flange having bolt holes or slots, and a socket with annular recesses for sealing gasket and the plain end; (2) plain end; (3) sealing gasket; (4) follower gland; and (5) tee head bolts and hexagonal nuts, conforming to ANSI Specifications A21.11 (AWWA C-111).
- (c) Fittings shall be as manufactured by Tifco, Tyler, or approved equal.

03. Workmanship.

- a. All pipe installation shall include, but not limited to the following:
  - (01) Materials shall not be distributed on the job faster than can be used to good advantage.
  - (02) All pipe shall be inspected prior to installation. No cracked, broken, or defective pipe or fittings will be allowed. All pipes cleaned before installation.

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Sitework-Sanitary Sewer

- (03) Proper implements, tools, and construction operations will be maintained by the contractor for the safe and proper protection of the work.
- (04) Maximum deviation from line and grade shall not exceed 1/2 inch for line and 1/8 inch for grade. Batterboards required, if the contractor grade establishment is judged insufficient by the engineer.
- (05) Pipe base, if utilized, shall be placed and compacted in trench before pipe installation.
- (06) Bell holes shall be dug at each joint to permit the joint to be properly made, to permit easy inspection of the joint, and to provide uniform bearing for the entire pipe length.
- (07) All pipe shall be carefully lowered into the trench to prevent damage to the pipe. The contractor will be responsible for inspecting the pipe before installation and for the proper laying of materials to manufacturer's recommendations. He shall be responsible for all damage to the pipe before final acceptance by the local public agency or the engineer, and shall reinstall pipe that does not meet specifications or was damaged during installation.
- (08) Gravel Pipe Base.
  - (a) Gravel pipe base shall be placed under lines wherever ground conditions or existing materials may prove harmful to pipe line installation.
  - (b) Gravel base shall be provided to a depth of six (6) inches below the outside of the pipe, and shall be placed for the full width of the trench.
- (09) Foundation stabilization materials shall be placed under pipe lines wherever soft ground conditions are encountered that are not beneficial to proper installation, and in such quantity as is required to stabilize the trench bottom.
- (10) No debris, tools, or other materials allowed in pipe.
- (11) All pipe sealed at night to provide public safety and provide foreign materials from entering pipe.

b. Sewer Pipe Installation

- (01) Furnishing and installing pipe specified herein for all trunk lines and laterals.
- (02) Pipe installation to manufacturer's recommendations.

Division 3  
Sitework-Sanitary Sewer

- (03) Service tees, end plugs and appurtenances for all pipe installed shall be installed as specified herein and to manufacturer's recommendations.

c. Pressure Main Installation.

- (01) Furnishing and installing pressure main and fittings as specified herein.
- (02) Lay and Jointing the Pipe.
  - (a) Maximum deflection at any joint shall not exceed three (3) degrees.
  - (b) Maximum deviation from established line and grade, one-half (1/2) inch.
  - (c) Concrete thrust blocking shall be installed at all fittings, required by the engineer, or established by standard construction procedures to prevent movement. All blocking shall be of 2,500 psi concrete. Concrete shall be poured as stiff as possible and shall be covered after pouring. The block sizes for various fittings shall conform to the standard details.
  - (d) All necessary precautions to prevent uplift shall be taken by the contractor.

d. Sanitary House Laterals.

- (01) Furnishing and installing 4 inch service laterals of pipe specified herein.
- (02) All highway crossings shall be maintained to satisfaction of the local public agency or the engineer.

04. Testing of Sewer Pipe.

- a. General. A test shall be conducted on the first section of pipe laid to establish that the pipe line material is capable of preventing infiltration and that the lines are being installed to insure that infiltration of ground water will not be greater than amount set forth herein. Section of pipe lines tested shall be at least 300 feet in length.

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If test indicates infiltration exceeding amount hereinafter set forth, defective material or workmanship shall be corrected and test rerun until leakage is within the amount specified.

Additional tests shall be made as often as engineer deems necessary to insure leakage is being held within limits specified.

**b. Low Pressure Air Testing of Gravity Sewers.**

- (01) Contractor shall furnish all facilities and personnel for conducting test under observation of the engineer.
- (02) Contractor may desire to make air test prior to backfilling for his own purposes. However, acceptance air test shall be made after backfilling has been completed and compacted.
- (03) The first section of pipe not less than 300 feet in length installed shall be tested in order to qualify.
- (04) Immediately following pipe cleaning, the pipe installation shall be tested with low pressure air. Air shall be slowly supplied to the plugged pipe installation until internal air pressure reached 3.25 pounds per square inch greater than the average back pressure of ground water that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization before proceeding.
- (05) The pipeline shall be considered satisfactory if the time required in seconds for pressure to decrease from 3.5 to 3.0 pounds per square inch greater than the average back pressure of any ground water that may submerge pipe is not less than that computed according to the following table entitled "Allowable Limits of Air Test".
- (06) If installation fails requirements, contractor shall determine source or sources of leakage, and he shall repair or replace all defective materials or workmanship. Completed pipe installation shall meet requirements of this test, before being considered acceptable.

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Sitework-Sanitary Sewer

ALLOWABLE LIMITS FOR AIR TEST

<u>Size of Pipe</u>	<u>Time - Minutes - Seconds</u>	
6 Inch	3	50
8 Inch	5	06
10 Inch	6	22
12 Inch	7	39
14 Inch	8	56
15 Inch	9	35
16 Inch	10	12
18 Inch	11	34
20 Inch	13	0
21 Inch	13	30
24 Inch	14	0

c. Deflection Test for PVC.

In addition to air testing, do a deflection test to all sanitary sewers, storm drains and culverts constructed of PVC pipe after the trench backfill and compaction has been completed. The test shall be conducted by pulling an approved solid pointed mandrel or a variable deflection measuring gauge through the completed pipeline. The diameter of the mandrel shall be 95 percent of the pipe diameter unless otherwise specified by the engineer. Conduct testing on a manhole-to-manhole basis and only after the line has been completely flushed out with water. Locate and repair any sections failing to pass the test and to retest the section, at no expense to owner.

d. Testing of Pressure Main.

(01) General. A test shall be conducted on the first section of pipe laid to establish that the pipe materials are capable of meeting design requirements. Section of test line shall be at least 200 feet in length. If test indicates materials or workmanship that does not meet design requirements, defective material or workmanship shall be corrected and test rerun until specifications are fulfilled.

**Division 3  
Sitework-Sanitary Sewer**

- (02) **Pressure.** After each section of pipe has been laid and partially backfilled, it shall be subjected to hydro-static pressure of 50% in excess of specified pipe strength. After the entire pipeline is completed, a final test shall be undertaken under the same conditions and utilized to guarantee the performance of the completed system.
- (03) **Duration.** The duration of each pressure test shall be at least one hour at 150 psi to determine leakage by formulas contained herein.
- (a) **Procedure.** Each valved section of pipe shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a pump connected to the pipe connection, means of measuring the water necessary to maintain test pressure, gauges and all necessary apparatus shall be furnished by the contractor. The contractor shall furnish all necessary assistance for conducting the test.
- (b) **Expelling Air.** Before applying the specified test pressure, all air should be expelled from the pipe.
- (c) **Examination During Test.** All exposed pipe, fittings, and valves, and all joints shall be carefully examined during tests. Any visible leaks shall be repaired until tight. Any cracked, broken, or defective pipe, couplings, fittings, or valves shall be replaced at the contractor's expense.
- (d) **Leakage.** Leakage shall be defined as the quantity of water supplied into the pipe, or any valved section of it, necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled.

Division 3  
Sitework-Sanitary Sewer

No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula in which:

$$L = \frac{ND}{7400} p$$

- L = Allowable leakage in gph.  
N = Number of joints in length of pipe tested.  
D = Nominal diameter of pipe in inches.  
p = Average test pressure during leakage test, in pounds per square inch.

Correction of Excessive Leakage. Should any test of pipe laid disclose leakage greater than that allowed under section above, the contractor shall, at his own expense, locate and repair the defective joints or pipe until the leakage is within the specified allowance.

31. MANHOLES

01. General. This section shall include the construction of new manholes and stubs.
02. Materials.
  - a. Frames and grates for standard, drop and special manholes shall be Silverton Foundary, Pattern Number 107, two hole style, or approved equal.
  - b. Frames and grates for watertight manholes shall be Silverton Foundary, Pattern Number 101a, Suburban, or approved equal.
  - c. Precast sections shall be a minimum of 48 inches in diameter, reinforced concrete pipe conforming to ASTM C-478-64T, or latest revision, with eccentric cones.
  - d. Poured-in-place manholes may be substituted.
  - e. Reinforcement shall be circular.
  - f. Minimum wall thickness - five inches.

Division 3  
Sitework-Sewer

- g. Manhole taps shall be pipe tap plus two inches minimum.
- h. Manhole grout shall be one part cement to two parts sand. Sand must pass 1/8 inch screen. Consistency must be such that it adheres readily to the pipe.
- i. Manhole extension rings shall be two or four inches in thickness and of material equal to manhole sections. Mortar shall provide water-tight seal between;  
(1) eccentric cone and ring, (2) ring and ring.
- j. Concrete bases shall provide uniform bearing through full circumference of manhole wall. Mortar shall provide water-tight seal between base and manhole wall.
- k. Ram-Nek, or approved equal, preformed flexible plastic joint compound shall be utilized for joints in manhole sections. Ram-Nek primer required to manholes prior to applying joint compound. Ram-Nek shall be heated prior to installation, and manhole rings compressed together to avoid later settlement and leaks.
- l. Manhole sections utilizing confined "O" ring joints approved.

03. Workmanship.

- a. Manhole rings and covers in roadways shall be set flush with surface. Manholes shall have a maximum of eight (8) inches of extension rings.
- b. Concrete manhole bases shall be hand troweled to provide a smooth surface for wash down.
- c. Finished manhole shall be watertight.

3J. CATCH BASINS

01. General. This section shall include the construction of new catch basins.

02. Materials.

- a. Frame and Grate. Shall be fabricated from structural steel conforming to the requirements of ASTM A36, dimensions shall conform to Standard Detail.
- b. Concrete See Division 4.

**Division 3  
Sitework-Sewer**

- c. Grout. Epoxy grout shall be one part cement to two parts sand. Sand must pass 1/8 inch screen. Consistency must be such that it adheres readily to the pipe and catch basin wall.
- d. Precast units may be used in lieu of cast-in-place units when approved by the engineer. Details of proposed units shall be submitted for approval.

**03. Workmanship.**

- a. Set frame and grate at slope of batter apron, recessed 1/2 inch at sides for positive entrance flow of storm water.
- b. Adequate foundation for all catch basins shall be obtained by removal and replacement of unsuitable material with well graded granular material.

Division 3  
Sitework-Waterlines

3K. WATERLINE INSTALLATION

01. General.

- a. This item shall include furnishing and installing all pipe to be constructed.
- b. All pipe installed to manufacturer's recommendations and to:
  - (01) AWWA Standards C-600 for Ductile Iron Pipe.
  - (02) PVC Water Pipe should be installed in accordance with the Uni-Bell Plastic Pipe Association guide for installation of polyvinyl chloride plastic pressure pipe for municipal water main distribution systems.
- c. All pipeline materials shall be American made.

02. Pipe Materials.

a. Ductile Iron Pipe.

- (01) Ductile iron pipe shall be Class 150, minimum, and meet the requirements of AWWA Standards C151.
- (02) Pipe shall be made with nominal inside diameters as shown on the plans.
- (03) Pipe shall have 150 psi working pressure designed for five (5) foot minimum depth of cover, lay condition Type 5.
- (04) Joints shall be mechanical joint or push on joint.
  - (a) Mechanical Joints.
    - (aa) A bell, cast integrally with the pipe or fitting and provided with an exterior flange having bolt holes or slots, and a socket with annular recesses for the sealing gasket and the plain end of the pipe or fitting.
    - (bb) A pipe or fitting plain end.
    - (cc) A sealing gasket.
    - (dd) A follower gland with bolt holes.
    - (ee) Tee-head bolts and hexagonal nuts.
    - (ff) Shall meet the requirements of AWWA Standards C111.

Division 3  
Sitework-Waterlines

(b) Push On Joints.

(aa) The integral socket bell shall be rubber ring type "Tyton Joint" or approved, and shall meet the same strength requirements as that of the pipe. An integral socket bell shall be furnished with each length of pipe.

(bb) Rubber rings shall conform to the requirements of AWWA Standard C111.

(05) Ductile Iron Pipe shall be cement lined on the inside conforming to AWWA Standards C-104, outside coating shall be a bituminous coat one (1) mill thick, conforming to AWWA Standard C151.

(06) All ductile iron piping shall be encased with polyethylene eight (8) millimeter film, and shall meet the requirements of AWWA Standard C105.

(07) Pipe shall be manufactured by U.S. Pipe and Foundry, or approved equal.

b. PVC Pipe.

(01) PVC pipe shall be Class 150, minimum, and meet the requirements of SKR 18. Pipe shall meet the requirements of AWWA C-900, with the exception that PVC water pipe shall be made to cast iron outside diameters. The pipe shall further meet Uni-Bell Standard Uni-B-2.

(02) Pipe shall be made with nominal inside diameters as specified herein or shown on plans and shall meet the standard dimension ration (SDR's) as set forth in Uni-B-2.

(03) The integral socket bell shall be rubber ring type "Ring Tite" or approved, and shall meet the same strength requirements as that of the pipe. An integral socket bell shall be furnished with each length of pipe.

(04) Rubber rings shall conform to the requirements of ASTM F-477.

(05) Pipe shall be "Blue Brute" as manufactured by Johns-Manville or approved equal.

Division 3  
Sitework-Waterlines

c. Concrete Cylinder Pipe.

- (01) Concrete cylinder pipe shall be Class 150, minimum, and shall meet the requirements of AWWA C-300.
- (02) Pipe shall be made with nominal inside diameters as specified herein or shown on plans
- (03) Steel cylinder shall be 12 gauge.
- (04) Spiral reinforcement shall be 7/32 inch diameter, with six coils per foot minimum.
- (05) Concrete nominal lining thickness and nominal coating thickness shall be 3/4 foot minimum.
- (06) Cement for concrete and mortar shall conform to the latest requirements of ASTM C-150, Type II.
- (07) Joints shall be bell and spigot rubber ring type.
- (08) Joints shall be coated and protected with Amercoat 83/84 Protective Coating System.
- (09) All pipe precut to lengths required, with no field cutting permitted.
- (10) Pipe shall be as manufactured by American Pipe Products Group, or approved equal.

e. Galvanized Steel Pipe.

- (01) Galvanized steel pipe shall be the screwed fitting type and shall conform to the requirements of ASTM A-120.

03. Workmanship.

- a. Materials shall not be distributed on the job faster than can be used to good advantage.
- b. All pipe shall be inspected prior to installation. No cracked, broken, or defective pipe or fittings will be allowed. All pipes cleaned before installation.
- c. Proper implements, tools, and construction operations will be maintained by the contractor for the safe and proper protection of the work.

Division 3  
Sitework-Waterlines

- d. Pipe base, if utilized, shall be placed and compacted in trench before pipe installation.
- e. All pipe shall be carefully lowered into the trench to prevent damage to the pipe. Contractor will be responsible for inspecting the pipe before installation and for the proper laying of materials to manufacturer's recommendations. He shall be responsible for all damage to pipe before final acceptance by the local public agency or the engineer, and shall reinstall pipe that does not meet specifications or was damaged during installation.
- f. No debris, tools, or other materials allowed in pipe.
- g. All pipe sealed at night to provide public safety and prevent foreign materials from entering pipe.
- h. Gravel Pipe Base.
  - (01) Gravel pipe bedding shall be placed under waterlines wherever ground conditions or existing materials may prove harmful to waterline installation.
  - (02) Gravel bedding shall be provided to a depth of six (6) inches below the outside of the pipe. The top of the base shall terminate six (6) inches above the outside of the pipe and the pipe base shall be placed for the full width of the trench.
- i. Foundation stabilization materials shall be placed under waterlines wherever soft ground conditions are encountered that are not beneficial to proper installation, and in such quantity as is required to stabilize the trench bottom.
- j. Bell holes shall be dug at each joint to permit the joint to be properly made; to permit easy inspection of the joint, and to provide uniform bearing for the entire pipe length.
- k. Laying and Jointing the Pipe.
  - (01) Maximum deflection at any joint shall not exceed three (3) degrees.
  - (02) Maximum deviation from established line and grade; one-half (1/2) inch.

Division 3  
Sitework-Waterlines

- (03) Concrete thrust blocking shall be installed at all fittings as specified herein, required by engineer, or established by standard construction procedures.
- (04) All necessary precautions to prevent uplift shall be taken by contractor.

1. Sterilization.

- (01) All lines will be sterilized prior to connection to the existing system.
- (02) Prior to commencing disinfection procedures, all lines shall be flushed thoroughly to remove dirt, construction debris, and other potential contaminants.
- (03) Initial amounts of chlorine shall be injected into the line to provide a dosage of at least 40 ppm. Treated water shall be retained in the pipe for at least twenty-four hours. A free chlorine residual of not less than ten ppm shall be maintained in all parts of the line after the 24 hour period has elapsed.
- (04) Chlorinating agent shall be either a liquid chlorine gas-water mixture, direct fed chlorine gas, or a calcium hypochlorite and water mixture at the contractor's option.
- (05) During the sterilization process, all valves in the main line shall be operated, and all blow offs flushed until a strong residual is found.
- (06) After chlorination, the water shall be flushed from the line until the water tests are equal chemically and bacteriologically to those of the present system. Bacteriological samples must be submitted to State Board of Health before consumer usage is allowed.
- (07) Sterilization shall be conducted in the presence of the engineer. Samples shall be taken at various points along the line to be certain all portions of the system have been sterilized.

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**m. Testing of Completed Waterline**

- (01) **General.** A test shall be conducted on the first section of pipe laid to establish that the pipe materials are capable of meeting design requirements. Section of test line shall be at least 200 feet in length and at the discretion of the engineer. If test indicates that the materials or workmanship that does not meet design requirements, the defective material or workmanship, shall be corrected and test rerun until specifications are fulfilled.
- (02) **Pressure.** After valved, each section of pipe has been laid and partially backfilled, it shall be subjected to hydrostatic pressure of 50% in excess of specified pipe strength. After the entire pipeline is completed, a final test shall be undertaken under the same conditions and utilized to guarantee the performance of the completed system.
- (03) **Duration.** The duration of each pressure test shall be at least one hour at 150 psi to determine leakage by formulas contained herein.

**(a) Procedure:**

Each valved section of pipe shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation shall be applied by means of a pump connected to the pipe connection. Means of measuring the water necessary to maintain test pressure, gauges and all necessary apparatus shall be furnished by the contractor. The contractor shall furnish all necessary assistance for conducting the test.

**(b) Expelling Air:**

Before applying the specified test pressure, all air shall be expelled from the pipe.

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(c) Examination During Test:

All exposed pipe, fittings, and valves, and all joints shall be carefully examined during the tests. Any visible leaks shall be repaired until tight. Any cracked, broken, or defective pipe, couplings, fittings or valves shall be replaced at the contractor's expense.

(d) Leakage:

Leakage shall be defined as the quantity of water supplied into the pipe, or any valved section of it, necessary to maintain the specified test pressure after the pipe has been filled with water and the air expelled. No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula in which:

$$L = \frac{ND}{7400} p$$

L = allowable leakage  
in gph  
N = number joints in  
length of pipe  
tested  
D = nominal diameter  
of pipe in inches  
p = average test pres-  
sure during leakage  
test, in pounds per  
square inch

(e) Correction of Excessive Leakage:

Should any test of pipe laid disclose leakage greater than that allowed under section above, the contractor shall, at his own expense, locate and repair the defective joints or pipe until the leakage is within the specified allowance.

3L. WATERLINE APPURTENANCES

01. General.

- a. This item shall include installing all pipe appurtenances required for each type of pipe, including thrust blocking to prevent pipe movement after installation. Materials may include, but are not limited to, cast iron bends, valves, valve boxes, hydrants, and service laterals.

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- b. Trench excavation and pipe base preparation are provided in previous sections, and special care shall be taken to provide proper bedding around fittings, adequate bell clearance, and reaction or thrust blocking required for installation.
- c. Submittal material for all valves to be installed shall be provided to the engineer prior to installation.

**02. Materials**

**a. Fittings.**

- (01) Fittings shall consist of all ells, and other appurtenances required for the project.
- (02) Cast Iron Fittings.
  - (a) Fittings shall meet the requirements of ANSI Specification A21.10 (AWWA C-110) for 250 psi working pressure. Fittings shall be the short body dimension type.
  - (b) Flanges shall conform to ANSI Specification B16.1, Class 125 unless otherwise specified and shall be faced and drilled in accordance with ANSI Specifications B16.1, Class 125.
  - (c) Gasket material for flanged joints shall be sheet rubber conforming to Federal Specifications HH-G-156, Class A or B, 1/16 inch thick, and as approved. The gasket shall be full cut with holes to pass bolts.
  - (d) Bolts and nuts for use with flanged joints shall be cadmium plated.
  - (e) Mechanical joints shall conform to the requirements of ANSI Specification A21.11 (AWWA C-111).
  - (f) Rubber rings for mechanical joints shall conform to the requirements of ANSI Specification A21.11 (AWWA C-111).
  - (g) Bolts and nuts for use with mechanical joints shall be galvanized tee-head bolts and hexagonal nuts.
  - (h) Fittings shall be as manufactured by Tifco, Tyler, Clow, or approved equal.
- (03) Flanged coupling adapters shall be Rockwell #912 or approved equal. Bolts and hardware shall be stainless steel.

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- (04) Flanged reducing coupling adapters shall be Rockwell #914 or approved equal. Bolts and hardware shall be stainless steel.
- (05) Reducing couplings shall be Rockwell #415 or approved equal. Bolts and hardware shall be stainless steel.
- (06) Compression couplings for service connections shall be Rockwell #411 or approved equal. Bolts and hardware shall be stainless steel.
- (07) Transition couplings shall be Rockwell #431, or approved equal. Bolts and hardware shall be stainless steel.
- (08) Tapping sleeves shall be Clow No.F-5205 or approved equal.

**b. Cast Iron Valves.**

**(01) Resilient Wedge Valves.**

- (a) Resilient wedge valves shall be brass mounted, non-rising stem conforming to AWWA C-509. All valves shall be 200 psi, minimum, working pressure, and hydrostatic shell test and furnished with "O-Ring" stem seals.
- (b) Valves shall have flange to flange ends, mechanical joint ends, or mechanical joint to flange ends.
- (c) All valves shall have a 2 inch square wrench nut.
- (d) Valves greater than 8 inch shall be butterfly valves.
- (e) All gate valves shall be furnished with a cast iron box. See 3J.02.c.
- (f) Valves shall be as manufactured by Clow, or approved equal.

**(02) Butterfly Valves**

- (a) Butterfly valves shall be rubber seated, tight closing type conforming to AWWA C-504, Class "150B" butterfly valves. All valves shall be 150 psi, minimum, working pressure, 300 psi test pressure.
- (b) Valves shall have flange to flange ends, mechanical joint ends or mechanical joint to flange ends.

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- (c) All valves shall have a 2 inch square wrench nut.
- (d) All butterfly valves shall be furnished with a cast iron valve box. See 3J.02.c.
- (e) Valves shall be Pratt Groundhog, Clow, Kennedy, Figure 40 or approved equal.

c. Tapping Valves.

- (01) Tapping valves shall meet or exceed AWWA C-500, except that the seat rings shall be of larger diameter to permit entry of the tapping machine cutters.
- (02) Tapping valves shall be Clow No. 5093 or approved equal.

d. Valve Boxes

- (01) Cast iron valved boxes shall be furnished and installed with all valves.
- (02) Boxes shall be adjustable length, two piece, for varying installation conditions, and shall have a slip type means of adjustment.
- (03) Shaft shall be 5-1/4 inch diameter, and cover shall be lettered WATER.
- (04) Boxes shall be Rich "920" as manufactured by Varicast, or approved equal.

e. Thrust and Resistance Blocking.

- (01) All blocking shall be of 2,500 psi concrete. They shall be poured at all fittings where required to prevent movement. Concrete shall be poured as stiff as possible and shall be covered after pouring. The block sizes for various fittings shall conform to the standard details.
- (02) Blocking shall be placed between undisturbed earth and the fitting to be anchored.
- (03) All blocking shall be placed so that the pipe and fitting joints will be accessible for repair.

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- f. **Air Vacuum Release Valves.** Combination air vacuum relief valves shall be iron bodied, bronze mounted combination air and vacuum relief valves, designed for normal usage of 150 psi, McCracken, Golden Anderson, or approved. One two (2) inch gate valve, as specified shall allow removal and reconditioning of vacuum relief valve. Connection to main pipe shall be made through the use of double strap service clamps, Mueller, as specified, or approved equal. Required piping shall be galvanized iron. Install at all high points or summits of any given line.
- g. **Blow Off Valves.** Blow off valves shall be constructed per standard details, with one two (2) inch gate valve installed for manual operation, as specified. Miscellaneous piping shall be galvanized iron. One 4"x 4" painted cedar post shall be furnished for ready field location, and to secure outfall piping. Connection to main line shall be made through use of double strap service clamps, Mueller, as specified, or approved equal.
- h. **Service Laterals.**

(01) **Service Saddles.**

- (a) Brass saddles 3/4 through 2 inch IP Tap, utilized with C-900 PVC pipe, shall be Mueller, or approved equal.
- (b) Brass saddles 3/4 through 2 inch IP Tap, utilized with ductile iron pipe shall be Ford Meter Box Company, Style 202B, or approved equal.

(02) **Corporation Stops.** Corporation stops used with 3/4 and 1 inch tap shall be Mueller or approved equal. Stop shall be furnished with iron pipe threads.

(03) **Gate Valves.** Gate valves used with 1-1/2 and 2 inch tap shall be bronze, non-rising stem and shall have pressure containing parts of material having at least the physical properties of ASTM B-62. Gate valves shall be of the solid wedge type. Stem shall be of cast silicon brass or rolled silicon brass. Valves shall be furnished with bronze tee handle and cast iron valve box as specified in Section F.02.d of this Division. Two hand wrenches shall be provided to operate all tee handle gate valves. Valve shall be as manufactured by Nibco, or approved equal.

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(04) Meter Stops.

- (a) Angle meter stops used with 3/4 and 1 inch polyethylene pipe shall be Catalog #H14265, Mueller, or approved equal.
- (b) Angle meter stops used 1-1/2 and 2 inch PVC pipe shall be Mueller Co., Catalog #14286, or approved equal. Reinforced rubber gaskets required.

(05) Piping.

- (a) Polyethylene pipe for 3/4 and 1 inch service laterals shall be iron pipe size hi-molecular strength, Class 200, NSF approved for drinking water, and shall conform to the requirements of ASTM D-2732. Pipe shall be as manufactured by Drisco, Yardley or approved equal. Stainless steel insert stiffness shall be utilized with all polyethylene service lateral connections as manufactured by Ford Meter Box Company, or approved equal.
- (b) PVC Pipe. PVC pipe for 1-1/2 and 2 inch service laterals shall be Schedule 40, Type 1, Grade 1, NSP approved, conforming to ASTM D-1785. Pipe shall be as manufactured by JM Manufacturing Company or approved equal.

(06) PVC Pipe Fittings.

- (a) Use Schedule 80 PVC fittings conforming to:
  - Threads -- ASTM D-2464
  - Sockets -- ASTM D-2467
  - Material -- ASTM D-1784
- (b) Solvent cement for PVC slip fittings and pipe shall conform to ASTM D-2564.
- (c) Teflon tape shall be used as sealant for thread joints.

(07) PVC or polyethylene manifolds for meter installation will not be permitted.

(08) Meter Boxes.

- (a) Service boxes for 3/4 and 1 inch service laterals not being connected to an existing service shall be Amitek, or approved equal.
- (b) Meter boxes for 1-1/2 and 2 inch service laterals shall be Brooks No.658 (C.I.) or approved equal.

Division 3  
Sitework-Waterlines

1. Hydrants.

- (01) Fire hydrants shall be a AWWA compression type, traffic model, with main valve to remain closed if barrel should be accidentally broken. Length of barrel shall be sufficient for 36" pipe cover. Hydrant shall be installed to finish grade, with base flange 6" above adjacent ground.
- (02) Hydrants shall have "O" ring seals, rugged main valve, positive drain valve bronze weather cap, and non-kinking chains. Hydrants shall have bronze seat right and bronze cap nut. Entire valve mechanism, including drain valves, must be easily removed without digging. Hydrant shall be capable of 360 degrees rotation on stem, Mueller Centurion, or approved equal. Operating nut shall be 1-1/2" pentagon, National Standard, counter-clockwise opening and color shall be yellow.
- (03) Each hydrant shall be equipped with two 2-1/2 inch hose nozzles and one 4-1/2 inch threaded pumper nozzle. Size of hydrant valve opening shall be 5-1/4 inch. Hydrant inlet shall be flanged or mechanical joint. Must meet AWWA specification C-502 and National Standard Specifications.

03. Workmanship.

a. Fittings.

- (01) Install to manufacturer's recommendations.
- (02) Dropping of fittings into trench is prohibited. Care shall be taken in handling at all times.
- (03) Before lowering cast iron fittings and while suspended, each fitting shall be inspected and lightly tapped with a hammer to detect flaws. All defective fittings shall be rejected.

b. Valves and Valve Boxes.

- (01) Install to manufacturer's recommendations.
- (02) Provide valve boxes to grade, for each valve.
- (03) Valve box shall not rest on valve and shall be centered and plumb over valve nut.

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c. **Fire Hydrants.**

- (01) Install to manufacturer's recommendations.
- (02) Plumb hydrants vertical.
- (03) Hydrant base shall be set on firm and solid foundation.
- (04) Concrete blocking shall be provided as per standard drawing in the specifications.
- (05) Flush hydrant thoroughly after installation to remove foreign matter.

d. **Service Laterals.**

- (01) Service laterals shall be installed as per Standard Drawing 3-4 in the specifications.
- (02) Service laterals shall include all required pipe, fittings from the main line to the meter boxes including meter boxes and meter stops, complete and connected to provide service to property.

**3M. TONING WIRE AND LOCATOR TAPE**

- 01. **Scope.** The work to be done under this section consists of furnishing all labor, material, equipment and performing all work specified herein for the burying of an insulated copper wire or metal impregnated locator tape in close proximity to installed non-ferrous pipelines.
- 02. **Materials.**
  - a. Copper wire shall be single strand Number 12.
  - b. Locator tape shall be 2 inch wide metal impregnated, as manufactured by Terra-Tape, Line Guard or approved equal.
- 03. **Workmanship.**
  - a. Wire or tape shall be buried the entire length of trench and shall be placed per the Standard Detail Drawing.
  - b. Wire shall be brought to the surface and connected to ground rods.
  - c. Tape shall be placed over the pipe zone material, approximately 6 inches above top of installed pipe.

Division 3  
Sitework-Culvert

3N. CULVERT INSTALLATION

01. General.

- a. This item shall include furnishing and installing all pipe for driveway approaches where curb and gutters are not required along with appropriate drainage swales, draws, creeks and constructing required wing walls.
- b. All pipe installed to manufacturer's recommendations.
- c. All pipeline materials shall be American made.

02. Materials.

a. Corrugated Metal Pipe.

- (01) Corrugated metal pipe shall be helical corrugated, Armco "Hel-Cor Aluminized Steel, Type 2", or approved equal, conforming to AASHO M36, Type 2.
- (02) Corrugated metal pipe shall be nominal inside diameters of 12 inches, minimum. Pipe shall be 14 gauge minimum.
- (03) Joints shall be made with connecting bands, fabricated from same material as pipe conforming to AASHO M218. Connecting bands shall be ten and one half (10-1/2) inches wide.

- b. All materials for storm drain pipe are approved for culvert installation, provided pipe will meet manufacturer's installation requirements.

03. Workmanship.

- a. Materials shall not be distributed on the job faster than can be used to good advantage.
- b. All pipe shall be inspected prior to installation. No cracked, broken, or defective pipe or fittings will be allowed. All pipes cleaned before installation.
- c. Proper implements, tools, and construction operations will be maintained by the contractor for the safe and proper protection of the work.

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- d. Maximum deviation from line and grade shall not exceed 1/2 inch for line and 1/8 inch for grade. Batterboards required, if the contractor grade establishment is judged insufficient by the engineer.
- e. Pipe base, if utilized, shall be placed and compacted in trench pipe installation.
- f. All pipe shall be carefully lowered into the trench to prevent damage to the pipe. Contractor will be responsible for inspecting the pipe before installation and for the proper laying of materials to manufacturer's recommendations. He shall be responsible for all damage to the pipe before final acceptance by the local public agency or the engineer, and shall reinstall pipe that does not meet specifications or was damaged during installation.
- g. No debris, tools, or other materials allowed in pipe.
- h. Gravel Pipe Base.
  - (01) Gravel pipe bedding shall be placed under all pipelines wherever ground conditions or existing materials may prove harmful to pipeline installation.
  - (02) Gravel bedding shall be provided to a depth of six (6) inches below the outside of the pipe. Top of the base shall terminate six (6) inches above the outside of the pipe and pipe base shall be placed for full width of the trench.
- i. Foundation stabilization materials shall be placed under all pipelines wherever soft ground conditions are encountered that are not beneficial to proper installation, and in such quantity as is required to stabilize the trench bottom.
- j. Bell holes shall be dug at each joint to permit the joint to be properly made; to permit easy inspection of the joint, and to provide uniform bearing for the entire pipe length.

Division 3  
Sitework-Streets

30. COMMON EXCAVATION FOR STREET CONSTRUCTION

01. Scope. This item covers the excavation of any material encountered irrespective of nature, character, or conditions; complete, including but not limited to:
- a. Protection of private property.
  - b. Disposal of cleared items.
  - c. All excavation and embankment.
  - d. Removal of existing asphaltic pavement.
  - e. Removal of existing sidewalks.
  - f. Removal of existing curbs and curb returns.
  - g. Locating and protecting existing utilities.
  - h. Repair of damage to existing utilities.
  - i. Maintenance of adequate barricades, lights, and warning signs for protection of public.
  - j. Hauling of and disposal of excavated materials.
  - k. Repair of private and public property damaged.
  - l. Sawing of all concrete and asphalt concrete pavement to neat, straight edges where existing surfaces are to remain.
  - m. Final backfill and cleanup.
  - n. All miscellaneous items of work to complete construction specified.
  - o. Reshaping of the grade.
  - p. Preparation of subgrade.
  - q. Grading of existing driveways which are specified for restoration.
02. Materials, as specified in 3E.
03. Workmanship, as specified in 3E.

Division 3  
Sitework-Streets

3P. PREPARATION OF SUBGRADE

01. **Scope.** This item covers the shaping, trimming and finishing of the graded roadbed, slopes and surfaces of roadway earthwork to bring them in reasonably close conformity to the lines, grades and cross sections established by the engineer.
02. **Stabilization Material.** Stabilization material shall be bank or river sand clean and free from organic and vegetative matter, sticks and debris.
03. **Workmanship.**
  - a. Subgrade shall be made free of ruts, depressions and irregularities.
  - b. Water required for compaction.
  - c. Compaction as specified in 3E.
  - d. Soft or unstable subgrade materials shall be excavated as directed by the local public agency or the engineer.

3Q. BASE AND LEVELING COURSES

01. **General.** This item includes furnishing all materials, labor and equipment for construction of base and leveling courses, complete.
02. **Materials.**
  - a. Base course material shall be 1-1/2"-0 crushed quarry rock.
  - b. Leveling course material shall be 3/4"-0 crushed quarry rock.
  - c. Base and leveling course material shall conform to the requirements of Section 703.07 of the Oregon Department of Transportation, Highway Division Standard Specifications, except that not less than 70 percent of the particles shall have less than two fractured surfaces.

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- d. A complete test report on base and leveling course material to be used shall be submitted with the proposal. The report shall be by a recognized independent testing agency and dated not earlier than six (6) months prior to construction start.

**03. Workmanship.**

- a. Sequencing and Scheduling. Notify engineer 48 hours prior to placement of base and leveling courses to permit inspection.
- b. Placement. Rock shall be spread to such depth that when thoroughly compacted it will conform to grades and dimensions on plans. Segregation shall be avoided.
- c. Compaction. Base and leveling course shall be compacted to achieve 95% density when tested in accordance with AASHO Standard Method T-180, Method A. Water shall be added as required.

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30-I. STREET CONSTRUCTION STANDARDS

01. **Design Standards.** Any street constructed within and dedicated to the City of Yachats as a City street, or dedicated to the public for use as a street and constructed after the date of these regulations shall comply with the following standards.
  - A. The maximum grade shall not exceed a twelve (12) percent slope on unsurfaced roads and twenty (20) percent slope on paved roads.
  - B. The maximum radius on curves, including switchbacks, shall not be less than 70 feet.
  - C. The dedicated right-of-way width shall be not less than 50 feet.
  - D. Minimum surface requirements.
    1. The road surface suitable for traffic shall be not less than 22 feet in width.
    2. The minimum surfacing materials shall include a layer of base rock not less than six (6) inches in depth, such rock being of a size no greater than three (3) inch minus, and a layer of finished rock not less than four (4) inches in depth and of size no greater than three-quarter (3/4) inch minus.
    3. The soil content of crushed rock used upon any street within the City shall not exceed two (2) percent.
02. **Drainage Ditches.** Drainage ditches shall be constructed on both sides of any street within the City limits and shall be of a width not less than three (3) feet and of sufficient depth to reach the bottom of the sub-grade and shall be adequate to provide drainage during reasonably foreseeable weather conditions within the City.
03. **Backslope.** The backslope shall be no greater ratio than 1/1 or less, and the top of all backslopes shall be rolled.
04. **Culverts Under Streets.** Culverts underneath the City streets shall be of a size no less than 12 inches in diameter.

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Size of the culverts required shall be determined by estimated maximum run-off. Culverts shall be spaced according to the conditions of a permit for street construction with the spacing to be determined by the type of soil, ground water, grade and such other factors that are relevant in determining drainage needs. Culverts shall be installed upon a bed of crushed rock no less than four (4) inches deep.

05. **Curbing.** If the City Council required concrete curbing, or asphalt or concrete paving such curbing and/or paving shall conform with the minimum requirements as set forth by the State Highway Commission.
06. **Street Fill.** All material used as fill in the construction of any street within the City shall be free of stumps, slash and brush and any other debris.
07. **Clean up.** All debris which may be accumulated as a result of street construction must be immediately removed from the right-of-way or burned on the right-of-way, such burning to be subject to the approval of all interested state and local agencies.
08. **Clear-Vision Areas.** A clear-vision area shall be maintained on the corners of all property at the intersection of two streets.
  - a. A clear-vision area shall consist of a triangular area, two sides of which are lot lines measured from the corner intersection of the street lot lines for a distance specified in this regulation, or, where the lot lines have rounded corners, the lot lines extended in a straight line to a point of intersection and so measured, and the third side of which is a line across the corner of the lot joining the non-intersecting ends of the other sides.
  - b. A clear-vision area shall contain no planting, fence, wall, structure, temporary or permanent obstruction exceeding 2.5 feet in height, measured from the top of the curb or where no curb exists, from the established street center line grade, except that trees exceeding this height may be located in this area provided all branches and foliage are removed to a height eight (8) feet above grade.

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- c. For clear-vision areas, the minimum distance shall be fifteen (15) feet or, at intersections including an alley, ten (10) feet, except that when the angle of intersection between streets, other than an alley, is less than thirty (30) degrees, the distance shall be twenty-five (25) feet.
9. **Street Intersections.** Streets shall intersect one another at an angle as near to a right angle as is practical considering the topography of the area and previous adjacent layout. Intersections shall be designed so that no danger to the traveling public is created as a result of staggered intersections; and in no case shall intersections be offset less than 100 feet.
10. **Cul-de-sacs and Turn-a-rounds.** In general, dead end (cul-de-sac) streets in urban subdivisions (average lot size under one (1) acre) shall not exceed four hundred (400) feet in length and shall terminate in a turn-a-round with a minimum property line radius of forty-five (45) feet or other type of turn-a-round approved by the Planning Commission. Turn-a-rounds approved by the Planning Commission shall be provided on all dead-end streets.
11. **Easements.**
  - a. Where alleys are not provided, easements of not less than five (5) feet in width shall be provided on each side of the rear line or side line for necessary utility lines, wires, conduits, storm and sanitary sewers, gas and water. Easements of the same or greater widths may be required along boundary lines or across lots or parcels where necessary for the extension of utility lines, waterways, and walkways, and to provide necessary drainage ways or channels.
  - b. A private easement established without full compliance with these regulations may be approved by the Planning Commission provided it is the only reasonable method by which the rear portion of an unusually deep lot or parcel may be provided vehicular access.
12. **Blocks.** No block shall be longer than one thousand two hundred (1,200) feet between street lines.

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13. **Public Access Ways.** When necessary for public convenience and safety, the Planning Commission may require the land divider to dedicate to the public access ways ten (10) to twenty (20) feet in width to connect to cul-de-sacs, to pass through oddly shaped or unusually long blocks, to provide access to schools, parks, beaches or other public areas, of such design and location as reasonably required to facilitate public use.
14. **Public Streets.** If topography or other physical conditions make a street of the minimum required width impractical, the Planning Commission may modify this street regulation requirement provided the public and future owner's interests are adequately protected.
15. **Layout of Streets.** The layout of streets shall give suitable recognition to surrounding topographical conditions in accordance with the purpose of this ordinance.
16. **Variance.** The standards for street construction may be varied by the City Council where topography, soil characteristics, or other factors indicate such variance would be in the best interest of the City. Any request for variance in the above standards must be made in writing and filed with the City Recorder when the application for construction is submitted.

30-2. PRIVATE STREETS

1. **General Requirements.**
  - a. Private streets shall provide access only to abutting lots. No street providing access to other streets or to areas not abutting such streets shall be approved as private streets.
  - b. At such time as a preliminary plan is proposed which includes private streets, all adjacent property owners shall be notified of such proposal and the time and place of the Planning Commission hearing.
  - c. A private road shall be approved provided:
    - (1) The Planning Commission is satisfied that such street is not presently needed as a public road.
    - (2) It will never be extended through to adjacent property.

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(3) It will not be utilized for public road purposes in the normal growth area.

- d. Modification of private street requirements and/or standards shall be approved only (1) for street creation in areas where because of topographical or geological conditions full compliance or strict adherence to the standards and requirements would prevent reasonable access to the area; or (2) for access created to not more than three lots.
- e. Yard setbacks shall be determined from the road right-of-way or access easement line in instances where private roads are considered.

2. Standards for Private Streets

- a. Private road right-of-way may be approved of less than 50' in width except that the right-of-way width shall not be less than 10% of the road length and in no instance shall the road right-of-way be less than 30' except that a private road to two lots may be 20' in width, a 10' utility easement on each side of the road right-of-way or easement shall be provided.
- b. Improvements on private roads shall be the same as those for public roads providing access to similar development.

30-3. STREET CONSTRUCTION PERMIT

- 1. Prior to starting street construction a written permit must be obtained from the City. Application for street construction must be obtained from the City Recorder's office.
- 2. The application must contain an engineering plan and profile. Requests for any variances from street standards should also be included with the application.
- 3. At the time of making application, the proposed road must be located on the ground by stakes clearly showing:
  - a. The area to be cleared, these stakes must be offset 5 feet outside of the area of clearing.
  - b. Cut and fill.
  - c. Upper slope stakes.
  - d. Center line of proposed street.
  - e. Culverts designating size and length.

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4. Upon receiving a completed application, the City Street Commissioner shall examine the proposed street as staked out and shall report to the City Council at its next meeting. The City Council shall consider the report of the Street Commissioner at its next meeting. The City Council shall either grant, deny, or grant with special conditions any variances from the standards.

3Q-4. DEDICATION OF PUBLIC STREET.

Any person wishing to create a public road or street which is not a part of a subdivision shall make written application to the City Council. The application shall consist of a letter addressed to the Council requesting acceptance of the dedication; a deed with the exact description of the proposed dedication signed by all owners of the property intended to be served by the road. The City Council shall refer the application to the following:

1. The City Engineer, who shall check the proposal for grade and conformance to acceptable road standards;
2. The County Surveyor, who shall check the description for accuracy;
3. The County Assessor's Office, which shall insure that the taxes are paid on the property being dedicated and;
4. The Planning Commission which shall insure that the road is not in conflict with the City's Comprehensive Plan nor any adjacent approved plans, plats or maps. These reports shall be forwarded to the City Council. If the Council approves the dedication at least three members of the Council shall sign the deed as approved. The deed may then be recorded. A public road will not be maintained by the City unless that road is accepted by the City for maintenance.

Division 3  
 Sitework-Pavement

**3R. ASPHALTIC CONCRETE PAVEMENT**

01. **Scope.** This item includes furnishing all materials, labor and equipment necessary for laying the asphaltic concrete pavement, complete, as shown on plans and specified herein.

02. **Materials for Asphaltic Concrete.**

a. **Composition.** Asphaltic concrete shall be composed of asphaltic cement, mineral filler, sand and gravel, or crushed rock mixed together in the proportions hereinafter specified.

b. **Asphaltic Cement.** Shall be paving asphalt conforming to AASHO Standard Specification for Asphaltic Cement. The penetrations shall be 60-70.

c. **Proportion of Materials.** Shall be of such size and gradings that when proportioned and mixed together from two or more stockpiles (3/4 - 1/4 and 1/4 - 0) they will produce a uniform mixture which will conform with the requirements as follows:

<u>Sieve Size Passing</u>	<u>Class "B"</u>	<u>Class "C"</u>
	<u>Percentages of Total</u>	
1"	100	-
3/4"	95-100	100
1/2"	81- 93	95-100
3/8"	-	-
1/4"	52 -72	60- 80
No. 10	21- 41	26- 46
No. 40	8- 24	9- 25
No. 200	2- 7	3- 8
Asphaltic Cement	4- 8*	4- 8*

\* Percent of total mix (by weight)

Exact proportions of several constituents used in production of bituminous mixture shall, within the limits above specified, be fixed by engineer, and proportions so established shall be changed only upon his order.

Division 3  
Sitework-Pavement

03. Workmanship.

- a. **Mixing Plant.** Asphaltic concrete shall be proportioned and mixed to produce a mixture within the job mix formula. The plant shall be equipped with suitable storage bins for aggregates, weighing devices, heating and mixing equipment. Plant facilities shall be open to engineer at all times during operation for checking temperatures being maintained in preparation of mixture.
- b. **Preparation of Mixture.**
  - (01) Size of batch shall be determined by engineer based on manufacturer's capacity rating or net cubic content of mixer below center of mixer shafts.
  - (02) Combined mineral aggregate shall be thoroughly mixed dry, after which proper amount of bituminous cement shall be distributed over aggregate and the whole thoroughly mixed for such period as is necessary to produce homogeneous mixture of unchanging appearance in which all particles of mineral aggregate are uniformly coated with bituminous cement.
  - (03) For batching plants, mixing time after introduction of bituminous cement shall be not less than 30 seconds and as much longer as is necessary to obtain specified results. For continuous mix plants, the mixing time in seconds shall be as determined by dividing the pugmill dead capacity in pounds by the pugmill output, in pounds per second, and shall be regulated by fixing a minimum gauge in the mixing unit or by other satisfactory mixing unit adjustments.
  - (04) The ingredients of the mixture shall be heated, combined and mixed in such a manner as to produce a mixture of such temperature that when deposited on the road it will be within the temperature range set forth hereinafter.

Division 3  
Sitework-Pavement

c. **Temperature Limits** - The temperature to which the aggregates and bituminous cement are to be heated and at which the asphaltic concrete is to be deposited on the road shall be in accordance with the following:

Degrees Fahrenheit to which aggregates are  
to be heated before mixing . . . . . 250-325

Degrees Fahrenheit to which bituminous cement  
is to be heated before mixing . . . . . 250-300

Degrees Fahrenheit at which asphaltic concrete  
is to be deposited on the road . . . . . 250-300

d. **Hauling, Spreading, and Finishing.**

- (01) Mixture shall be transported from mixing plant to point of use in dump trucks having tight, clean, smooth, metal beds, which have been sprayed with a minimum amount of fuel oil, paraffin oil and lime solution to prevent mixture from adhering to beds.
- (02) No loads shall be sent out so late in the day as to prevent completion of spreading and compacting during daylight unless artificial light satisfactory to engineer is provided. Trucks shall be furnished with suitable canvas or burlap covers to prevent loss of heat, if required to meet established temperature standards.
- (03) Contact surfaces of curbs, gutters, catch basins, manholes, cleanouts, edges and surfaces of existing pavements and other structures within the pavement area shall be treated with a thin uniform coating of asphalt cement of type designated by engineer and applied as directed by engineer.
- (04) Mixture shall be laid on leveling course herein before specified. Leveling course shall be shaped and rolled as necessary to repair any areas disturbed by trucking. Placing of this mixture will be permitted only during dry weather and when the ambient temperature is above 40 degrees F.

**Division 3  
Sitework-Pavement**

- (05) Mixture shall be delivered to and spread by an asphaltic concrete paver of standard self-propelled type which meets the approval of engineer, and shall be thereby struck off and finished to specified grade and cross section. Mixture shall be laid in strips of such width as to hold to a practical minimum the number of longitudinal joints required.
- (06) Length of strips and time of placing adjoining strips shall be such that the edge of any strip along a longitudinal joint shall have the adjoining strip constructed against it within 24 hours unless authorized by engineer.
- (07) No asphaltic concrete material shall be placed against the edge of a strip course or layer of similar material that has been rolled and has cooled unless said edge has been prepared in the same manner as hereinafter set forth for transverse joints.
- (08) On areas of irregular shape, limited area, or where unavoidable obstacles make use of specified spreading and finishing equipment impracticable, in the judgement of the engineer, mixture may be spread and finished by hand methods which shall be performed in a skillful manner, without segregation of materials, and to specified grade, cross section and smoothness.
- (09) Care shall be taken at all times to prevent segregation in the mixture as evidenced by areas of fine and coarse materials, and any portions where such segregation occurs shall be corrected with fresh mixture either spread and worked into the surface, or by complete removal and replacement of aggregated mixture as directed by engineer.
- (10) On full depth asphalt, contractor shall lay blacktop in a minimum of two (2) lifts. Width of spread shall be varied so that longitudinal joints on succeeding lifts do not fall over joints in the lower lifts.

**Division 3  
Sitework-Pavement**

**e. Compacting**

- (01) After spreading, striking off and finishing have been performed and while mixture is still hot, the course of asphaltic concrete shall be compacted thoroughly and uniformly by rolling. Rolling shall be done with self-propelled three wheeled or tandem roller weighing not less than six tons and at least one of which shall weigh not less than ten tons. In general, one roller shall be provided for each 75 tons of mixture placed per hour or each 600 square yards of mixture placed per hour when the depth of course is such that 75 tons spread over an area exceeds 600 square yards.
- (02) Rolling shall be continued until asphaltic concrete has been compacted to such extent that its specific gravity expressed in percentage of the specific gravity of the combined aggregates is not below 92%.
- (03) Along beams, curbs, headers and walls, around manholes and catch basins, and at other places not accessible to the roller mixture shall be thoroughly compacted with hand tampers, smoothing irons or mechanical tampers. On depressed areas, a trench roller may be employed, or compression strips may be used under the roller to transmit compression to the depressed area.
- (04) Surface of the asphaltic concrete after compaction shall be smooth and true to established cross section and grade. Any mixture that becomes loose or broken, mixed with dirt, or is in any way defective shall be removed and replaced with fresh hot mixture, which shall be immediately compacted to conform with surrounding area. Any areas showing excess of bituminous cement due to improper rolling procedure shall be removed and replaced.

- f. **Transverse Joints.** Placing of a course or strip of asphaltic concrete shall be as nearly continuous as practicable and the roller shall pass over an unprotected end of freshly laid mixture only when the laying of the course or strip is to be discontinued long enough to permit the mixture to become chilled.

**Division 3  
Sitework-Pavement**

In all cases, when work is resumed, the material previously laid and permitted to become chilled shall be cut back or removed along the end so as to produce a slightly beveled edge for the full thickness of the course and the old cut away material shall be removed from the work. The new mixture shall be placed or raked against the fresh cut, thoroughly tamped, and rolled to provide a smooth joint exactly meeting the line, grade and cross section of adjoining asphalt concrete after thorough compaction. When end of a course of strip of asphaltic concrete is to be temporarily subjected to traffic, end shall be left on a bevel of approximately 1:1 to provide a fresh edge against which subsequently placed asphaltic concrete is to abut.

- g. **Surface Smoothness.** The surface of the top or wearing surface course, when finished, shall be of uniform texture, smooth, true to crown and grade, and free from defects of all kinds. The smoothness shall be such that when tested with a ten foot straight edge placed on the surface with its centerline parallel to the centerline of the highway, the maximum deviations of the surface from the edge of the straight edge will nowhere exceed one-half inch.
- h. **Control of Traffic.** No traffic shall come in contact with any course or lift of pavement until course of lift has cooled and set sufficiently to prevent marking. Those edges which are to be along longitudinal joints shall be protected from traffic to the extent that no breaking down of the edge shall occur.
- i. **Patching.**
  - (01) Omissions or damage to wearing surface shall be immediately corrected by hand patching. Defects such as raveling, low centers, lack of uniformity, or other imperfections caused by faulty workmanship shall be corrected as directed by engineer.
  - (02) All costs incurred in correcting omissions and in patching shall be borne by contractor.

**Division 3  
Sitework-Pavement**

- j. **Cleanup.** After the pavement has been completed, the contractor shall collect and remove from the site all debris resulting from his operations. Graded areas along the streets or driveways that have been disturbed by the paving operations shall be regraded to the satisfaction of the engineer.

Division 3  
Sitework-Pavement

**3S. PORTLAND CEMENT CONCRETE PAVEMENT**

01. **Quality Assurance.** Requirements of ACI 301 shall govern work, materials and equipment related to this section unless noted otherwise.
02. **Submittals.** Manufacturer is responsible for the design of the concrete mix which shall conform to ASTM C94 requirements for ready mix concrete. Prior to delivery of concrete, manufacturer furnishes to the City of Yachats a written statement giving the design mix and properties by weight of cement and aggregate plus amount of water in gallons per bag proposed for use in each class or type of concrete specification. Furnish evidence of testing or proposed design mix which assures design strength as specified, statement in writing on letterhead of manufacturer, identified to the specific project, addressed to the City of Yachats.

Concrete submittals will not be required for total project quantities of less than 50 cubic yards.

03. **Products.**

a. **Concrete Mix.**

- (01) **Strength.** 3300 psi minimum compressive strength after 28 days when tested in accordance with ASTM C39.
- (02) **Aggregate.** 1-1/2" maximum size.
- (03) **Slump.** 4" minimum and maximum when tested in accordance with ASTM C143.
- (04) **Cement.** 6.30 sacks per cubic yard of concrete, minimum.

b. **Cement Type.** ASTM C150 Type I for all concrete.

c. **Admixtures.** ASTM C494 only as approved by City.

d. **Hardener and Sealer.** Horn Clear Seal as manufactured by Grace Construction Materials, or approved equal.

Division 3  
Sitework-Pavement

04. Mixing and Delivery.

(Attention directed to Section 26. 1511 UBC Standard, 179). Certification is required. Under "Additional Information": Show water added in addition to design mix, who added it and who authorized it. Note: Engineer/Architect or testing laboratory may authorize additional water. If slump test indicates slump when tested is within specified limit, no problem; if slump is in excess of specified limit, concrete is rejected and cannot be used on project. The concrete shall be placed in a maximum elapsed time of 1-1/2 hours after the mixing water and cement has entered the drum until completion of discharge.

05. Thickness Requirements.

a. Minimum total thickness of the Portland cement concrete for each type of street constructed is as follows:

- |  |          |
|--|----------|
| 01. Minor residential (non-through street) | - 5"     |
| 02. Residential                            | - 5-1/2" |
| 03. Collector                              | - 6-1/2" |
| 04. Arterial                               | - 8"     |
| 05. Bicycle Path                           | - 4"     |

See Yachats Comprehensive Plan for specific designations for each street within City limits. New streets not in Master Plan must have thickness approved by City.

06. Preparation.

- a. Subgrade under curbs and street shall be excavated and filled with 2 inches of clean sand to provide uniform bearing surface.
- b. Construction of Portland cement concrete pavement shall not be in progress or continued when the air temperature in the shade and away from artificial heat falls below 40 degrees F.
- c. Streets may be constructed in half sections using wooden forms as a guide. All forms must be set and maintained true to the line and grade until the concrete has sufficiently hardened.
- d. Curb and gutter section must be integrally poured as a unit. Construction of poured curb after gutter installation not permitted.

Division 3  
Sitework-Pavement

07. Placing.

- a. Place concrete as near as possible to the final location. Movement by vibrator not permitted.
- b. The contractor shall place the concrete uniformly in its final position by the slip form or other approved method in one complete pass in such a manner that a minimum of finishing will be necessary to provide a dense and homogeneous pavement in conformance to true grade and cross section. The machine shall vibrate the concrete for the full width and depth of the pavement being placed. Such vibration shall be accomplished with the vibrating tubes or arms working in the concrete.
- c. The contractor shall compact the concrete by means of vibrating screeds, mechanical tampers, tamping templates and such other implements as approved. A vibrating screed or an automatic screeding and tamping machine may be substituted for a tamping template, subject to approval. The contractor shall operate the equipment in such a manner that a satisfactory compaction of the concrete is produced and the surface of the pavement is uniform, true to grade and cross section. Immediately after placing concrete upon the subgrade and before initial set has occurred, the contractor shall strike off the concrete and tamp by means of a tamping template, used at right angles to the center line of the street, until the concrete is thoroughly consolidated to specified grade and crown section and sufficient mortar is brought to the surface for finishing purposes.

08. Joints. The joint pattern layout should be planned prior to construction. Although the end of the day header construction joint cannot generally be planned, the overall joint spacing can be anticipated. The joint pattern of any project should consider the width of the concrete placement planned by the contractor. For pavement less than six inches thick, the maximum joint spacing should be 12 to 15 feet. For the plain jointed pavement 6 inches or greater, the maximum joint spacing should be between 15 to 18 feet. In order to establish a good plane of weakness for stress relief, joints should have a depth of one quarter (1/4) the thickness of the slab in inches. This depth will allow the pavements to crack at the joint and provide an aggregate interlock.

**Division 3  
Sitework-Pavement**

The joint pattern relationship of length to width should not exceed a ratio of 1 to 1-1/2; i.e., a pavement ten feet wide should not be jointed longer than 12 to 15 feet.

- a. Transverse contraction joints shall be constructed by sawing to the depths and widths and locations called for in the Standard Plans shown as Detail. Alternate method of joint construction is the placement of a narrow straight edge into partially set concrete, then carefully removing without creating a hump.
  - b. Construction joints shall be constructed where there is an interruption of more than 30 minutes in the concreting operation. For streets constructed in half sections, a longitudinal keyway joint shall be used.
  - c. Expansion joints using 1/2 inch premolded material shall be provided around catch basins and manholes to isolate the structures. The top of the material shall be 1/4 inch below finish concrete grade.
09. **Finishing.** After the concrete is placed and compacted, the contractor shall strike it true to line, grade and cross section as shown and float to a smooth, even texture with an approved long handled wood float having a troweling or smoothing surface from 6 to 12 inches wide, or other approved floating device. The contractor shall apply the float to the surface of the concrete with its length parallel to the centerlines of the street and operate it from bridges, planing off the high places and filling the low places. Preceding applications of the float shall be lapped by at least one-half its length. If, after such planing, low places are discovered in the surface of the concrete, the contractor shall add additional concrete to fill in and bring such low places to grade, as approved. Floating shall leave the surface finish at specified grade, cross section and surface tolerance with a surface free from soupy mortar, marks or irregularities. Following the float finish and at the proper set, the surface shall be broom finished. The contractor shall draw the broom transversely across the pavement with not more than one stroke per width of broom.

Division 3  
Sitework-Pavement

Any areas of minor honeycomb or other minor defect in composition of the concrete shall be filled along the exposed edges with a stiff mortar or cement and fine aggregate applied to the moistened concrete in a professional manner.

Areas showing serious defects in composition shall be cause for removal of the affected pavement and replacement with pavement of specified quality for the full width of strip between longitudinal joints or edges and for a length not less than 10 feet. The contractor shall not tool the free edges of new pavement and joints with previously placed Portland cement concrete with an approved edging tool to remove laitance and mortar resulting from finishing operations and to provide a clean rounded edge to the new pavement. Tooling shall not form ridges on the surface of the concrete. Tooling of edges at transverse joints shall not be performed as directed.

10. Tolerances. At the conclusion of the finishing operation the surface of the pavement shall not vary from a true surface when tested with a 10 foot testing straightedge, more than .01 foot in 10 feet. The finished surface shall not vary more than 0.03 foot from the plan elevations at any point. If the surface smoothness of the pavement after curing is found to exceed the tolerance permitted, the high spots shall be ground until they meet the tolerance. The practicable extent of grinding shall not exceed 0.5 inch, shall not create spalling of aggregate and shall not create deficiencies in pavement thickness.
11. Curing. Immediately after the final floating, surface finishing and edging has been completed and while the concrete surface is still moist, the entire exposed surface of the newly laid concrete shall be covered and cured in accordance with one or another of the following provisions as the contractor may elect:
  - a. Liquid Membrane-Forming Compounds. Membrane-forming compound shall be of the white pigmented type and shall be applied uniformly to damp concrete by pressure-spray methods at a rate which will form an impervious membrane when tested in accordance with AASHTO T-155.

**Division 3  
Sitework-Pavement**

- b. **White Polyethylene Sheeting.** The white polyethylene sheeting shall be applied to damp concrete as soon as the sheeting can be placed without marring the surface. The sheeting shall be placed in intimate contact with the surface, shall extend over and beyond the sides or edges of the slabs or forms and shall be weighted as required to hold it in position as a waterproof and moisture proof covering. Laps shall be of dimensions and design in place to maintain tightness equivalent to the sheeting.
  - c. **Waterproof Paper.** Waterproof paper shall be applied to damp concrete as soon as it can be placed without marring the surface. The paper shall be placed in intimate contact with the surface, shall extend over and beyond the sides or edges of the slabs or forms and shall be weighted as required to hold it in position as a waterproof and moisture proof covering. Transverse laps shall be at least 18 inches and longitudinal seams shall be cemented.
  - d. **Cotton or Jute Mats.** Cotton or jute mats shall be applied to damp concrete as soon as the surface has set sufficiently to prevent marring thereof. Just prior to placing, the mats shall be saturated with water and shall be kept fully wetted during the curing period. The mats shall be maintained in intimate contact with the concrete surface and shall be extended over the edges and beyond sufficiently to be well weighted down alongside the pavement edges. Regardless of which of the above methods the contractor chooses, the curing medium shall be intact and effective for a period of not less than 72 hours after application.
12. **Protection.** The contractor shall erect and maintain suitable barriers to protect the concrete from traffic or other detrimental trespass until the pavement is opened to traffic. If necessary, the contractor shall maintain watchmen to insure that barriers are not removed or destroyed and that trespass upon the pavement does not occur. Wherever it is necessary that traffic, including contractor's vehicle and equipment, be carried from one side of the pavement to the other, the contractor shall construct and maintain suitable bridges over the pavement as directed.

**Division 3  
Sitework-Pavement**

The concrete shall have attained the specified compressive strength and shall be free from scarring, abrasion, stones, loose mortar and other matter apt to be deleterious to the concrete prior to allowing equipment or traffic to use the new surface. All equipment shall be operated without damage to the new concrete. The contractor shall repair or replace any part of the pavement, as directed, which has been damaged by traffic or from any other cause prior to its official acceptance, at no expense to the owner.

Division 3  
Sitework

3T. COMPACTION TESTING

01. If, in the opinion of the local public agency or the engineer, the methods utilized by the contractor for placing trench backfill, embankment, base course, leveling course or asphaltic concrete pavement are not achieving the degree of compaction specified for that item, a compaction test or tests will be ordered by the local public agency or the engineer.
02. Test will be performed by a recognized independent testing agency.
03. If test results reveal that specified compaction was not achieved, contractor will remove and replace that portion of the work found to be defective in a manner that will achieve the required compaction. Additional testing will be performed following replacement of backfill as directed by the local public agency or the engineer. All testing costs to be borne by the contractor.
04. If test results reveal that specified compaction was achieved, testing costs will be borne by the local public agency.

3U. STREET MONUMENTATION

01. This item shall include furnishing all labor, materials, equipment and services necessary for installation of monument cases as specified herein.
02. Monument Cases.
  - a. Cast iron monument cases shall be installed at monument locations.
  - b. Shaft shall be 6-1/4 inch inside diameter.
  - c. Monument cases shall be Valley Iron and Steel Company, Pattern Number 700, or approved equal.
  - d. All cases shall be American made.
03. Workmanship.
  - a. Before installation of casings and while suspended, each casing shall be inspected and lightly tapped with a hammer to detect flaws. All defective casings shall be rejected.

**Division 3  
Sitework**

- b. Install to manufacturer's recommendations.
- c. Monument casing shall be centered and plumb over the monument location.

**04. Installation.**

- a. Contractor shall be responsible for having all monuments referenced in advance of construction, re-established and set to grade at the proper time.
- b. It shall be the responsibility of the contractor to install the required monument casings in accordance with the plans, specifications and as directed by the local public agency or the engineer. The contractor shall carefully protect all reference points to the monuments and he shall give reasonable notice of the schedule for monument work in order to avoid destruction of the points.
- c. Contractor shall maintain and protect monument casings once installed.

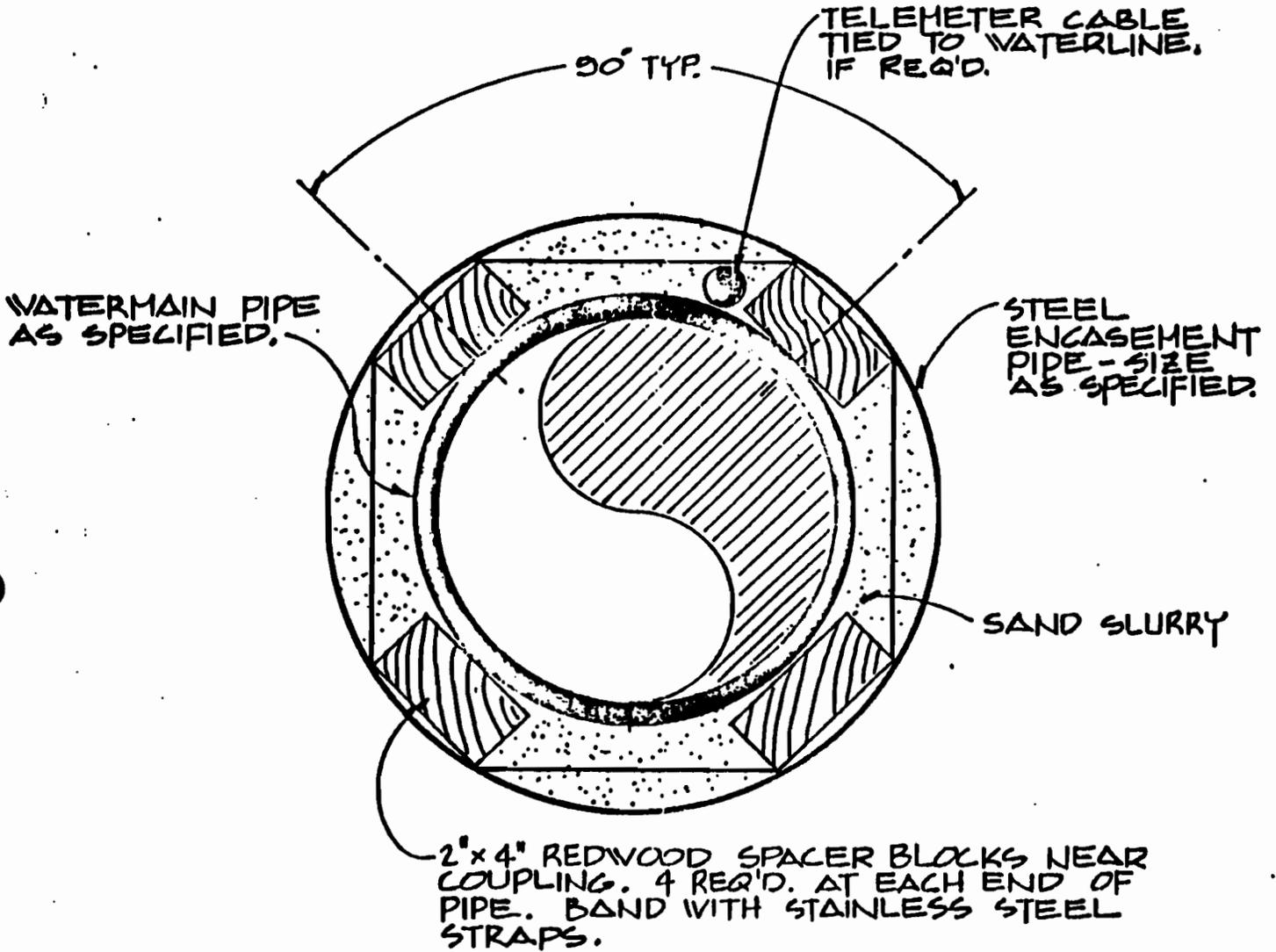
Division 3  
Sitework

3V. SIGN POSTS

01. **Scope.** This item shall consist of the furnishing, fabricating, galvanizing and erecting of sign posts in conformity with the lines, grades, dimensions and locations as directed or provided by the City of Yachats.
02. **Materials.**
  - a. **Backfill.** Backfill materials shall conform to the applicable portions of Division 3.
  - b. **Concrete.** Concrete shall conform the requirements of Division 4.
  - c. **Posts.**
    - (01) Post materials shall conform to the applicable portions of Division 6.
    - (02) Posts shall be 2-3/8 inch outside diameter hot dip galvanized pipe, 4 x 4 Pressure Treated Douglas Fir, 2-1/2 inch outside diameter steel post as manufactured by Traffic Safety Supply or approved equal.
    - (03) Each post shall be of lengths as shown on Standard Drawing, 3-24.
  - d. Signs shall be in accordance with the Manual on Uniform Traffic Control Devices.
03. **Workmanship.**
  - a. Post shall be set in cylindrical concrete foundations. For concrete foundations a hole shall be excavated for the bury depth of the post; not less than 12 inches in diameter.

**Division 3  
Sitework**

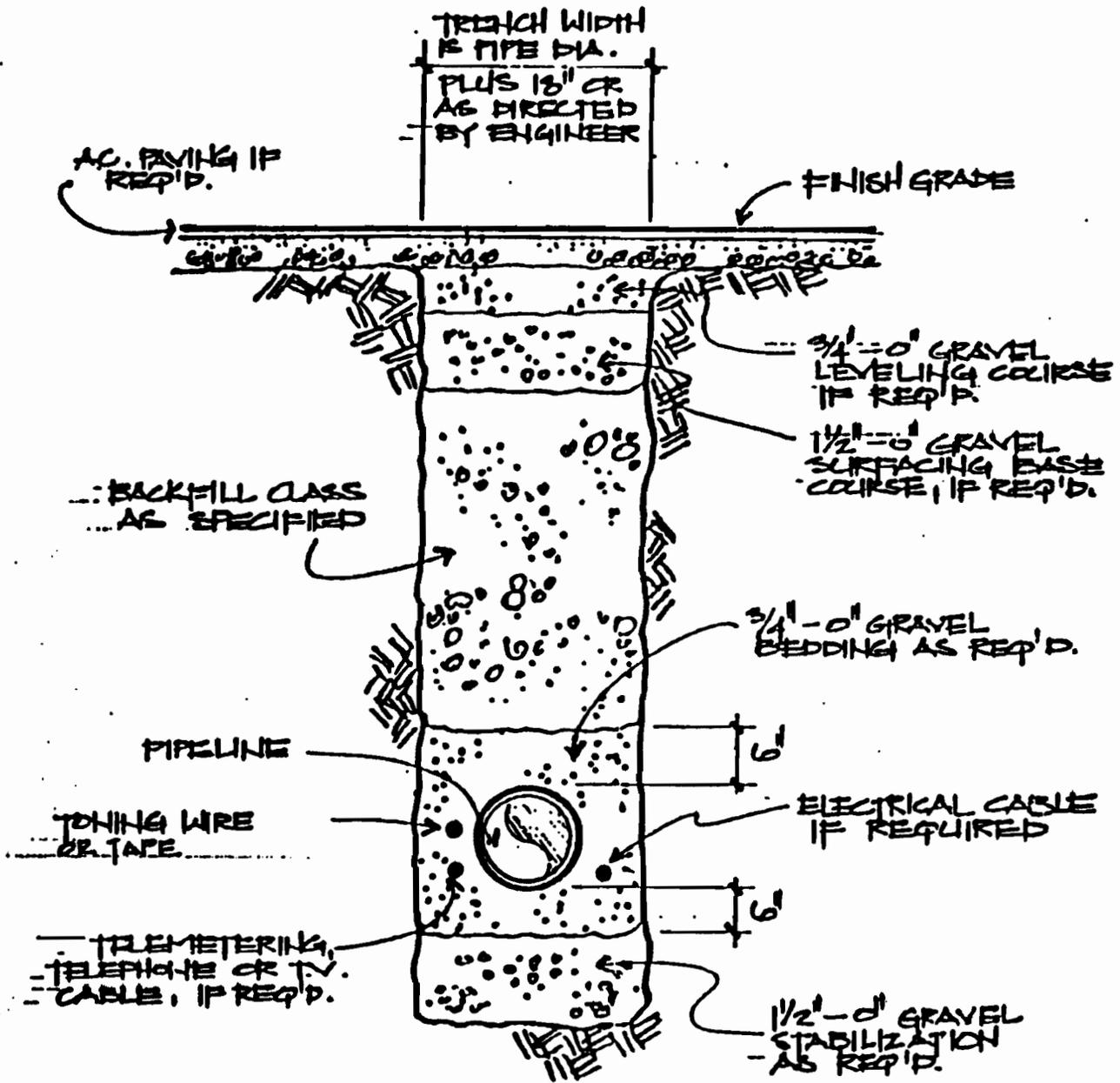
- b. All posts to be set in 2,500 psi concrete footings as shown, as to furnish a foundation and support sufficient to withstand any strain or shock ordinarily brought to bear on a post of this character. A liberal factor of safety to be provided.
- c. Sign posts shall be erected at a true vertical.
- d. The material shall be carefully handled so that no posts will be bent, cracked, or otherwise damaged.



# STANDARD DETAIL

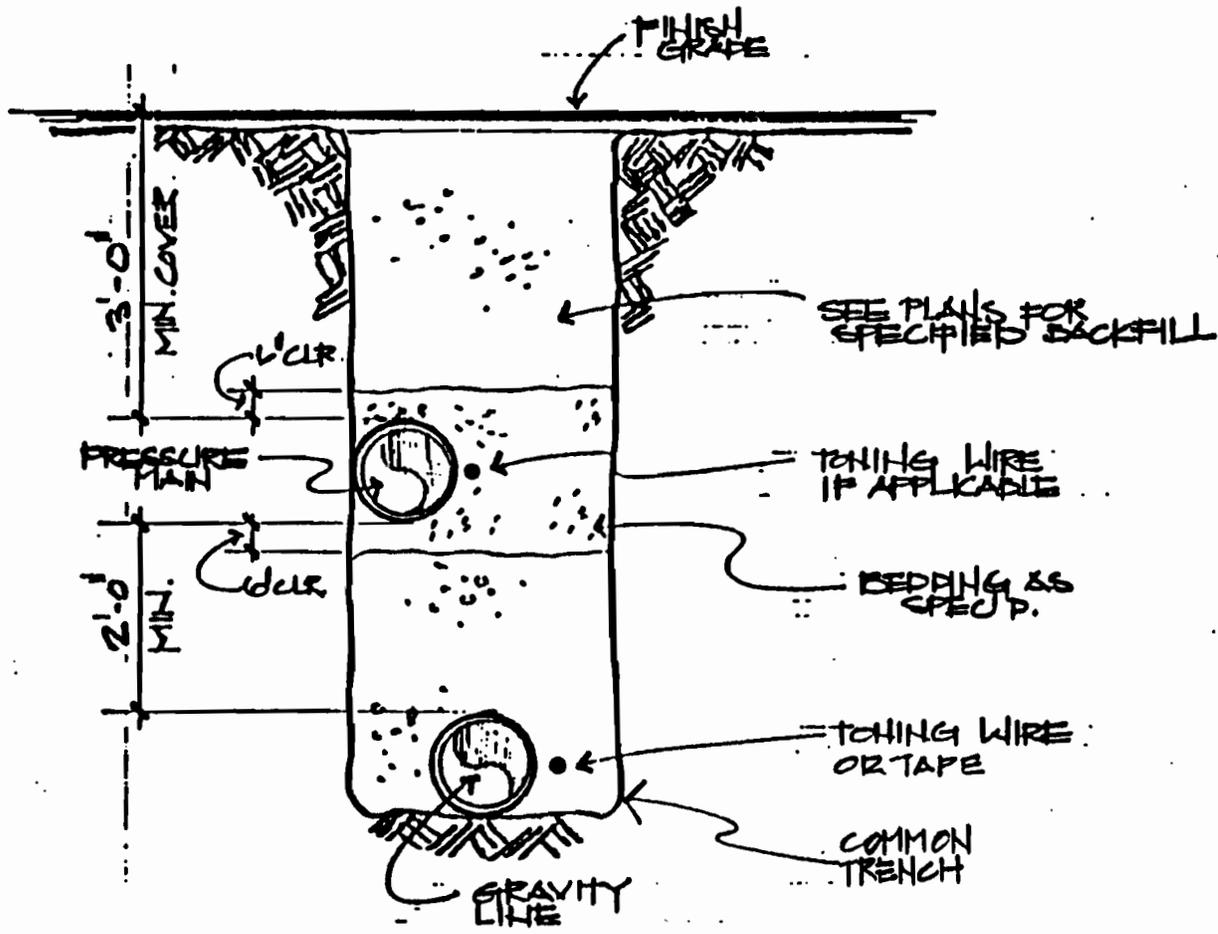
## PIPE ENCASEMENT

3-1



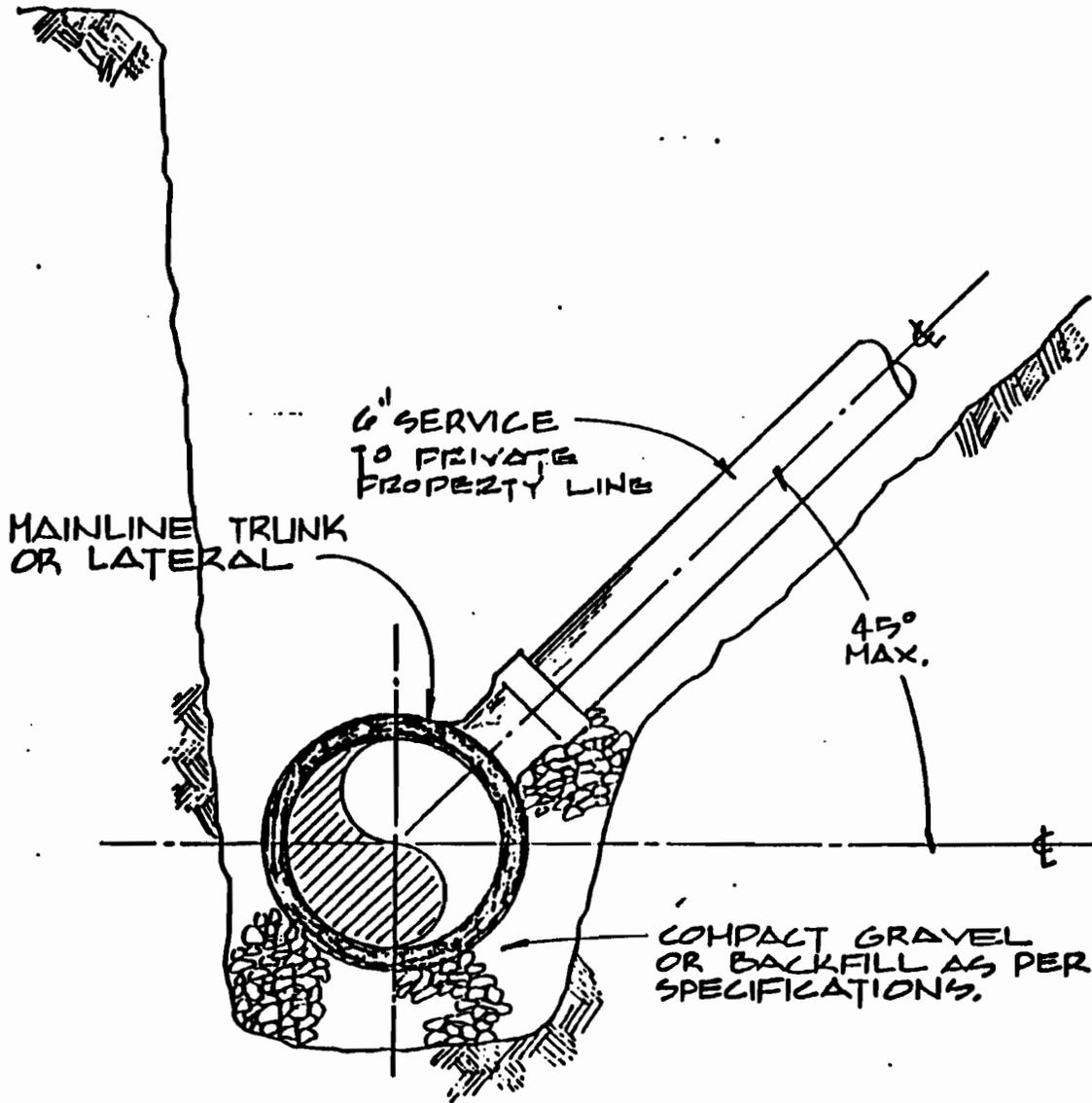
# STANDARD DETAIL

## TYPICAL TRENCH SECTION



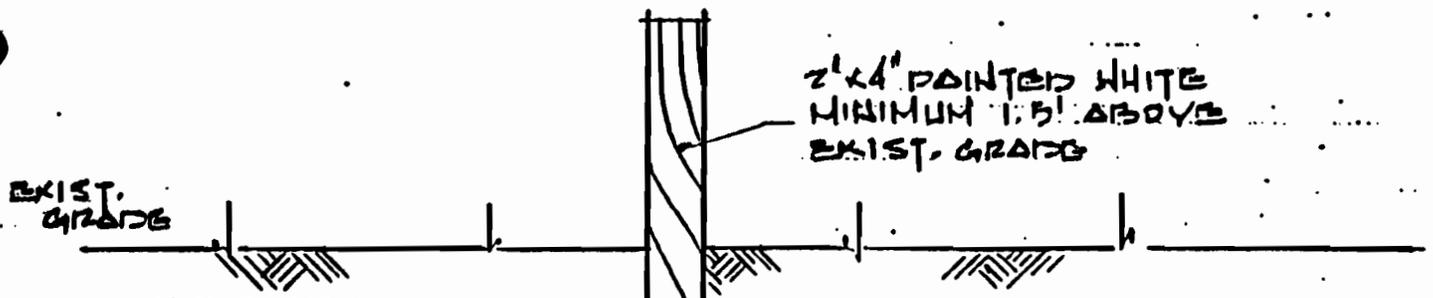
# STANDARD DETAIL

## GRAVITY & PRESSURE MAINS



**STANDARD DETAIL**

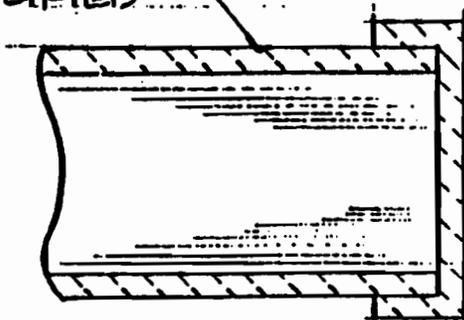
**SERVICE LATERAL**



NOTES: DETAIL INCLUDES  
 MAIN ENDS, TAPS, ETC.  
 BOTH PERMANENT AND  
 TEMPORARY

ALL LOCATIONS OF SERVICE  
 LATERALS IN SUBDIVISIONS  
 SHALL BE NOTED ON THE CURB  
 WITH A MARKED "S" INSTALLED  
 IN THE CURB

PIPE MATERIAL  
 AS SPECIFIED



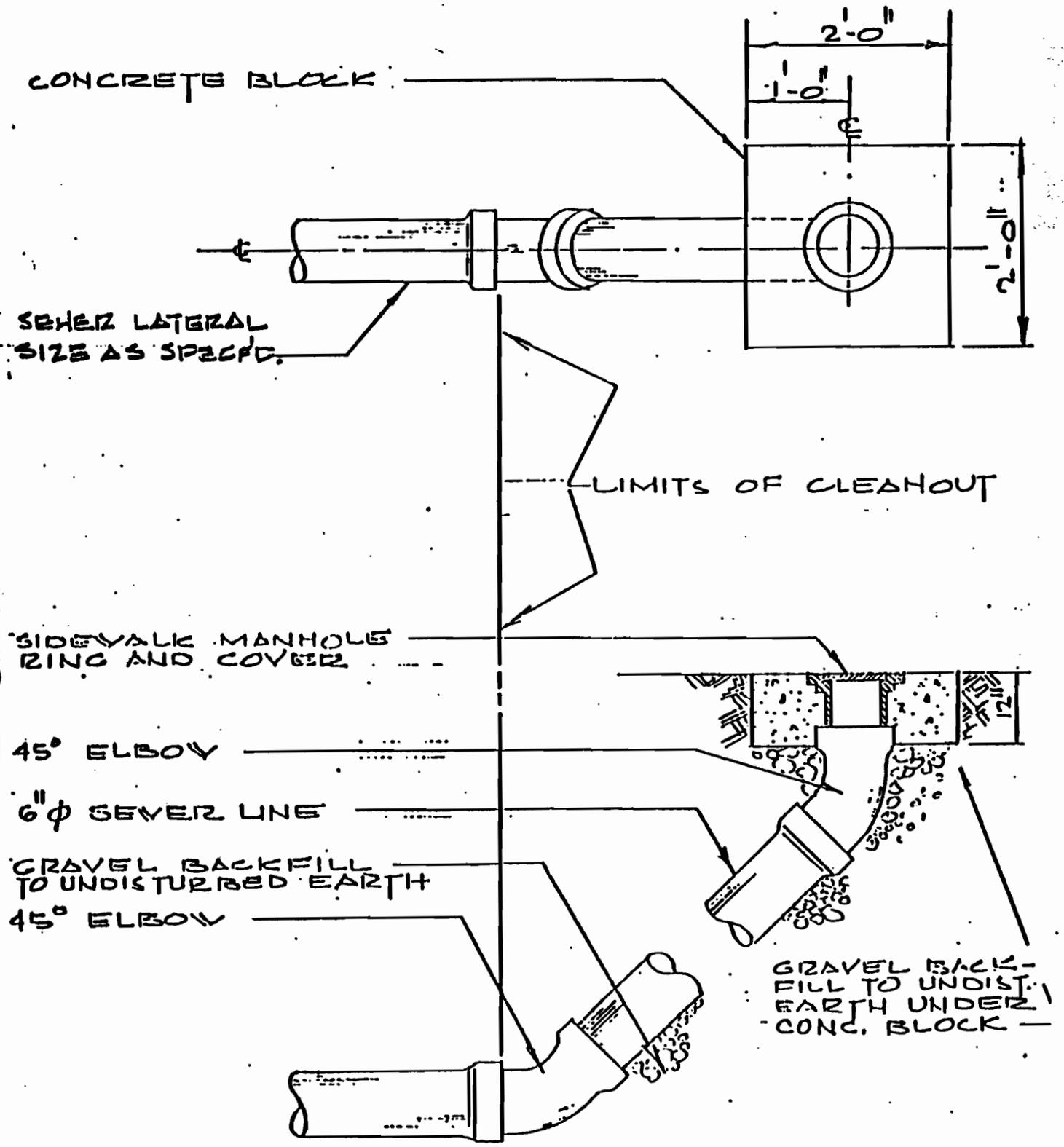
END PLUG SAME  
 MATERIAL AS PIPE

ELEVATION

**STANDARD DETAIL**

**SEWER PLUG**

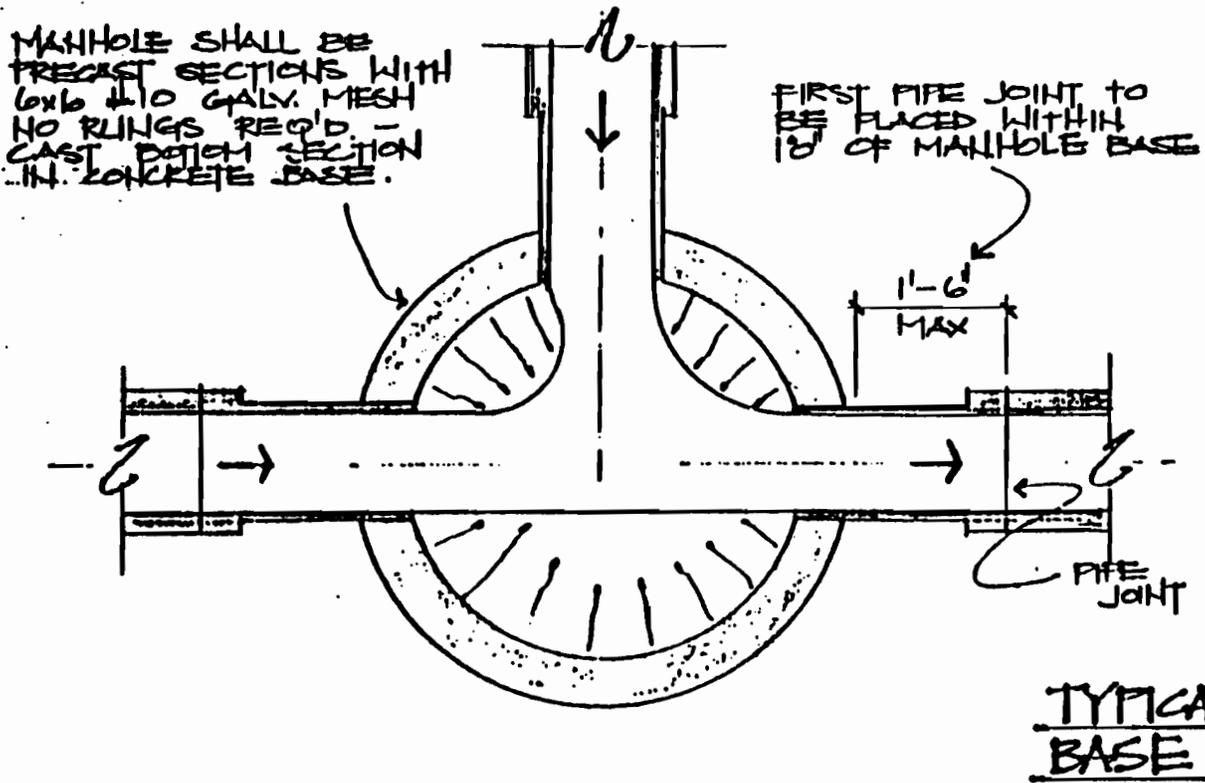
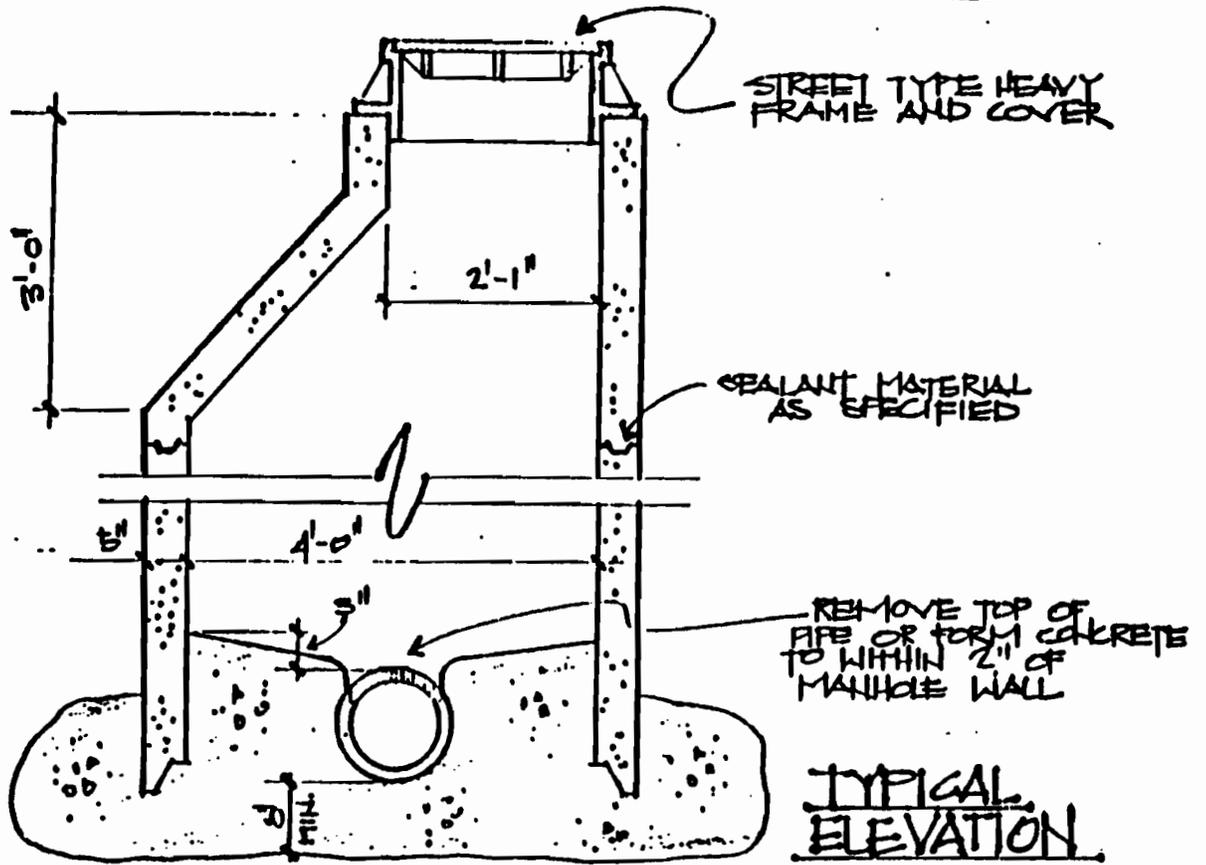
**3-5**



# STANDARD DETAIL

## CLEANOUT, LAMPHOLE

3-6



# STANDARD DETAIL

## STANDARD MANHOLE

3-7

STREET TYPE HEAVY  
FRAME & COVER

PLASTIC GASKET  
MATERIAL @ ALL  
JOINTS.

SLOPE  $3'' \pm$   
PER  $1'-0''$

VARIABLES -  $2'-6''$  MIN.

COMPACTED  
GRAVEL

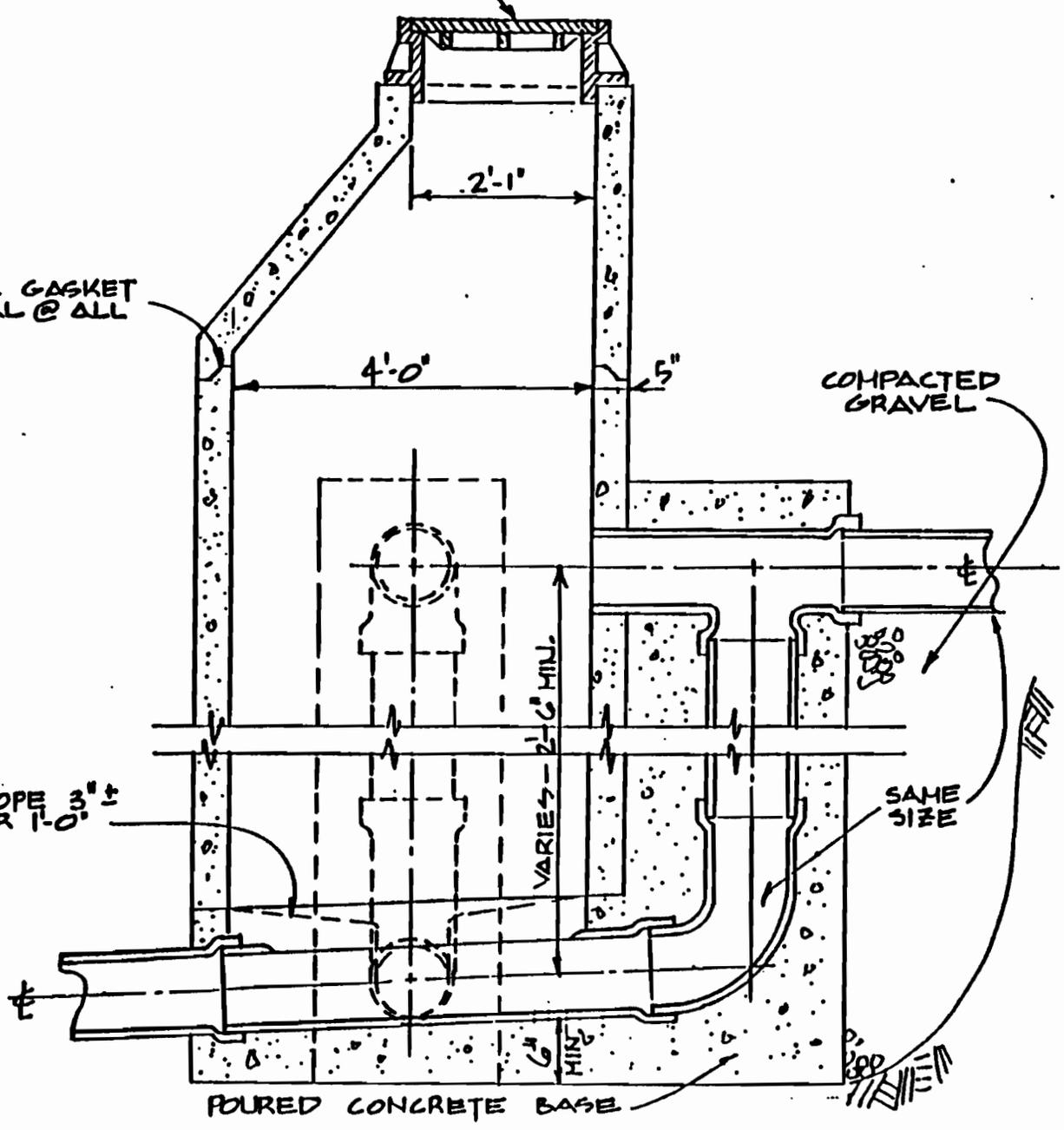
SAME  
SIZE

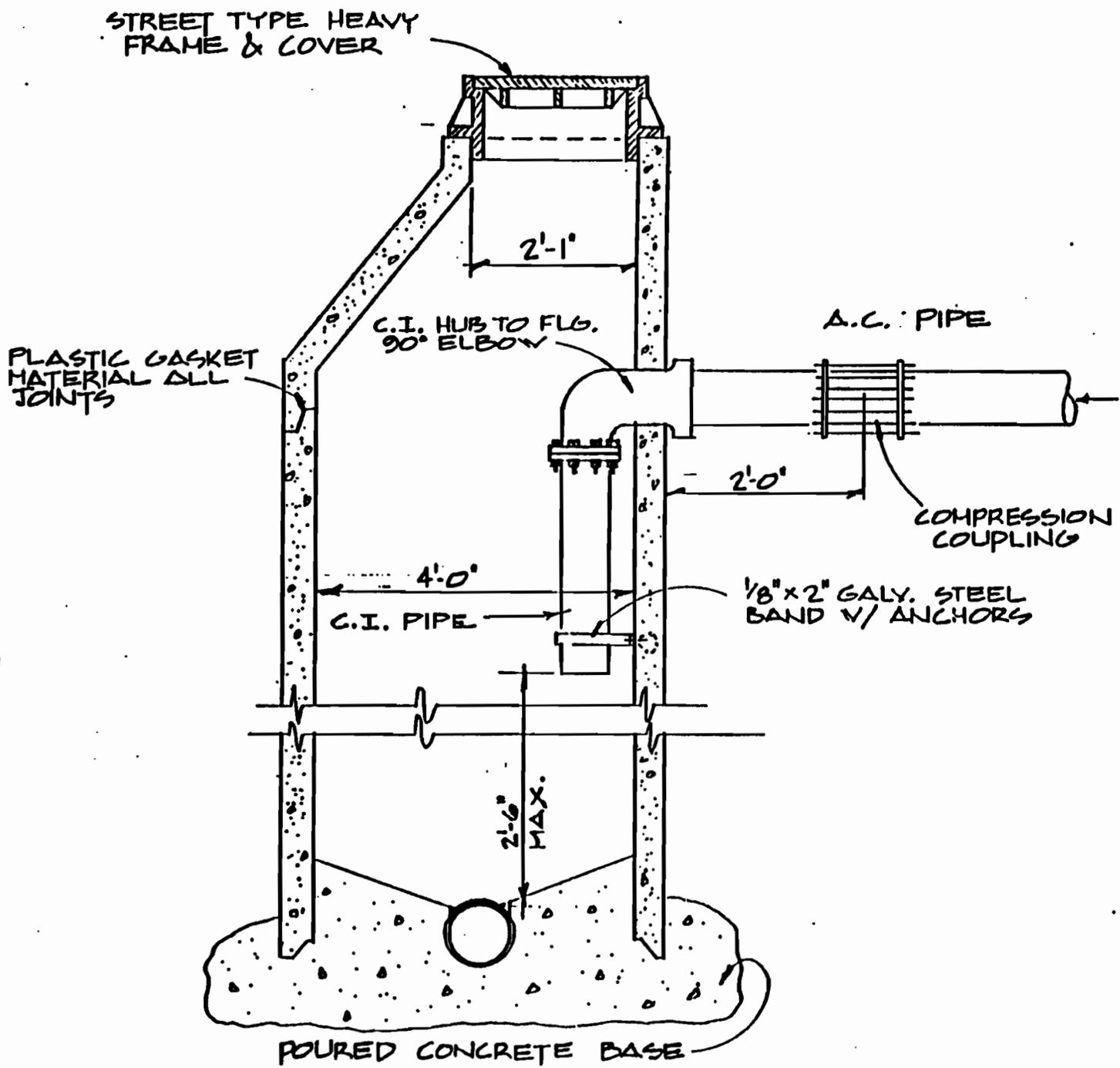
POURED CONCRETE BASE

# STANDARD DETAIL

## STANDARD DROP MANHOLE

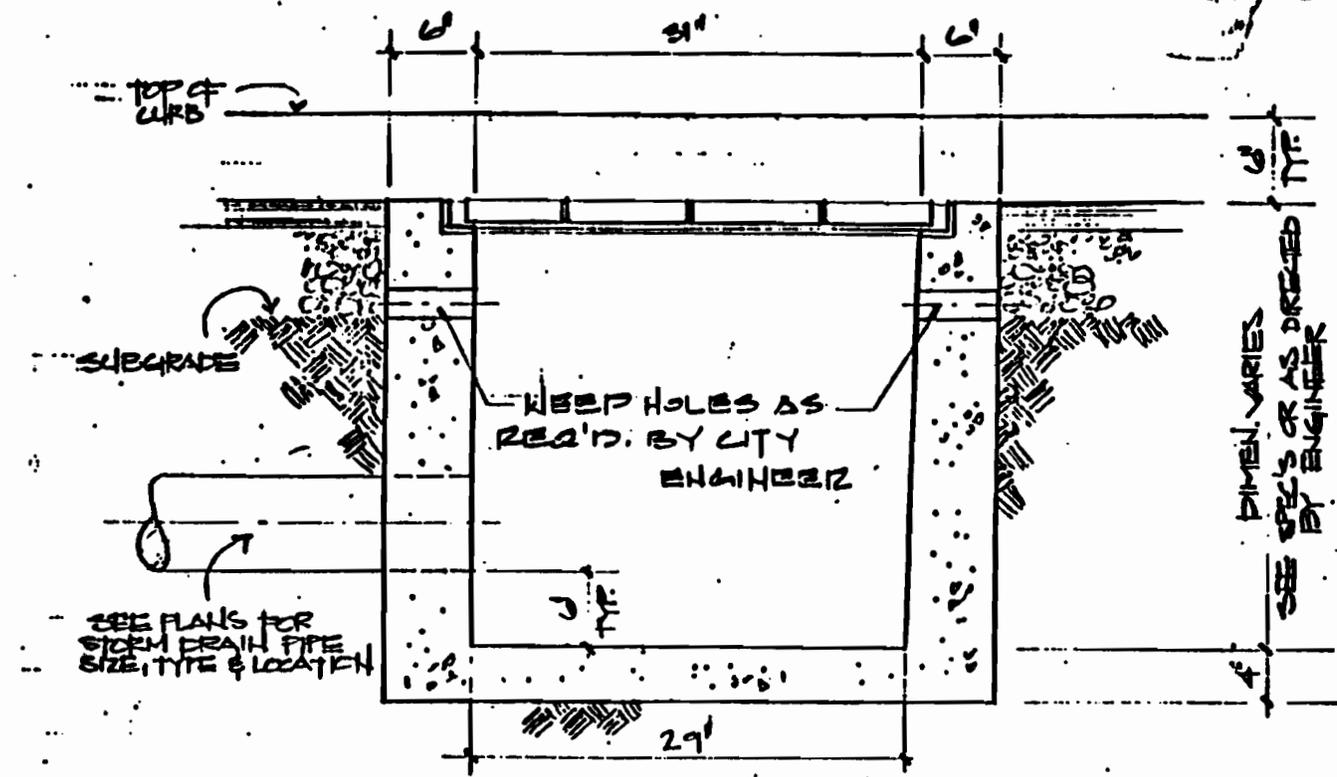
3 - 8



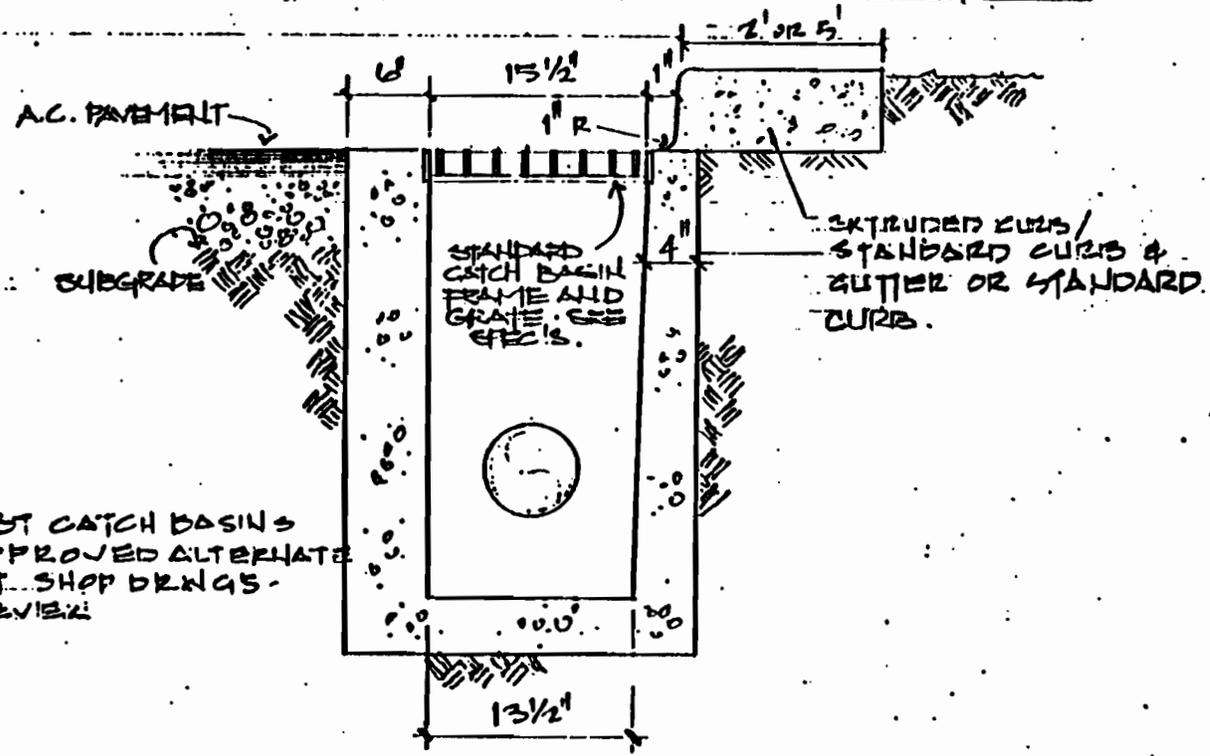


**STANDARD DETAIL**

**SPECIAL DROP MANHOLE**



LONGITUDINAL SECTION



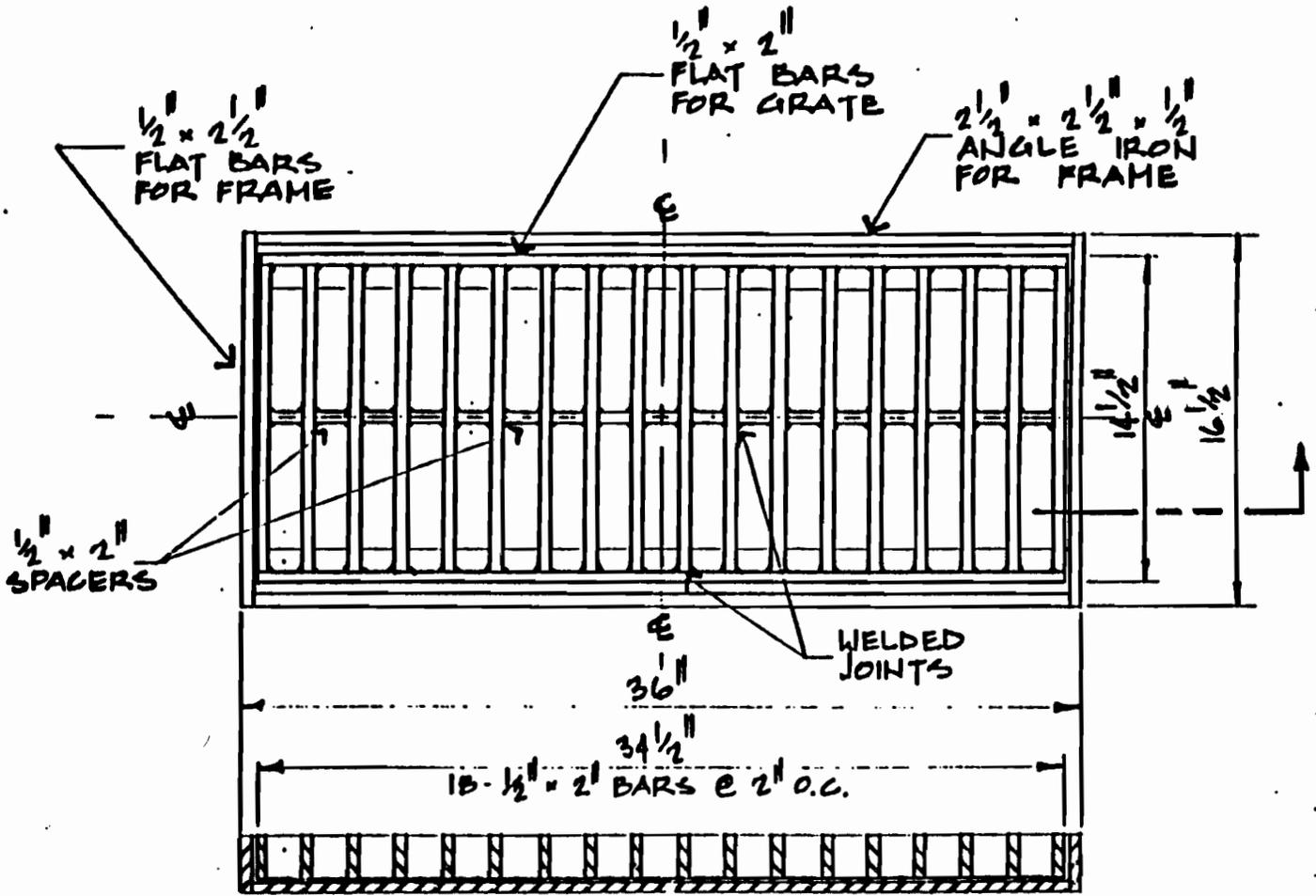
HORIZONTAL SECTION

**STANDARD DETAIL**

**CATCH BASIN**

**3-10**





SECTION

NOTES:

1. METAL FRAME & GRATE SHALL HAVE 2 SHOP COATS OF RED LEAD.

2. MATERIALS:

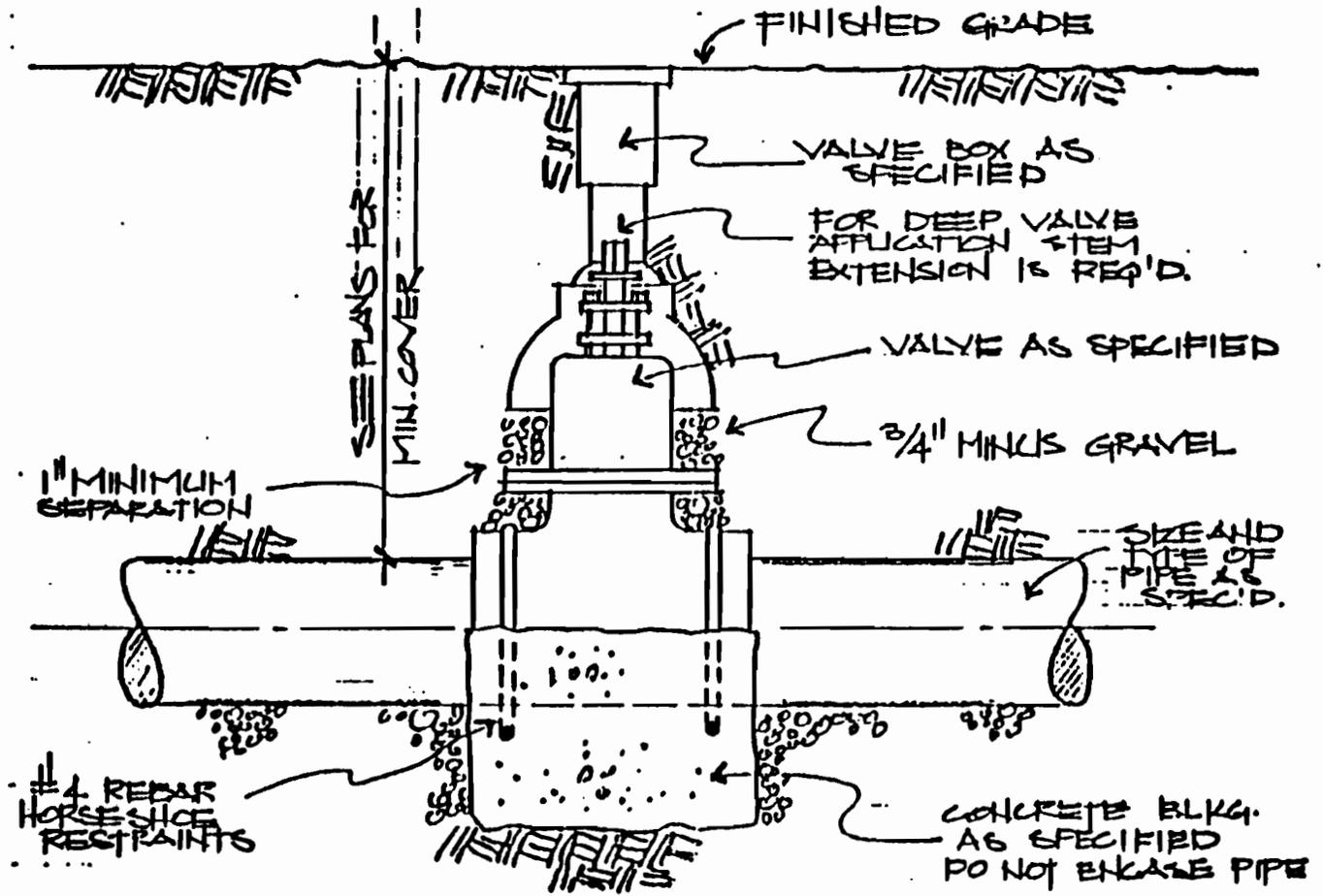
- 2 ANGLES  $\frac{1}{2}'' \times 2\frac{1}{2}'' \times 2\frac{1}{2}'' \times 2'-11''$  LONG
- 2 FLAT BARS  $\frac{1}{2}'' \times 2\frac{1}{2}'' \times 1'-4\frac{1}{2}''$  LONG
- 2 FLAT BARS  $\frac{1}{2}'' \times 2'' \times 2'-10\frac{1}{2}''$  LONG
- 18 FLAT BARS  $\frac{1}{2}'' \times 2'' \times 1'-1\frac{1}{2}''$  LONG
- 17 SPACERS  $\frac{1}{2}'' \times 2'' \times 0'-1\frac{1}{2}''$  LONG

3. THIS GRATE MAY BE USED WHERE BICYCLE TRAFFIC IS PRESENT.

**STANDARD DETAIL**

**CATCH BASIN FRAME & GRATE**

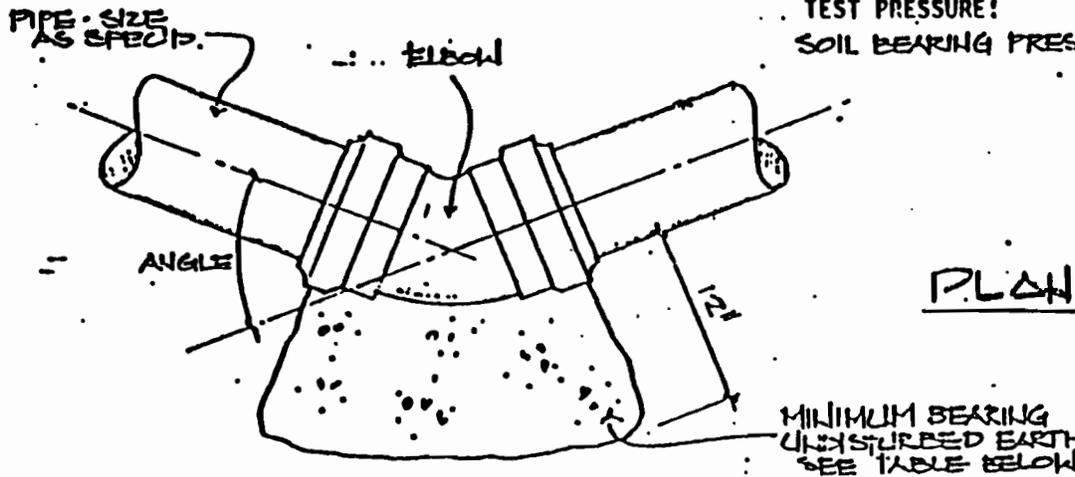
**3-11**



# STANDARD DETAIL

## TYPICAL VALVE AND BOX

PIPE: CLASS 150  
 TEST PRESSURE: 225 P.S.I.  
 SOIL BEARING PRESSURE: 1000 P.S.F.



MINIMUM BEARING  
 UNDISTURBED EARTH  
 SEE TABLE BELOW

PIPE SIZE	ANGLE	THRUST (LBS.)	MINIMUM BEARING AREA (SQ. FT.)
4	90°		5.9
	45°		3.2
6	22-1/2°		1.6
	90°		12.1
	45°		6.6
8	22-1/2°		3.3
	90°		20.9
	45°		11.3
10	22-1/2°		5.7
	90°		34.2
	45°		18.5
12	22-1/2°		9.4
	90°		48.7
	45°		26.4
14	22-1/2°		13.4
	90°		66.1
	45°		35.8
16	22-1/2°		18.1
	90°		85.5
	45°		46.3
	22-1/2°		23.5

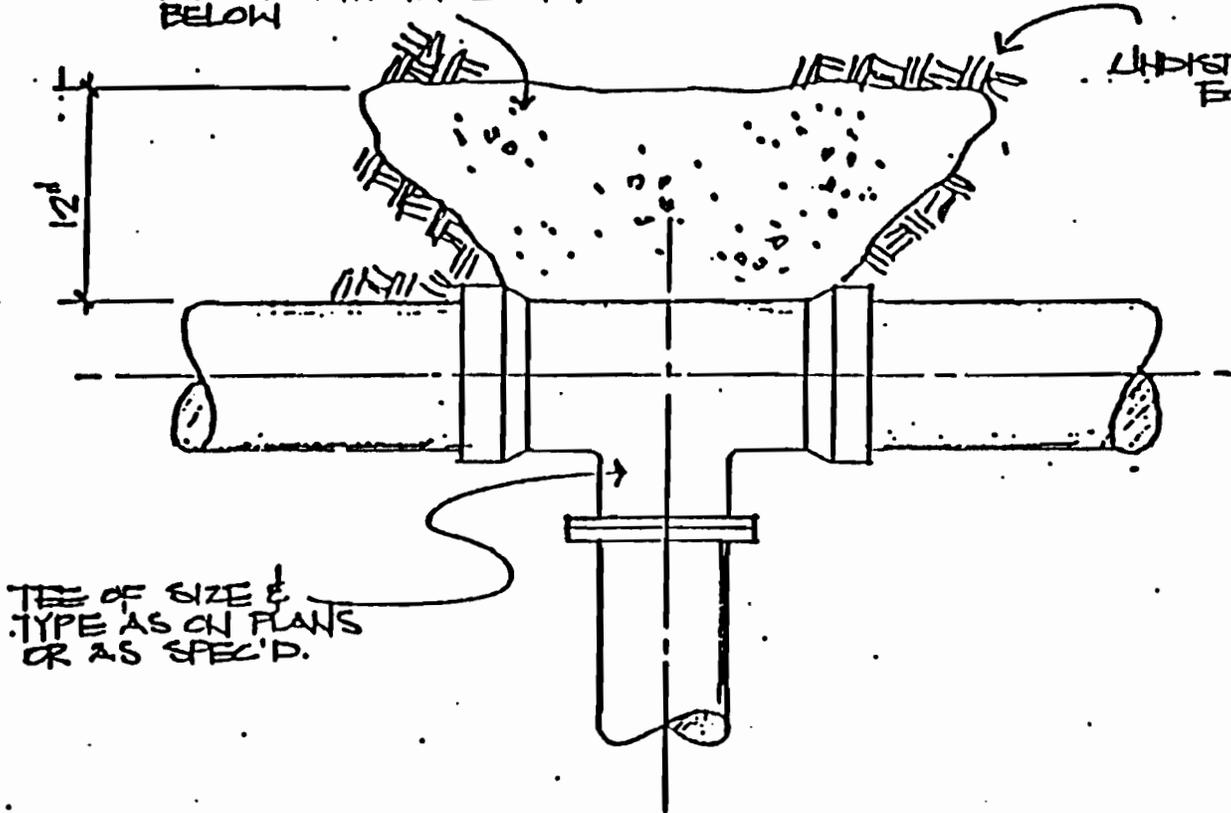
**STANDARD DETAIL**

**HORIZONTAL THRUST BLOCK**

PIPE : CLASS 150  
 TEST PRESSURE: 225 PSI.  
 SOIL BEARING PRESSURE: 1000 PSI.

CONCRETE BLOCKING  
 PROVIDE BEARING AREA  
 AS SHOWN IN CHART  
 BELOW

UNDISTURBED  
 EARTH

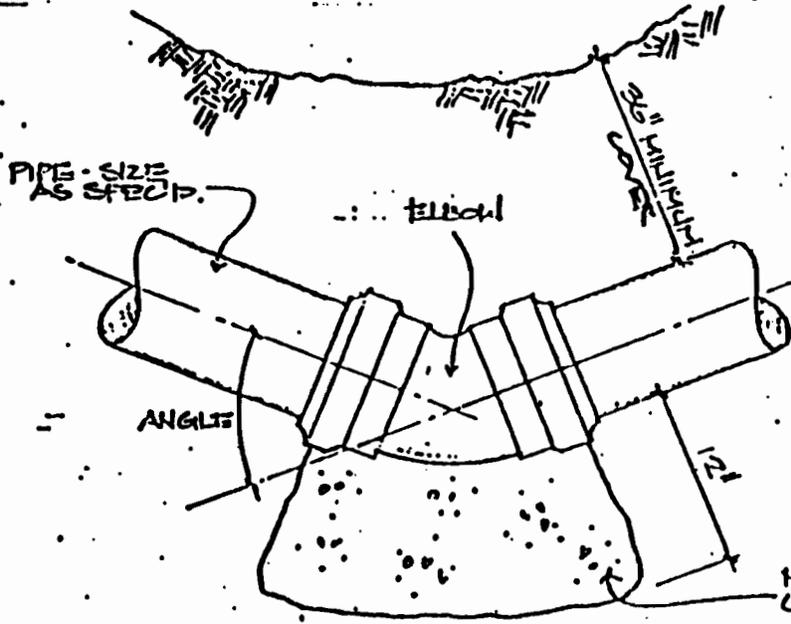


TEE OF SIZE &  
 TYPE AS ON PLANS  
 OR AS SPEC'D.

PIPE SIZE	THRUST (LBS.)	MINIMUM BEARING AREA (SQ. FT.)
2		
4	2,775	2.8
6	5,700	5.7
8	9,870	9.9
10	16,125	16.1
12	22,965	23.0
18	52,449	52.4
20	64,720	64.7
24	93,154	93.2

# STANDARD DETAIL

## TEE BLOCKING



PIPE: CLASS 150  
 TEST PRESSURE: ∴ 225 P.S.I.  
 SOIL BEARING PRESSURE: 1000 P.S.F

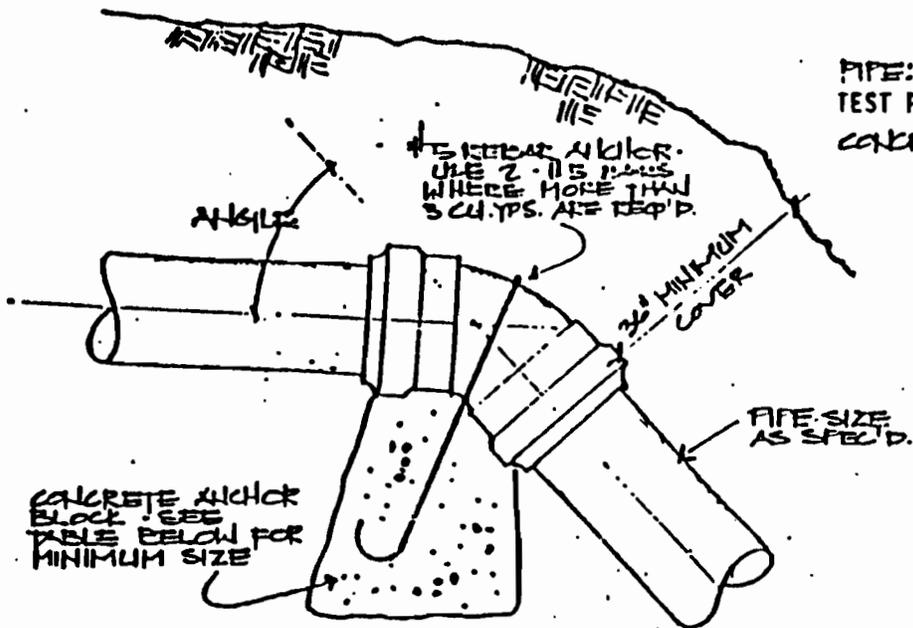
SECTION

MINIMUM BEARING  
 UNDISTURBED EARTH  
 SEE TABLE BELOW

PIPE SIZE	ANGLE	THRUST (LBS.)	MINIMUM BEARING AREA (SQ. FT.)
4	90°	5,900	5.9
	45°	3,200	3.2
	22-1/2°	1,600	1.6
6	90°	12,100	12.1
	45°	6,600	6.6
	22-1/2°	3,300	3.3
8	90°	20,900	20.9
	45°	11,300	11.3
	22-1/2°	5,700	5.7
10	90°	34,200	34.2
	45°	18,500	18.5
	22-1/2°	9,400	9.4
12	90°	48,700	48.7
	45°	26,400	26.4
	22-1/2°	13,400	13.4
14	90°	66,100	66.1
	45°	35,800	35.8
	22-1/2°	18,100	18.1
16	90°	85,500	85.5
	45°	46,300	46.3
	22-1/2°	23,500	23.5

**STANDARD DETAIL**

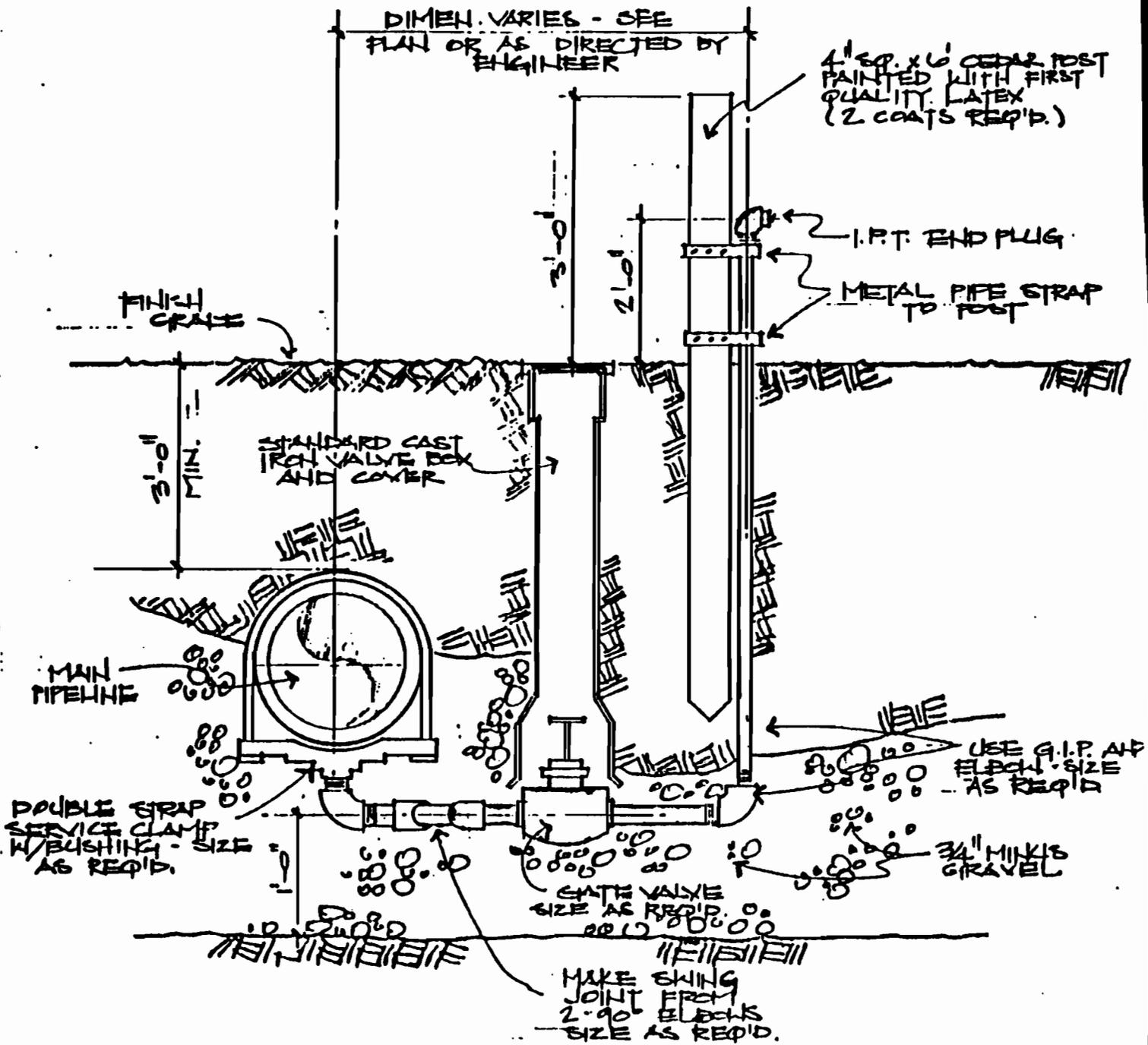
**VERTICAL THRUST BLOCK**



PIPE SIZE	ANGLE	THRUST (LBS.)	MINIMUM CONCRETE (CY.)
4	90°		1.5
	45°		0.8
	22-1/2°		0.4
6	90°		3.0
	45°		1.6
	22-1/2°		0.8
8	90°		5.2
	45°		2.8
	22-1/2°		1.4
10	90°		8.4
	45°		4.6
	22-1/2°		2.3
12	90°		12.0
	45°		6.5
	22-1/2°		3.3
14	90°		16.3
	45°		8.8
	22-1/2°		4.5
16	90°		21.1
	45°		11.4
	22-1/2°		5.8

# STANDARD DETAIL

## ANCHOR BLOCK



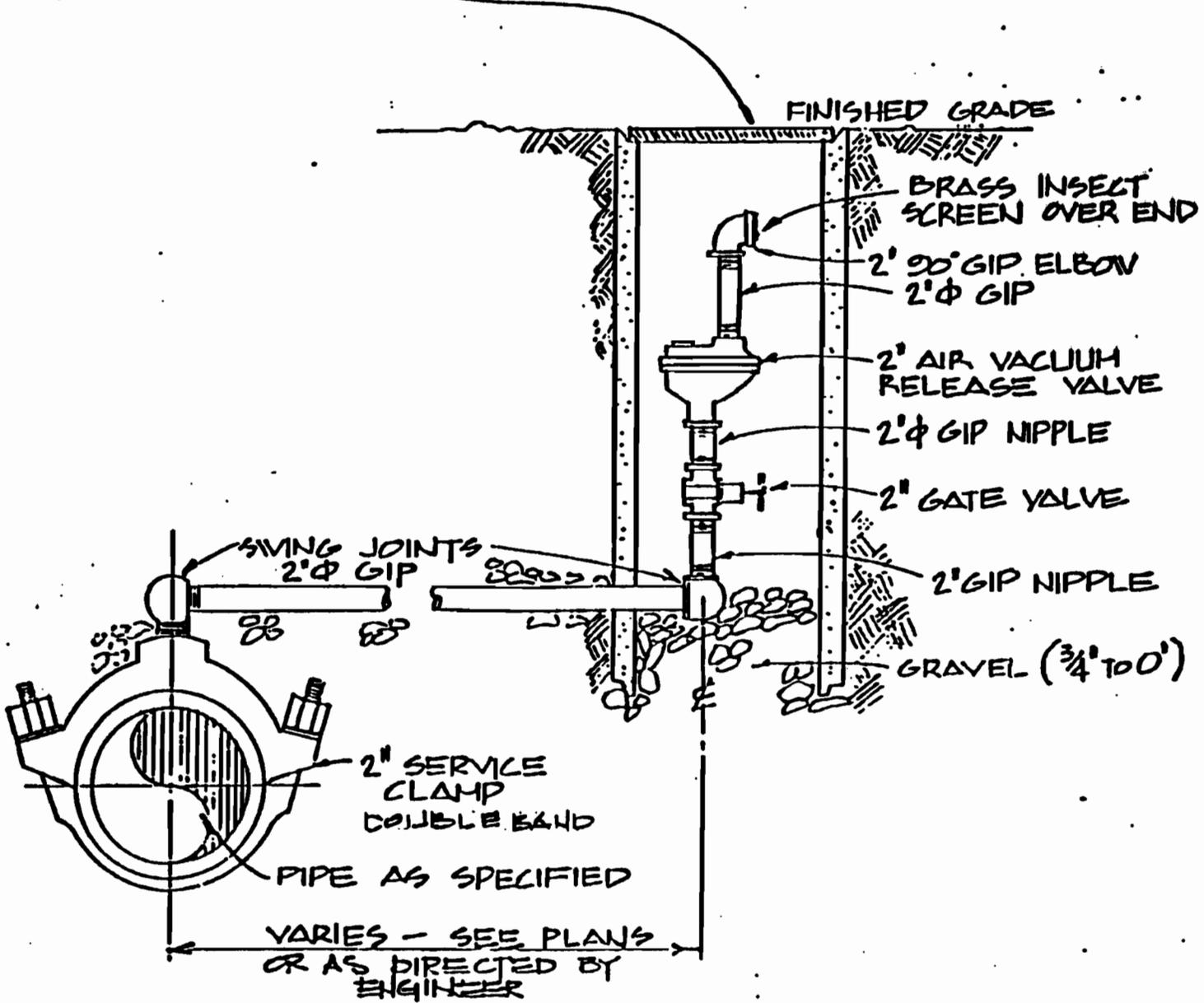
\* ANY DEVIATIONS FROM STANDARD MUST BE APPROVED BY THE ENGINEER

# STANDARD DETAIL

## BLOW OFF VALVE

3-17

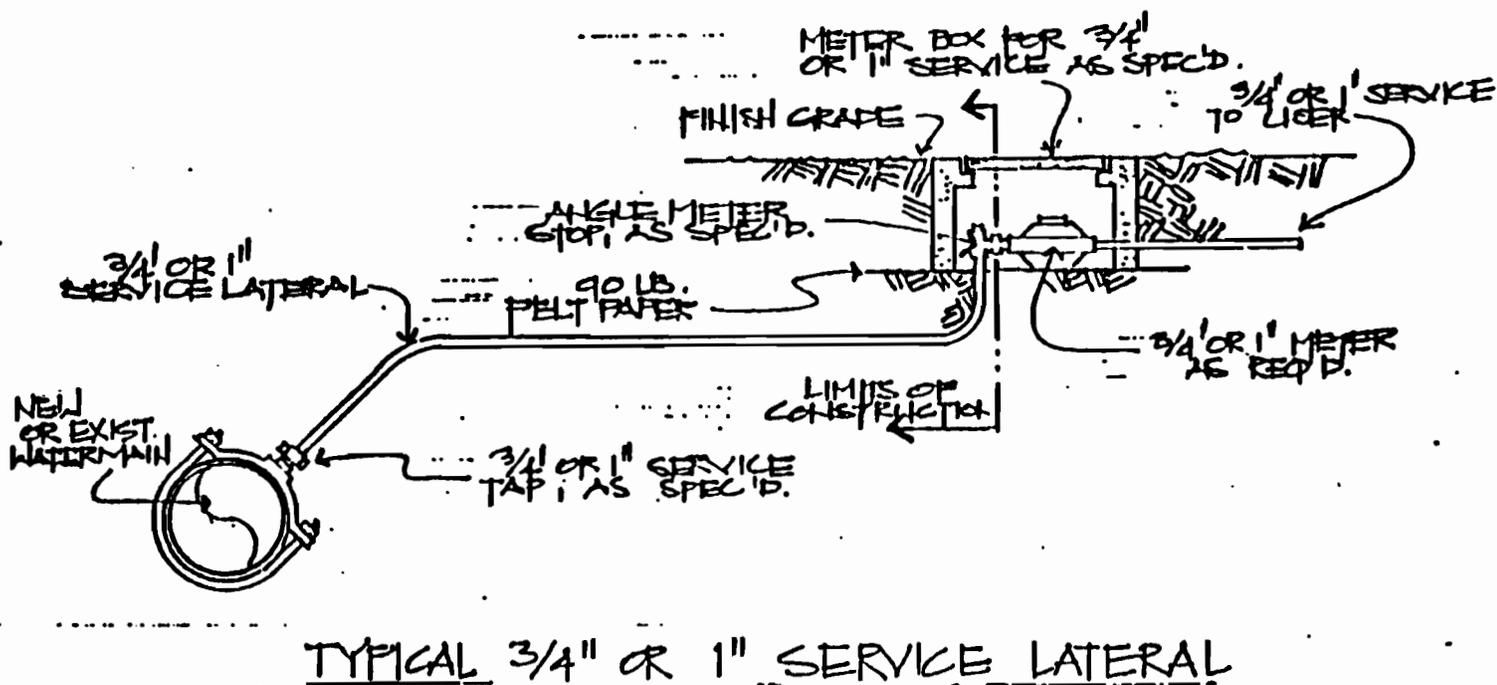
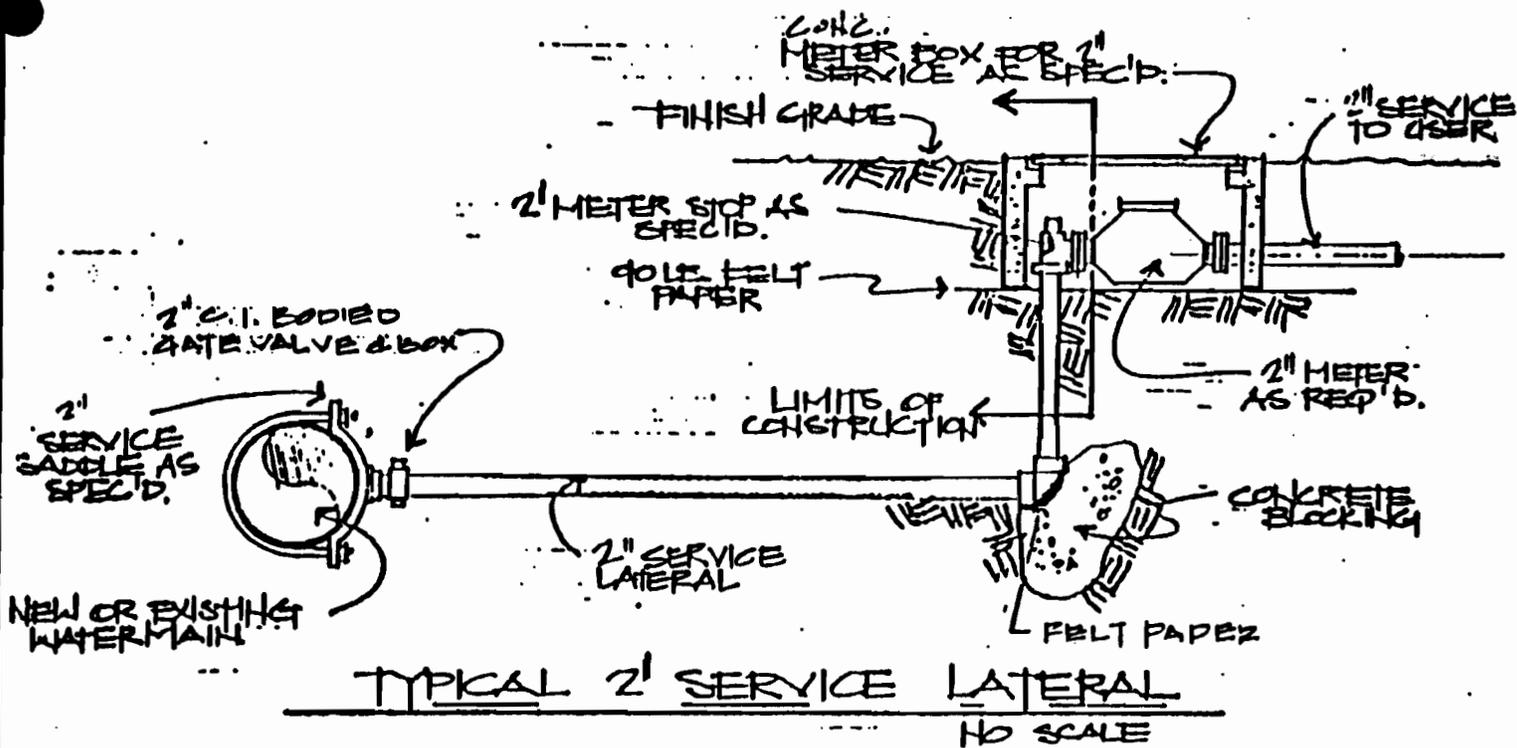
SHALLOW TYPE CAST IRON MANHOLE  
COVER & FRAME: GROUT TO 24"  $\phi$   
T & G CONCRETE PIPE.



ALL AIR VACUUM ASSEMBLIES SHALL HAVE  
POSITIVE DRAINAGE PROVIDED AS APPROVED  
BY THE ENGINEER

# STANDARD DETAIL

## AIR VAC. RELEASE VALVE



**STANDARD DETAIL**

**SERVICE LATERALS**

**3-19**

**NOTE:** SEE PLANS. HYDRANT SHOE AND GATE VALVE SHALL NOT BE CONNECTED DIRECTLY TO HYDRANT

RAH

2'-0"

DIMEN. VARIES

SEE PLANS OR AS SPECIFIED BY ENGINEER

FIRE HYDRANT AS SPECIFIED

LIMITS OF FIRE HYDRANT

FINISH GRADE

1/2" GRAVEL OR BRICKEN ROCK DRAIN

VALVE BOX

LENGTH VARIES

6" PVC SECTION

6" H.I. PIPE GATE VALVE

3'-0" MIN. CLEAR.

2" MIN. SPEC. TEE

M.J. GATE

PIPE BEDDING MATERIAL AS SPECIFIED

2" SQ. POLYED CONG. THRUST BLOCKING

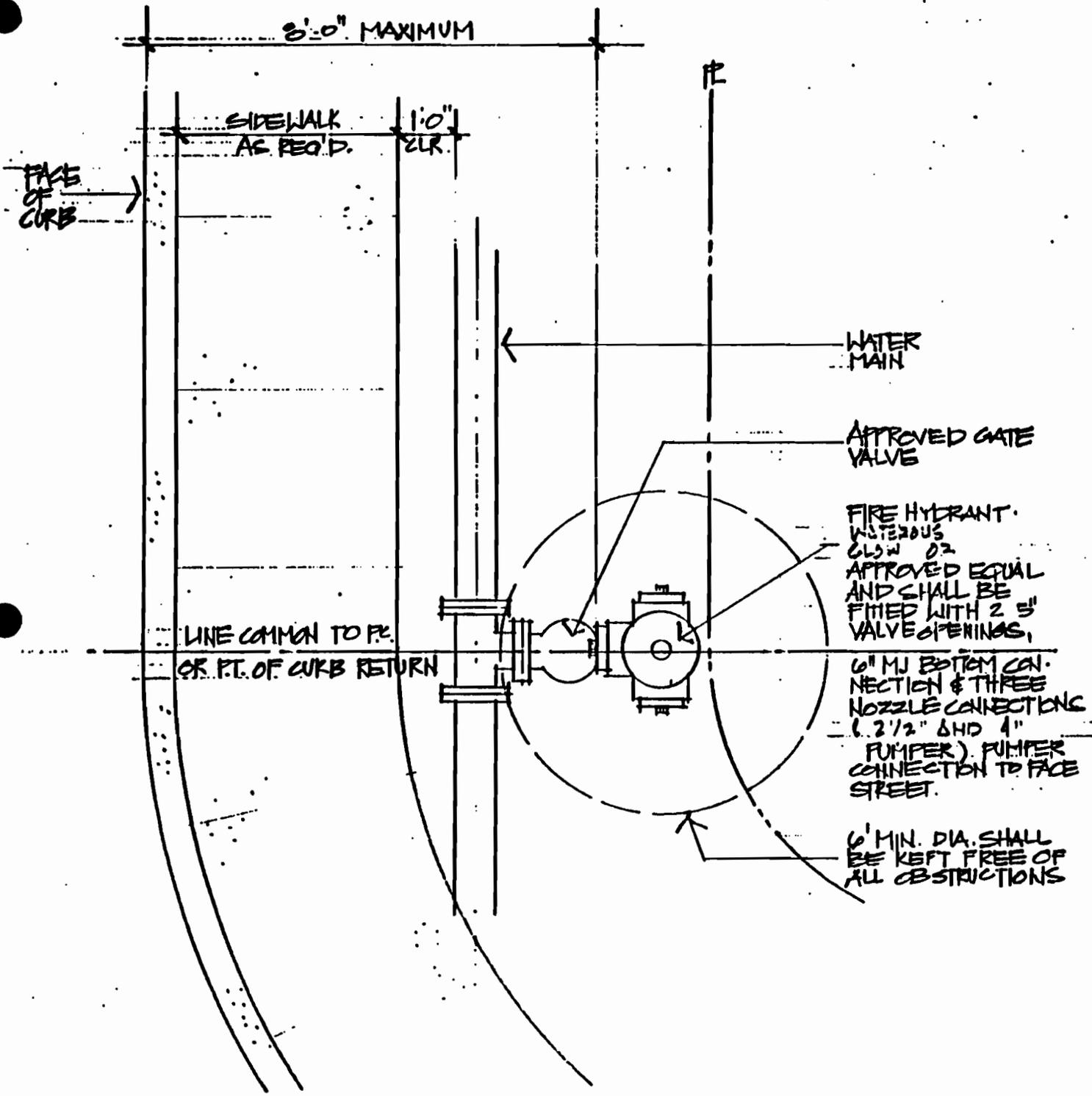
POLYED CONG. THRUST BLOCKING

8" SOLID CONG. BLOCK

# STANDARD DETAIL

## FIRE HYDRANT

3-20

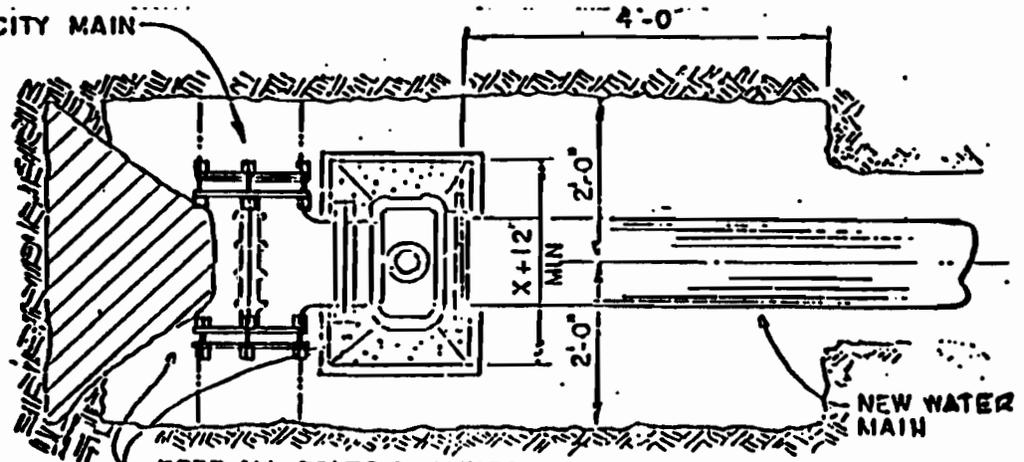


# STANDARD DETAIL

## FIRE HYDRANT LOCATION

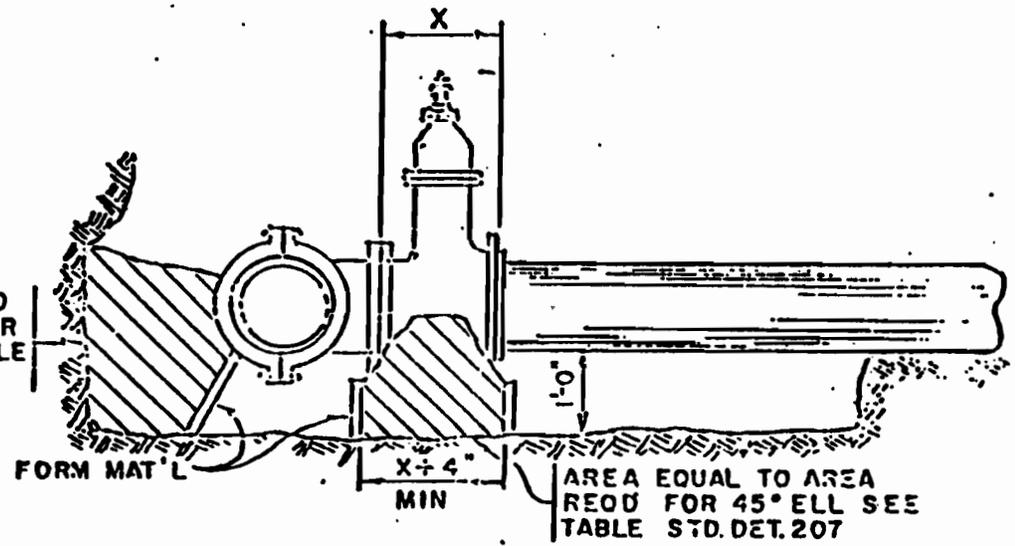
3-21

EXISTING CITY MAIN



KEEP ALL BOLTS & JOINTS FREE OF CONCRETE

AREA EQUAL TO AREA REQD FOR TEE - SEE TABLE STD.DET. 207

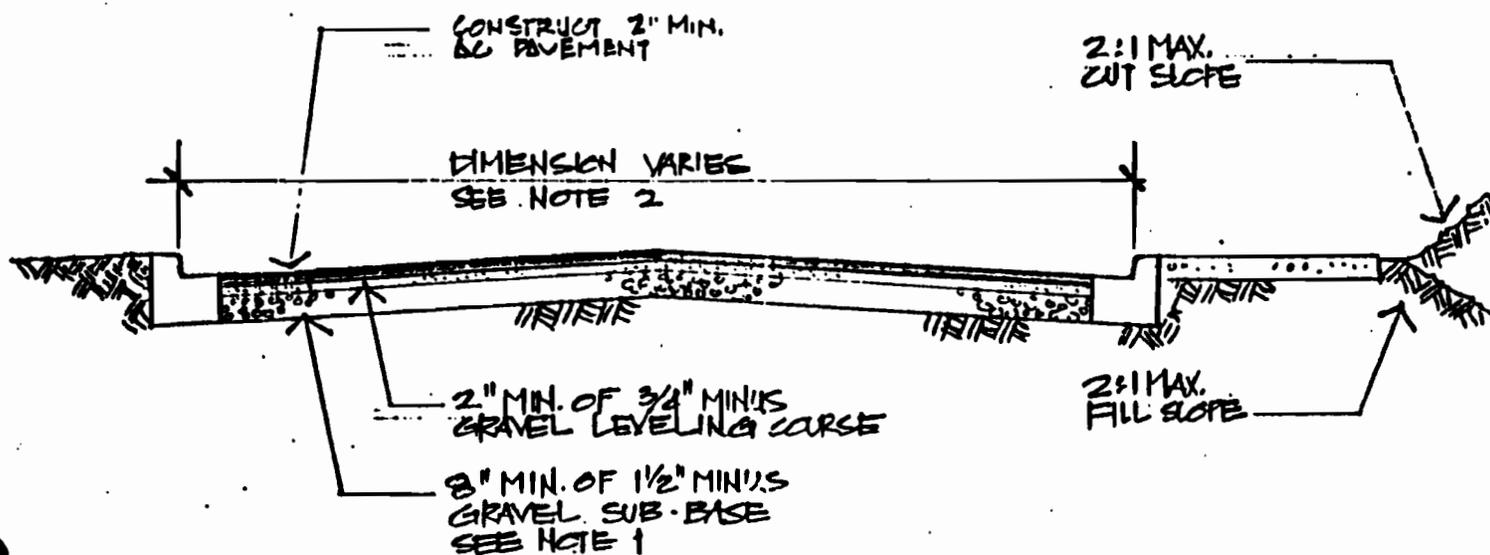


AREA EQUAL TO AREA REQD FOR 45° ELL SEE TABLE STD.DET.207

NOTE: ALL PHASES OF INSTALLATION SHALL BE INSPECTED AND APPROVED BY CITY ENGR.

# STANDARD DETAIL

## TAPPING SLEEVE & VALVE

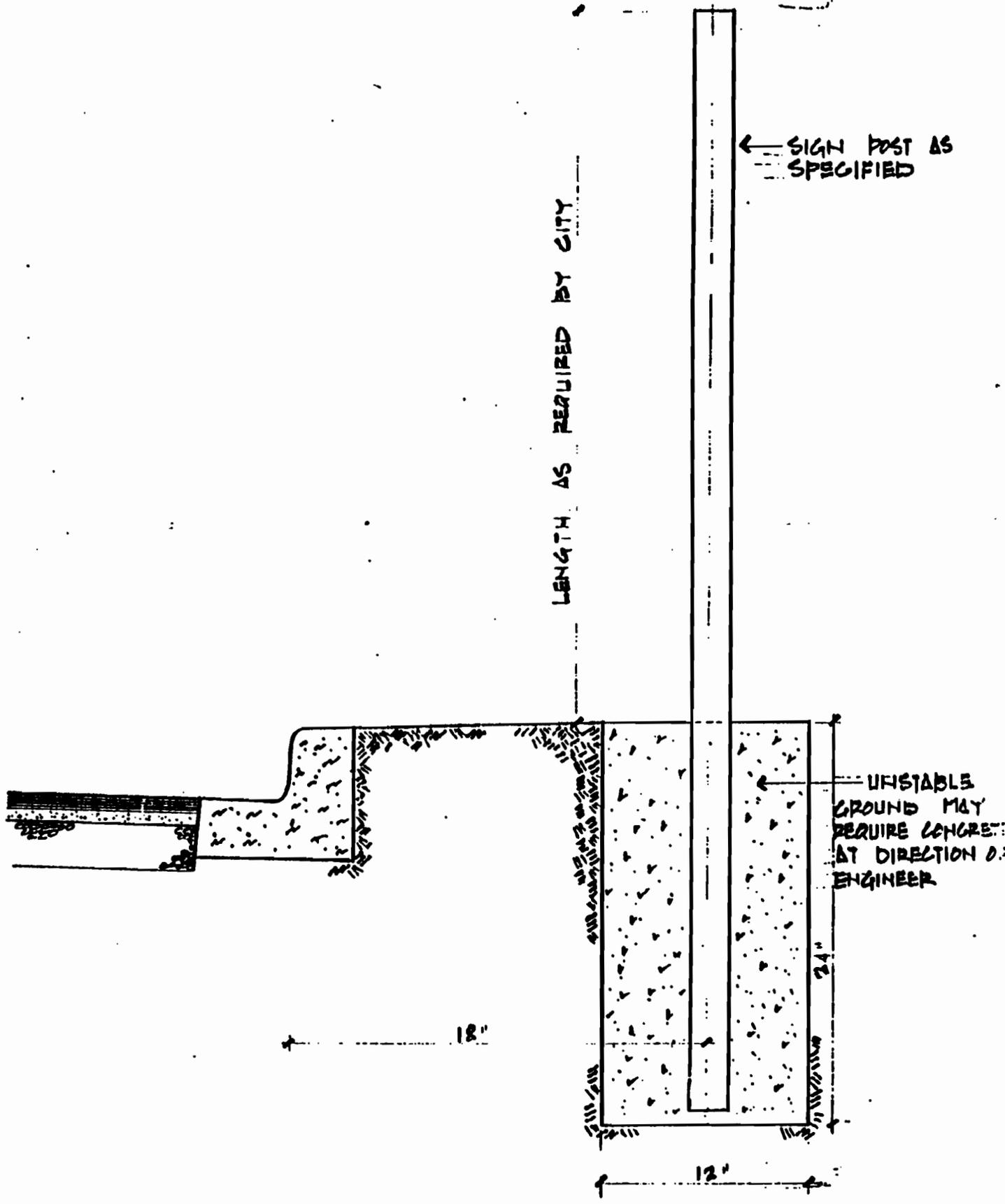


- NOTES:
- 1) ACTUAL BASE REQUIREMENTS TO BE DETERMINED BY ENG'R. FOR PARTICULAR PROJECT.
  - 2) WIDTH TO BE IN ACCORDANCE WITH "CITY OF BROOKINGS SUBDIVISION ORDINANCE"

**STANDARD DETAIL**

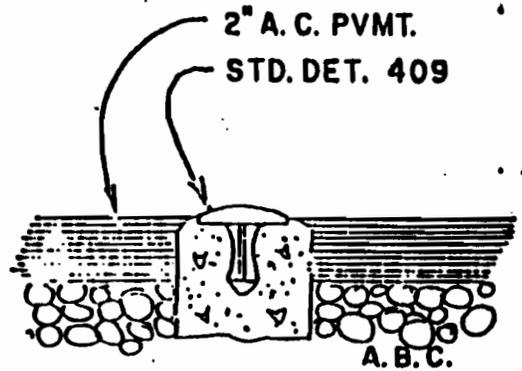
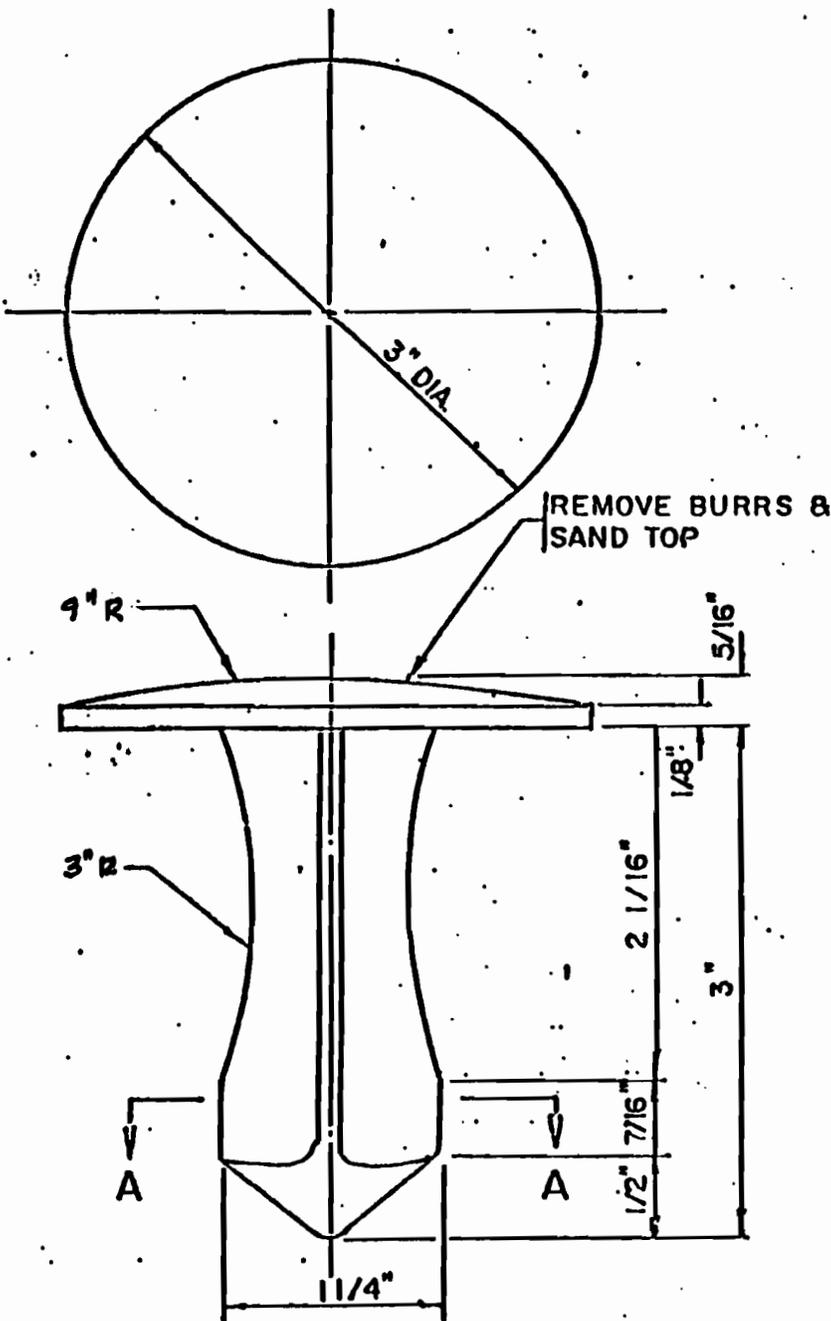
**TYPICAL STREET SECTION**

**3 - 23**



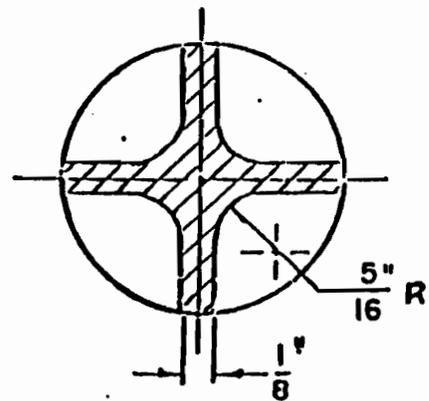
# STANDARD DETAIL

## SIGN POST INSTALLATION



DETAIL A

MONUMENT SET IN 30" CONC. .  
 POST W/ BRASS CAP SET  
 FLUSH W/ TOP OF PAVEMENT.  
 THIS DETAIL SHALL APPLY  
 AT STREET INTERSECTIONS,  
 AS SUBDIVISION MONUMENTS  
 AND 1/16 CORNERS



SECTION A-A

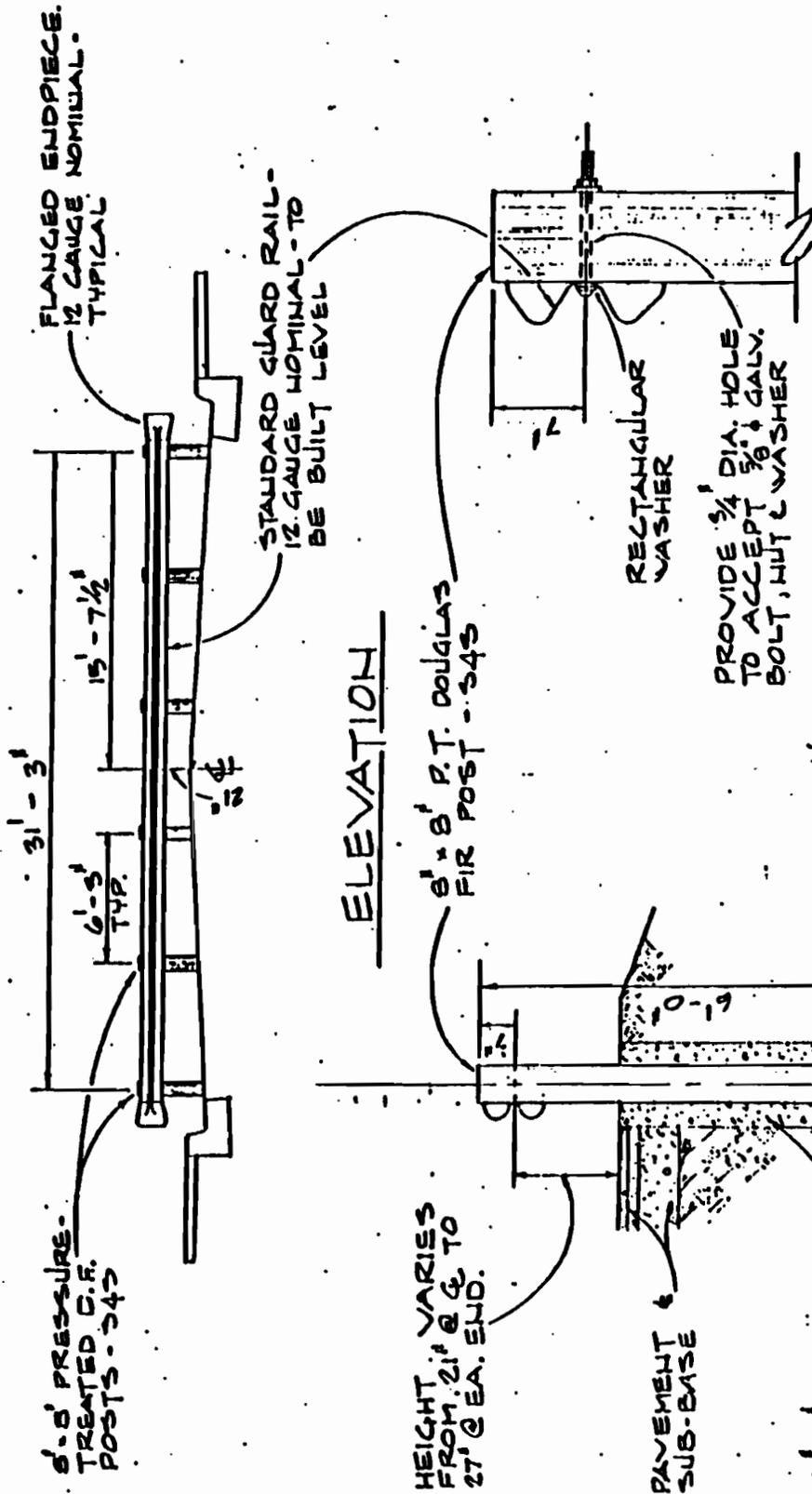
NOTE:

MATERIAL TO BE BRASS  
 OR BRONZE

**STANDARD DETAIL**

**SURVEY MONUMENT**

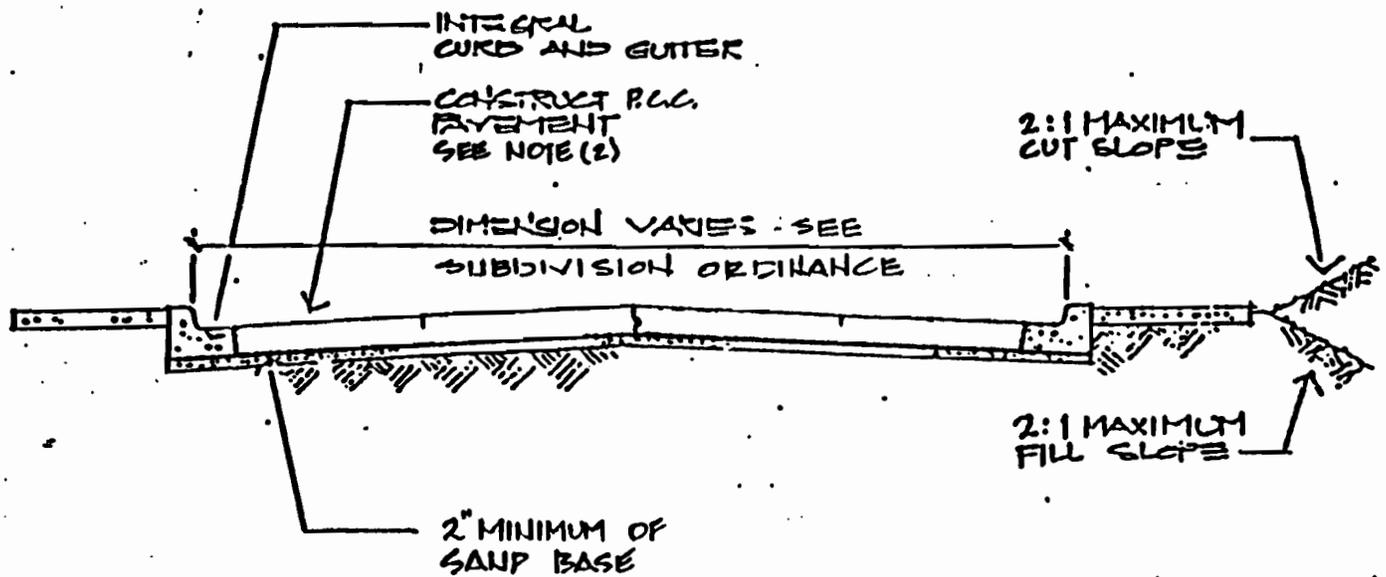
**3-25**



ASSEMBLY DETAIL

# STANDARD DETAIL

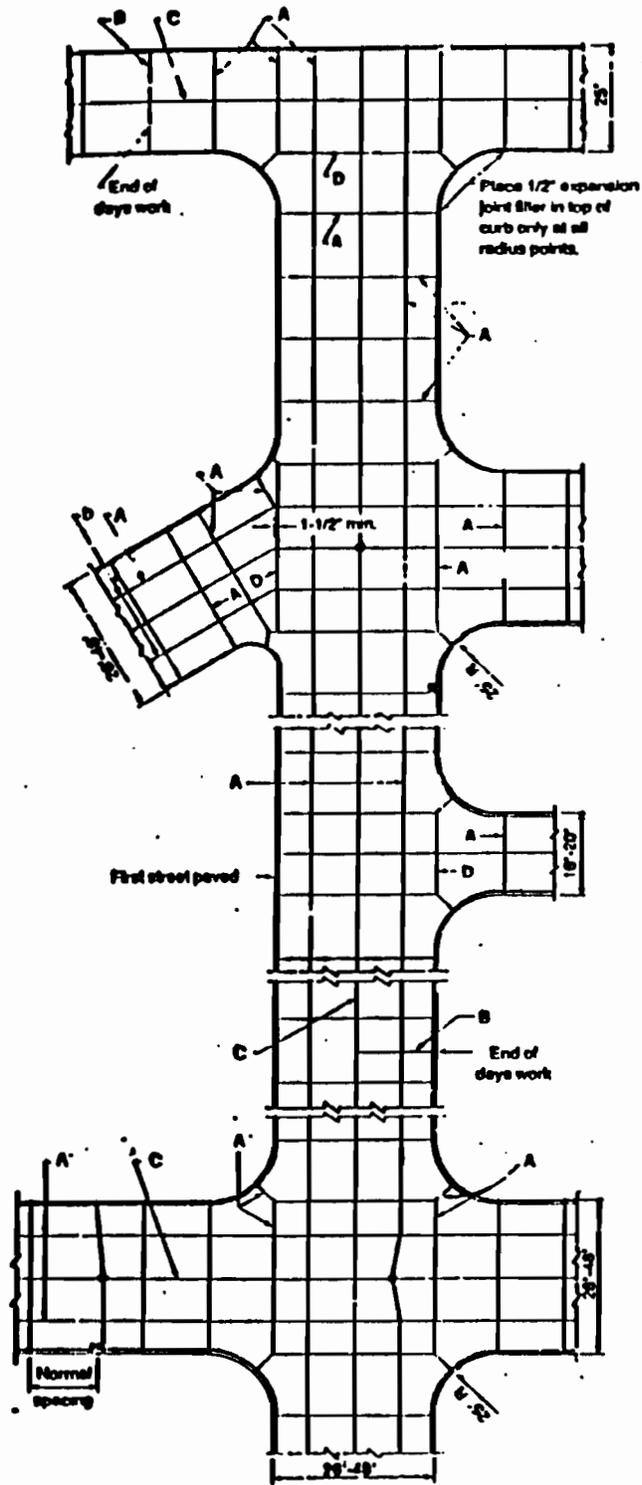
## GUARD RAIL BARRIER



**STANDARD DETAIL**

**TYP. CONC. STREET SECTION**

**3 - 27**

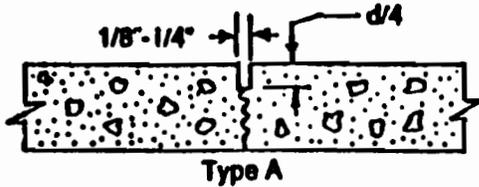


Pavement joints

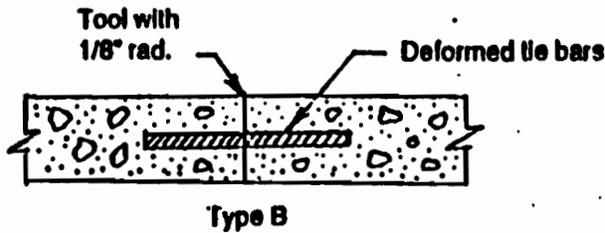
# STANDARD DETAIL

## CONC. STREET PLAN

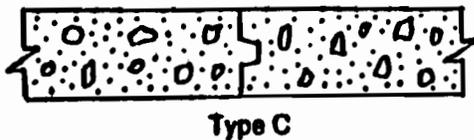
### Control (Contraction) Joints



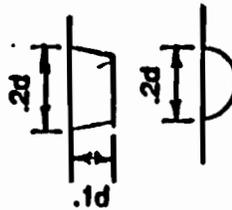
**Type A**  
Transverse Contraction or Longitudinal Joint,  
Sawed or Pre-molded:



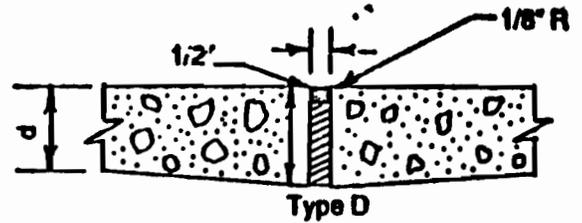
**Type B**  
Tied Longitudinal Construction Joint

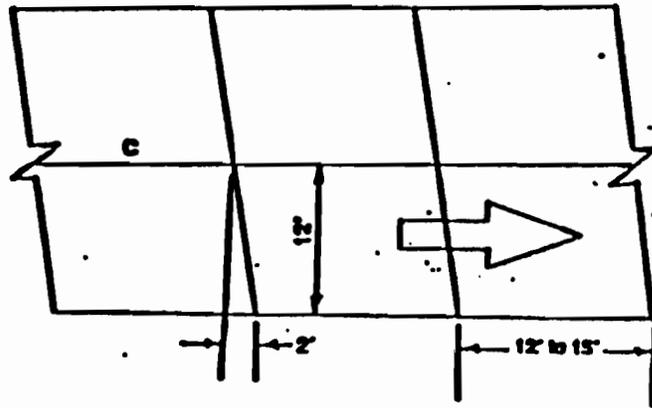


**Type C**  
Longitudinal Keyway Construction Joint  
for pavement 6 inches or greater. Straight  
butt type joint used for 5 inch  
pavements or less. Centerline joint for  
half width street construction.

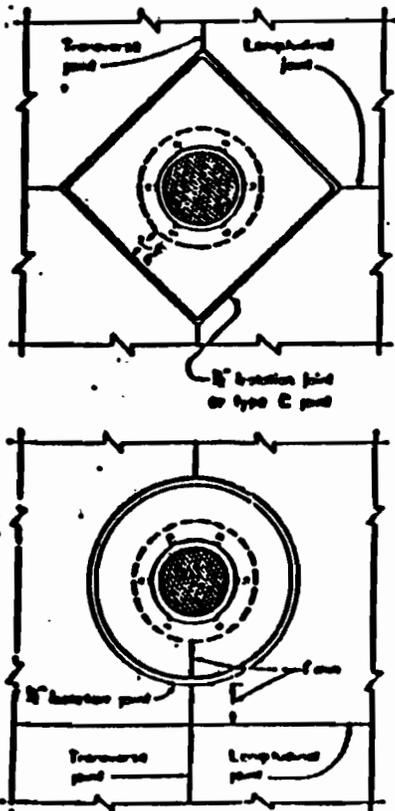


### Isolation (Expansion) Joints

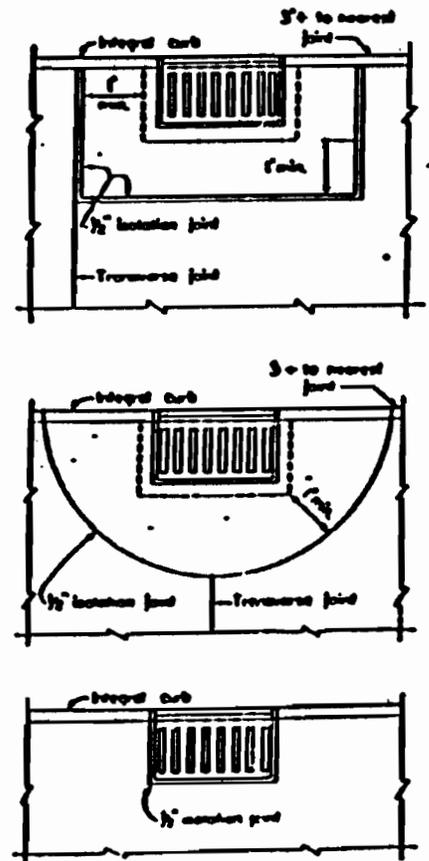




**Manhole covers**



**Drainage inlets**



**STANDARD DETAIL**

**JOINT PLANS**

Division 4  
Concrete

**DIVISION 4 - CONCRETE**

\*\*\*\*\*

**4A. GENERAL**

01. Division 2 of the Special Specifications is a part of this Division.
02. Published specifications, standards, tests or recommended methods of trade, industry or governmental organizations apply to work of this section, where cited by abbreviation noted.
  - a. Uniform Building Code, 1973 Edition. (UBC)
  - b. American Society for Testing and Materials, 1973 Edition. (ASTM)
  - c. American Concrete Institute. (ACI)
03. Work under this item includes, but is not limited to:
  - a. Furnishing, mixing, forming, placing, finishing and curing all concrete required for construction of curbs and gutters, catch basins and sidewalks.
  - b. Furnishing and installing all required reinforcing steel.

**4B. FORMWORK**

01. **General.**
  - a. **Formwork.** Conform to ACI 347 unless otherwise noted.
    - (01) Shall prevent leakage or washing out of cement mortar.
    - (02) Shall resist spread, shifting, settling and deflection greater than 1/8 inch between supports after concrete placement.
    - (03) Shall reproduce accurately required lines, grades, and surfaces with tolerances specified.

**Division 4  
Concrete**

**b. Shoring.**

(01) Shall carry vertical and lateral loads to ground either independently or in combination with portions of structure which have attained adequate strength.

(02) Shall transmit loads from successive parts of structure directly through falsework without creating bending or shearing stresses in concrete.

(03) Shall withstand wind and earthquake forces.

**c. Safety.** Contractor shall be responsible for adequate strength and safety of all form work including falsework and shoring.

**02. Materials.**

**a. Plywood Forms.** DEPA exterior "Plyform", or approved, Class I or Class II thickness required to support concrete at rate poured.

**b. Steel Forms.** Approved by local public agency or the engineer may be used in lieu of wood, at contractor's option.

**c. Chamfers.** Surfaced lumber WCLIB construction grade or better.

**d. Wood Framing.** WCLIB standard grade or better, Douglas fir.

**e. Accessory Items.**

**(01) General.**

(a) Include all devices necessary for proper placing, spacing, supporting and reinforcing steel in place.

(b) Accessories which will be exposed in the finished concrete surface shall be:

- (1) Galvanized.
- (2) Stainless Steel.
- (3) Concrete.
- (4) Plastic.
- (5) Aluminum.
- (6) Or approved.

**Division 4  
Concrete**

**(02) Form Ties.**

- (a) Richmond "Snap Ties".
- (b) Dayton "Sure Grip".
- (c) Or approved type recommended by manufacturer for conditions of installation. No metal allowed within one inch of surface after tie removal.

**(03) Reinforcing Bar Supports.**

- (a) Slabs exposed to view - above grade - Dayton "Sure Grip" stainless steel reinforcing bar supports, or approved.
- (b) Slabs on grade, masonry or concrete supports.

**(04) Premolded Expansion Joint.**

- (a) Material, bituminous type.
- (b) Manufacturer. Carey "Elastite" 1/2 inch thick or approved.

**(05) Sealing Compound. "Careylastic" or approved.**

- f. **Form Coatings.** Form sealer, nonstaining, nongrain raising, free of mineral oils or other nondry ingredients and leaving no bond-inhibiting residues on concrete. Grace Construction Materials "Form Film", or approved.

**03. Construction.**

- a. Construct forms true to required lines, grades, dimensions and surfaces.
- b. Arrange forms to permit single pours of exposed surfaces, areas, or panels without occurrence of joinery between adjacent forming materials in same plane.
- c. Carefully align snap ties horizontally and vertically where concrete is exposed to view.
- d. Cleanouts and Openings. Provide on interior face of wall forms as required for effective removal of loose dirt, debris and waste material, for inspection of reinforcing and for introduction of vibrators.
- e. Apply form sealer to wood forms prior to placing reinforcing steel. Follow approved manufacturer's directions.

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- f. Falsework and centering shall be constructed according to ACI 347-68.
- g. **Accessory Items.**
  - (01) **Contraction Joints.**
    - (a) Weakened plan contraction joints for curb and gutter shall be constructed at right angles to curb line, with spacing in 5 foot multiples, not to exceed 15 feet.
    - (b) Contraction joints may be sawed or hand formed with joint depth to be a minimum of one fourth the total depth of the section.
  - (02) **Expansion Joints - Provide in Following Locations.**
    - (a) Wherever walks abut vertical surfaces.
    - (b) Curb and Gutter. Expansion joints shall be constructed at right angles to the curb line with spacing in 15 foot multiples, not to exceed 45 feet. Expansion joints shall also be placed at interface at straight curb and short radius curved sections, interface of new curb with old curb, and both sides of driveway cuts.
    - (c) **Walks.**
      - (1) Expansion joints shall be constructed at right angles to the curb line with spacing not to exceed 15 foot.
      - (2) Expansion joints shall also be placed at interface at straight walked and short radius curved sections, interface of new walk with old walk and both sides of driveway approaches.
    - (d) Elsewhere indicated or necessary to prevent shrinkage from cracking concrete. Bring joint material to within 1/2 inch of top surface. Fill remainder of joint material with standard sealing compound.
  - (03) **Construction Joints.**
    - (a) Provide where indicated or required by construction.
    - (b) Provide key indentations at all joints as shown.
    - (c) Prevent formations of shoulders and ledges.

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(04) **Embedded Items.** Properly locate and place inserts and embedded items.

**h. Removal of Forms and Supports.**

(01) Do not remove formwork until concrete has hardened and attained sufficient strength to permit safe removal and adequate support of inherent and imposed loads.

(02) Minimum setting times shall be as follows:

- (a) Walls..... 7 days
- (b) Structural Slabs.....21 days
- (c) Footings and Foundation Slabs.3 days
- (d) Earth Supported Slabs.....3 days

(03) **Forms.**

- (a) Remove forms carefully to avoid damaging corners and edges of exposed concrete.
- (b) Re-Use. The engineer will approve re-use of forms provided they are in good condition and have been cleaned, repaired and resealed as required to achieve concrete of specified quality.

**4C. REINFORCING STEEL**

**01. Submittals.**

**a. Shop Drawings.**

(01) Bending and placing diagrams prepared by firm supplying reinforcing steel for the project.

(02) Bending and placing diagrams prepared in accordance with "Manual of Standard Practice for Detailing Reinforced Concrete Structures", ACI Publication 315-65.

**b. Manufacturer's literature describing products if required by engineer.**

**c. Samples, Certificates of Compliance, Mill Test Reports.**

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**02. Product Delivery, Storage and Handling.**

- a. Deliver reinforcing and accessories to site not more than 48 hours before placement.
- b. Store in manner to prevent excessive rusting and fouling with grease, dirt or other bond-weakening coatings.
- c. Take precautions to maintain identification after bundles are broken.

**03. Materials**

- a. Reinforcing bars new billet steel, ASTM A-615-68, Grade 40.
- b. Tie wires ASTM A-82-66.
- c. Welded wire fabric ASTM A-185-72.
- d. All steel furnished shall be American made.

**04. Fabrication and Installation.**

- a. Shop-fabricate and cold-bend as detailed on reviewed shop drawings.
- b. Conform with requirements of ACI 316-65 and ACI 301-66 Section 504 where specific details are not shown or where drawings and specifications are not more demanding.

**05. Placement.**

**a. General.**

- (01) Place bars and welded wire fabric according to tolerances specified in Section 504 and 505 301-66.
- (02) Ensure placement will permit concrete protection in conformance with ACI 318-63 Section 308 or to extent shown.
- (03) Support and fasten bars securely with concrete blocks, spacers, chairs or ties. Wire-tie bar intersections. Secure bars at intervals not exceeding 80 x diameter of bar for horizontal bars and 192 x diameter of bar for vertical bars.

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- (04) Do not bend bars around openings or sleeves. Wherever conduits, piping, inserts, sleeves, etc., interfere with placing or reinforcing, obtain the engineer's approval of placing before pouring concrete.
- b. Splices and laps in conformance with ACI 318-63, Section 805.
- c. Prior to placing, verify reinforcing has been bent, positioned, and secured in accordance with drawings; ensure removal of oil, grease, dirt or other bond-weakening coatings; replace severely rust-pitted reinforcing.

4D. CONCRETE CAST-IN-PLACE

- 01. **Quality Assurance.** Requirements of ACI 301-66 shall govern work, materials and equipment related to this section unless noted otherwise.
- 02. **Submittals.** Manufacturer is responsible for the design of the concrete mix which shall conform to ASTM C94-67 requirements for ready mix concrete. Prior to delivery of concrete, manufacturer furnish to owner through engineer a written statement giving the design mix and gallons per bag proposed for use in each class or type of concrete specification. Furnish evidence of testing of proposed design mix which assured design strength as specified, statement in writing on letterhead of manufacturer, identified to this specific project, addressed to owner, mail to engineer.
- 03. **Products.**
  - a. **Concrete Mix.**
    - (01) Strength. 2500 psi minimum compressive strength after 28 days when tested in accordance with ASTM C39 for curb and gutters, catch basins, walks, manhole bases, thrust blocking and sign post bases.
    - (02) Aggregate. 1-1/2" maximum size.
    - (03) Slump. 4" minimum and maximum when tested in accordance with ASTM C143.
    - (04) Cement. 5-1/2 sacks per cubic yard of concrete, minimum.



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- b. **Cement Type.** ASTM C150 Type I for all concrete.
- c. **Admixtures.** ASTM C494 only as approved by engineer.
- d. **Non-Shrink Grout.** Master Builders "Embeco".
- e. **Hardener and Sealer.** Horn Clear Seal as manufactured by Grace Construction Materials or approved equal.

**04. Mixing and Delivery.**

(Attention directed to Section 26. 1511 UBS Standard, 1967). Certification is required. Under "Additional Information": Show after added in addition to design mix, who added it and who authorized it. Note: engineer/architect or testing laboratory may authorize additional water. If slump test indicates slump when tested is within specified limit, no problem; if slump is in excess of specified limit, concrete is rejected and cannot be used on project.

**05. Preparation.**

- a. Protect finish surfaces adjacent to concrete-receiving places.
- b. Spray forms with water immediately before casting.
- c. Notify local public agency, engineer, inspector, and testing agency 48 hours before the intended pour.
- d. Subgrade Preparation.
  - (01) Subgrade under curbs, walks and catch basins shall be excavated or filled with suitable material to required lines and grades.
  - (02) Subgrade shall be mechanically compacted to achieve 95% relative maximum density in upper six inches. Compaction to extend one foot outside form lines.
  - (03) Subgrade shall be moist prior to concrete placement.

**06. Placing.**

- a. Achieve proper consolidation and avoid honeycombing by spading and mechanical high frequency vibrator. Avoid segregation of materials by excessive vibrating.

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- b. Avoid segregation by excessive drops, 6'-0" maximum drop.
- c. Mechanical compaction by immersion high frequency vibrators operating at speeds of not less than 7,000 rpm. Insert vibrator vertically at intervals as required to gain thorough compaction, 18 inches to 30 inches usual. Vibrator tip to extend into previously placed concrete layer. Avoid damage to form faces.
- d. Place concrete as near as possible to the final location. Movement by vibrator not permitted.
- e. Hot Weather Concreting. Conform to ACI 605-59 when mean daily temperature rises above 75 degrees Fahrenheit.
- f. Cold Weather Concreting. Conform to ACI 306-66 when mean daily temperature falls below 40 degrees Fahrenheit.
- g. Construction Joints.
  - (01) Verify location and conformance with typical details; provide only where designated or approved by engineer.
  - (02) Thoroughly clean surfaces and remove laitance prior to placing adjacent concrete.
  - (03) Vertical Joints. Thoroughly wet and slush with coat of neat cement grout prior to placing adjacent concrete.
  - (04) Where construction joint occurs between adjacent slab sections, allow 24 hours to elapse between placing sections.
- h. Scored Joints. Walks, score on five (5) foot centers.
- i. Walls.
  - (01) Distribute concrete in maximum 18 inch high layers unless otherwise approved.
  - (02) Space points of deposit to eliminate need for lateral flow.
  - (03) Level top surface upon stopping work.

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- j. Slabs.
  - (01) Complete areas as defined by formwork same day as started.
  - (02) Make surfaces smooth, clean and in plane true to elevations shown whether level or sloped.
  
- k. Curb and Gutter.
  - (01) Machine Curb and Gutter Placement.
    - (a) The slipform-extrusion machine approved shall be so designed as to place, spread, consolidate, screen, and finish the concrete in one complete pass in such a manner that will necessitate a minimum of hand finishing to provide a dense and homogeneous section.
    - (b) The machine shall shape, vibrate, and/or extrude the concrete for the full depth and width of the concrete section being placed. It shall be operated with as nearly a continuous forward movement as possible.
  
  - (02) Formed Method for Curb and Gutter and Catch Basins.
    - (a) Forms shall be of wood, metal or other suitable material that is straight and free from warp, and has sufficient strength to resist the pressure of the concrete without excessive deflection.
    - (b) Front and back forms shall extend for full depth of concrete being placed.
    - (c) Forms shall be cleaned and coated with approved release agent prior to concrete placement.
    - (d) Concrete shall be deposited in forms without segregation and tamped and spaded or mechanically vibrated for thorough consolidation.

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**07. Curing.**

- a. Comply with UBC Chapter 26 and the modifications specified herein.
- b. Curing process must control moisture and temperature within the curing mix for not less than 14 days for all concrete work.
- c. Ideal curing temperature is 70 degrees Fahrenheit. When curing temperature exceeds 80 degrees Fahrenheit or falls below 50 degrees Fahrenheit, special curing procedures must be affected. These procedures must meet with the engineer's approval and remain in effect so long as he deems it necessary.
- d. **Curing Compounds.**

(01) Application in strict compliance with manufacturer's detailed instructions as herein outlined and modified. Spray application, rate not to exceed 250 square feet per gallon. Apply as soon as practical after sheen has disappeared from concrete, no later than one hour after final troweling.

(02) Location. All slabs, walks and curbs.

**08. Protection.** Protect all concrete from damage, special care given to exposed slabs to prevent staining or discoloration.

**09. Cleaning, Patching and Defective Work.**

- a. Where concrete is under strength, out of line, level, or plumb, or shows objectionable cracks, honeycombing, rock pockets, voids, spalling, exposed reinforcing or is otherwise defective, and, in the engineer's judgement, these defects impair proper strength or appearance of the work, the engineer will require its removal and replacement at the contractor's expense.

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- b. Immediately after stripping and before concrete is thoroughly dry, patch minor defects, form-tie holes, honeycombed areas, etc., with patching mortar. Patch shall match finish of adjacent surface unless noted. No patching allowed at concrete walls to be sandblast finish.
- c. Remove ledges and bulges.
- d. Compact mortar into place and neatly fill defective surfaces to produce level, true planes.
- e. Cleaning.
  - (01) Insure removal of bituminous materials, form release agents, bond breakers, curing compounds if permitted or other materials employed in work of concreting which would otherwise prevent proper application of sealants, liquid water-proofing, or other delayed finished or treatments.
  - (02) Where cleaning is required, take care not to damage surrounding surfaces or leave residue from cleaning agents.
    - (a) Stained or discolored concrete cleaned as directed by engineer.
    - (b) Stains or other defects which cannot be removed are subject to correction by removal and replacement.

**10. Concrete Surface Finish - Flat Work.**

- a. Broom Finish.
  - (01) Location. Walks and slabs.
  - (02) Trowel to smooth, hard, slick surface, free from trowel marks. Absorption of wet spots with neat cement not allowed.
  - (03) Broom lightly at right angles to slab length. Provide scoring as specified.

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**b. Smooth Trowel Finish.**

- (01) Location. Interior slabs.
- (02) Trowel to smooth, hard, slick surface, free from trowel marks. Absorption of wet spots with neat cement not allowed.

**c. Sack Finish Concrete.**

- (01) While concrete is green, apply with rubber float the following mixture: 1 part sand, 1 part cement, mixed as dry as practicable.
- (02) Fill all voids and rub off excess.
- (03) Location. All exposed vertical concrete surfaces not otherwise finished including curbs and foundation walls.

**11. Concrete Finishes - Formed Work.**

**a. Curb and Gutter Finish.**

- (01) Edged.
- (02) Troweled.
- (03) Exterior surfaces light broom finish.
- (04) Grinding exposed surfaces not allowed.

**b. Catch Basin Finish.**

- (01) Formed outside and inside.
- (02) Troweled on top surface.
- (03) Smooth interior surface required.

**c. As Cast Finish - Walls.**

- (01) Location. All vertical surfaces not subject to view.
- (02) Remove snap ties and fill holes with cement mixed as dry as practicable; pack solid.
- (03) Correct all aggregate pockets, honeycombing, and other defects as directed by engineer.
- (04) Grind off fins and projections from all exposed concrete.
- (05) Remove stains and foreign materials as directed by engineer.

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**4E. CONCRETE TESTS AND INSPECTIONS**

01. General. Tests and inspections for work provided under following:
  - a. Reinforcing.
  - b. Concrete, cast-in-place.
02. Reinforcing. The testing agency will, when required by engineer:
  - a. Take samples from bundles as delivered to job site from mill.
    - (01) When bundles are identified by heat number and accompanied by mill analysis, two specimens shall be taken from each ten tons, or fraction thereof, of each size and grade.
    - (02) When reinforcing is not positively identified by heat numbers or when random sampling is intended, two specimens shall be taken from each two and one-half tons, or fraction thereof, of each size and grade.
  - b. Test for tensile and bending strength.
03. Concrete Cast-In-Place.
  - a. The testing agency will, when required by the local public agency or the engineer, review mix designs, certificate of compliance, and samples of materials the contractor proposes to use.
  - b. The testing agency will, when required by the local public agency or the engineer:
    - (01) Perform testing in accordance with ACI-318-63.
    - (02) Test concrete to control slumps according to ASTM C143-71.

**Division 4  
Concrete**

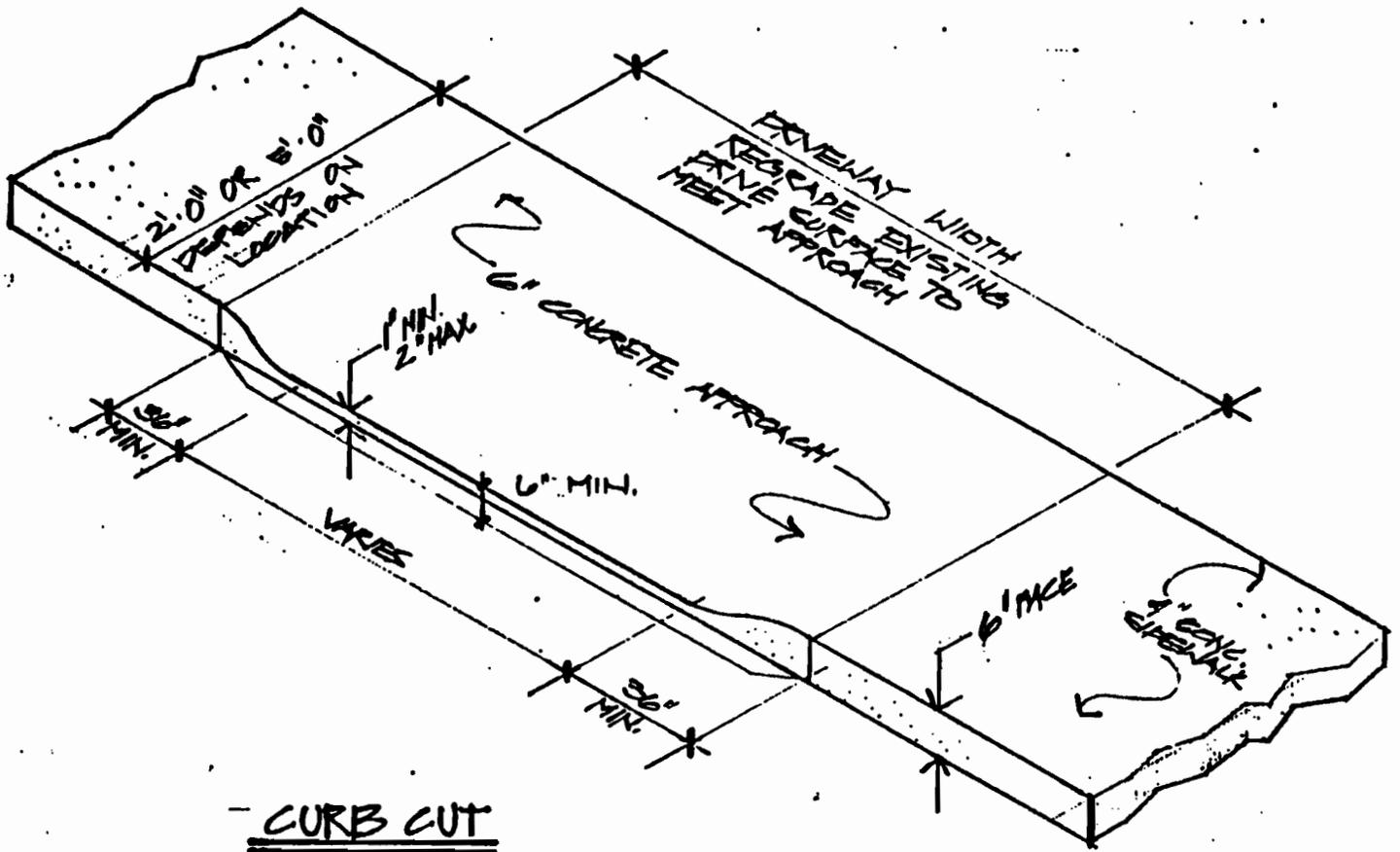
- (03) Test concrete for required compressive strength as follows:
- (a) Make and cure specimen cylinders according to ASATM C31-69.
  - (b) Transport specimen cylinders from job to laboratory.
  - (c) Test specimen cylinders at age seven days and age 28 days for specified strength according to ASTM C39-69.
  - (d) Base strength value on average of three cylinders taken for 28 day test.

**04. Testing Agencies.**

- a. Pittsburgh Testing, 545 Conger Street, Eugene, Oregon.
- b. Northwest Testing Laboratories, 4427 Nugget Way, Eugene, Oregon.
- c. Or other approved certified private testing laboratory, not a representative of concrete supplier.

05. Cost for testing as outlined herein paid for by contractor.





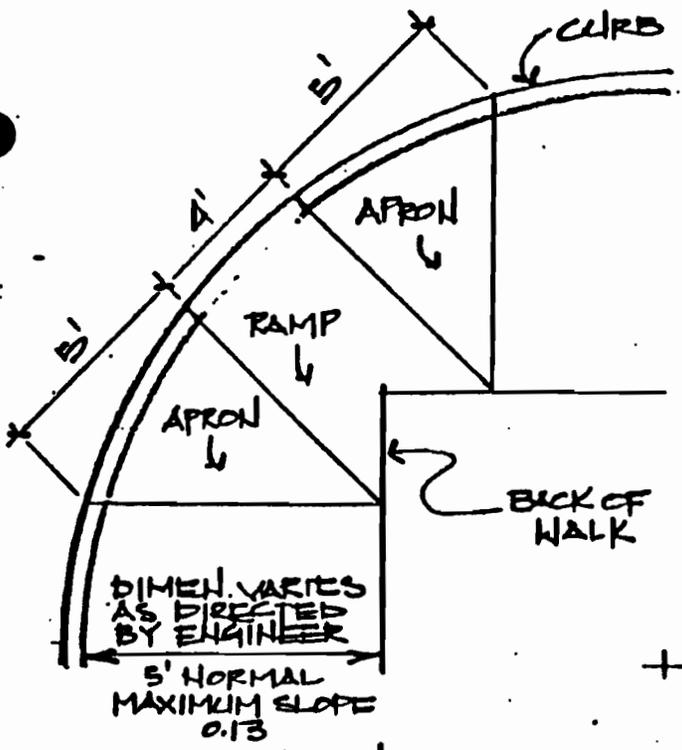
CURB CUT



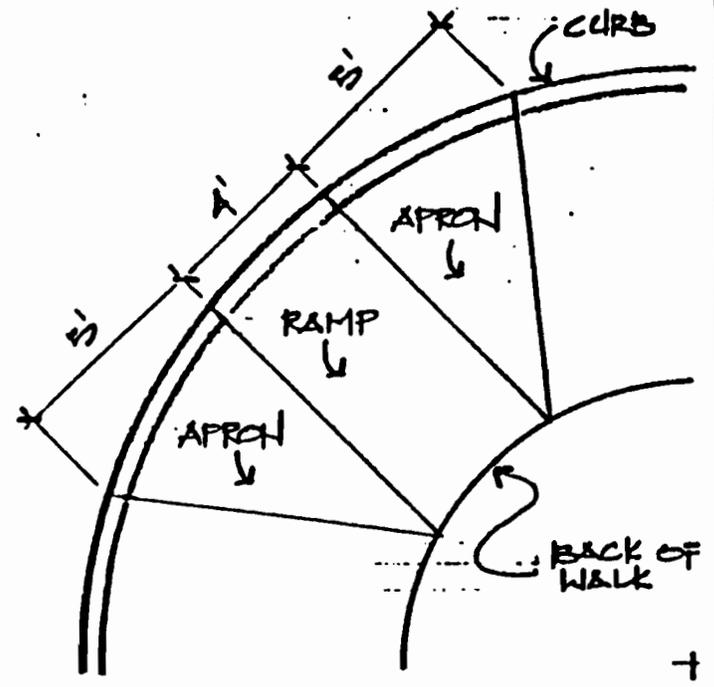
SECTION @ CURB CUT

**STANDARD DETAIL**

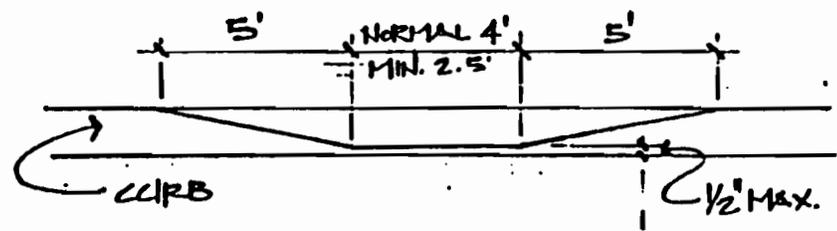
**DRIVEWAY CURB CUT**



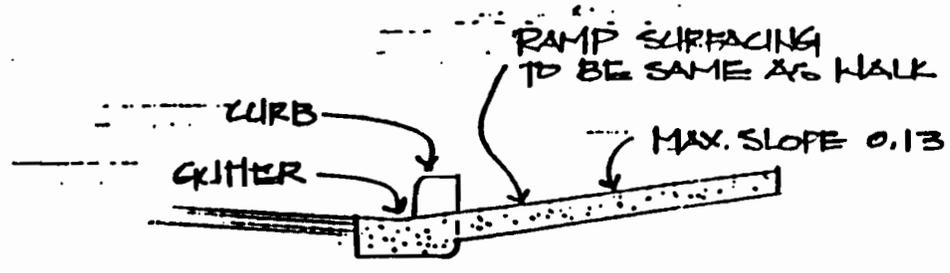
PLAN  
WHERE APPLICABLE



PLAN  
WHERE APPLICABLE



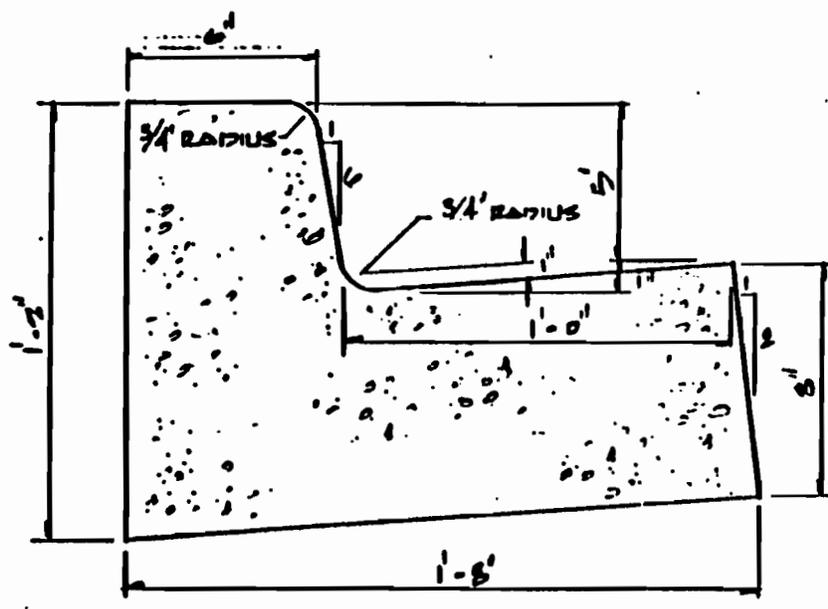
ELEVATION



SECTION

**STANDARD DETAIL**

**PEDESTRIAN RAMP**



SECTION

1/2" APPROVED EXPANSION JOINT MATERIAL

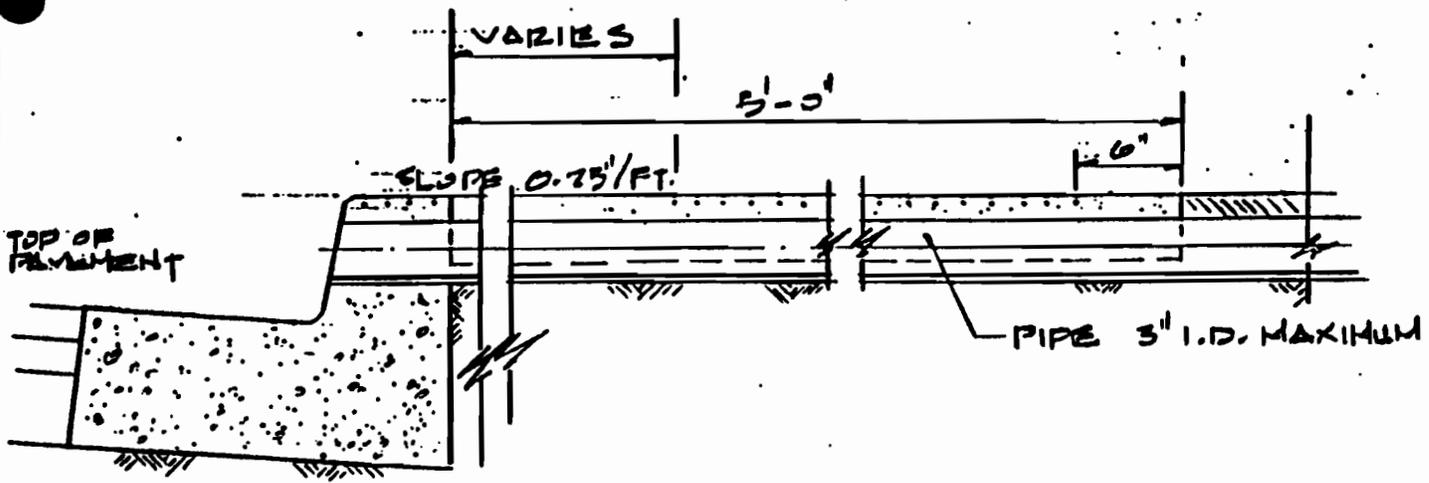
PLAN



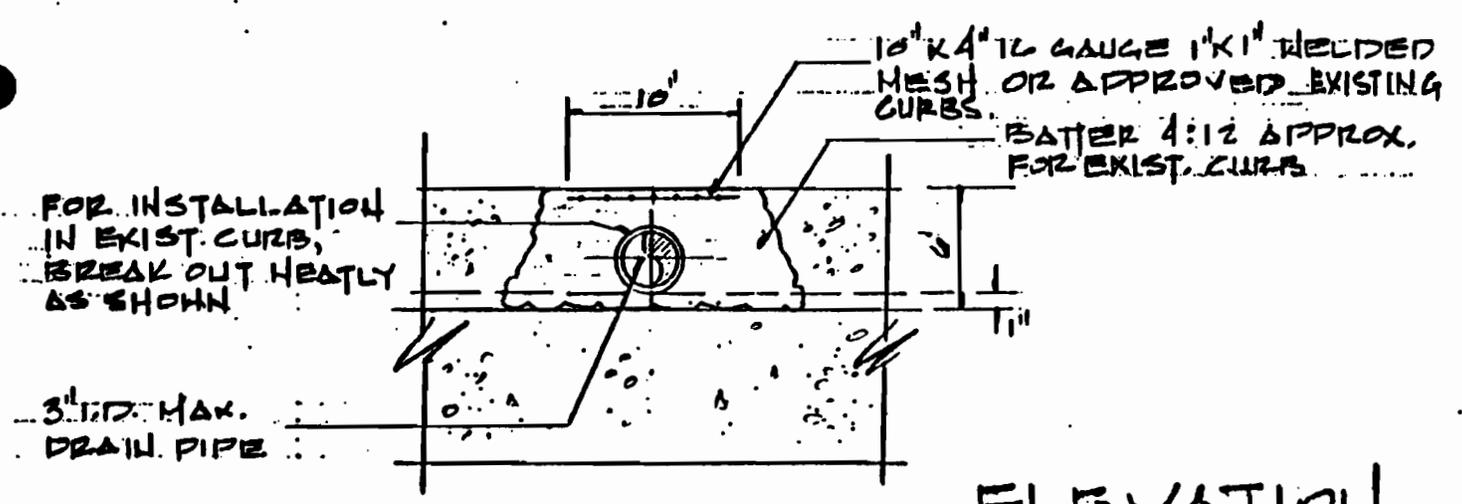
NOTE: EXPANSION JOINTS AT MAXIMUM 45 FT. INTERVALS IN 15 FT. MULTIPLES.

**STANDARD DETAIL**

**EXPANSION JOINT**



SECTION



ELEVATION

NOTE:

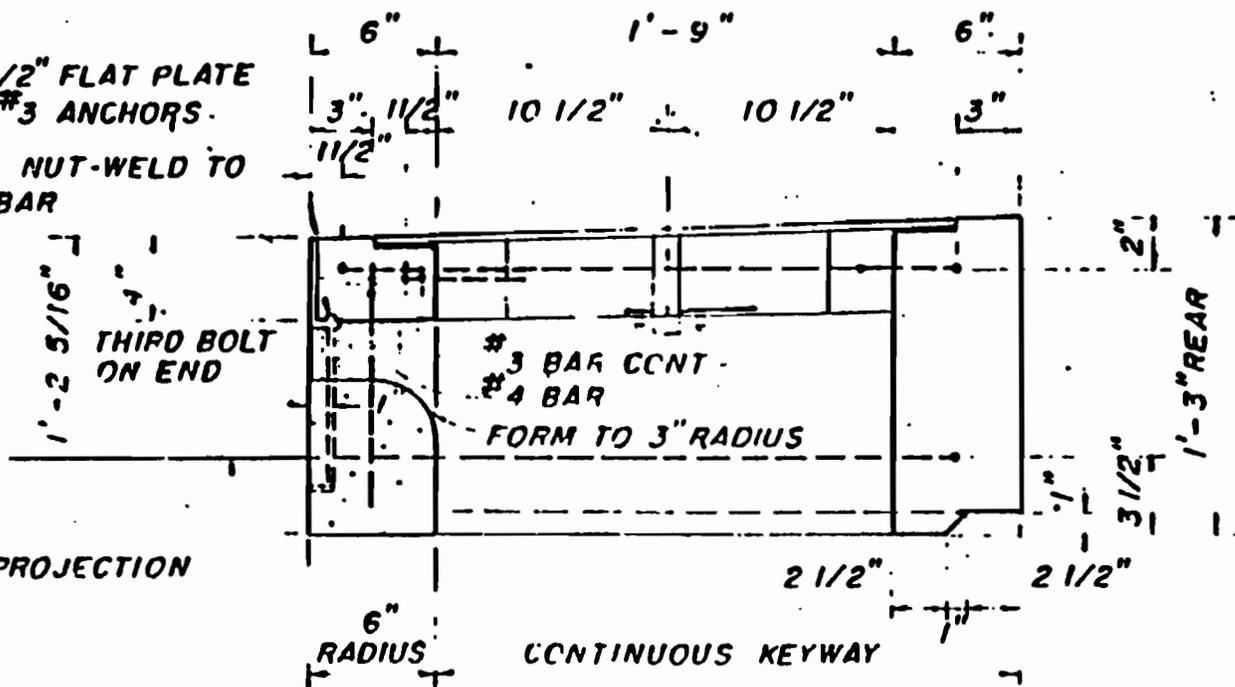
1. 2 DRAINS PER LOT MAXIMUM. NO DRAIN TO BE INSTALLED WITHIN DRIVEWAY AREA.
2. WHERE LOCATIONS PERMIT A CONTRACTION JOINT CENTERED OVER TOP OF PIPE MAY BE USED IN LIEU OF MESH. PRIOR APPROVAL BY CITY ENG. REQ'D.

**STANDARD DETAIL**

**WEEP HOLES**

1/4" x 3 1/2" FLAT PLATE  
WITH 3 - #3 ANCHORS.

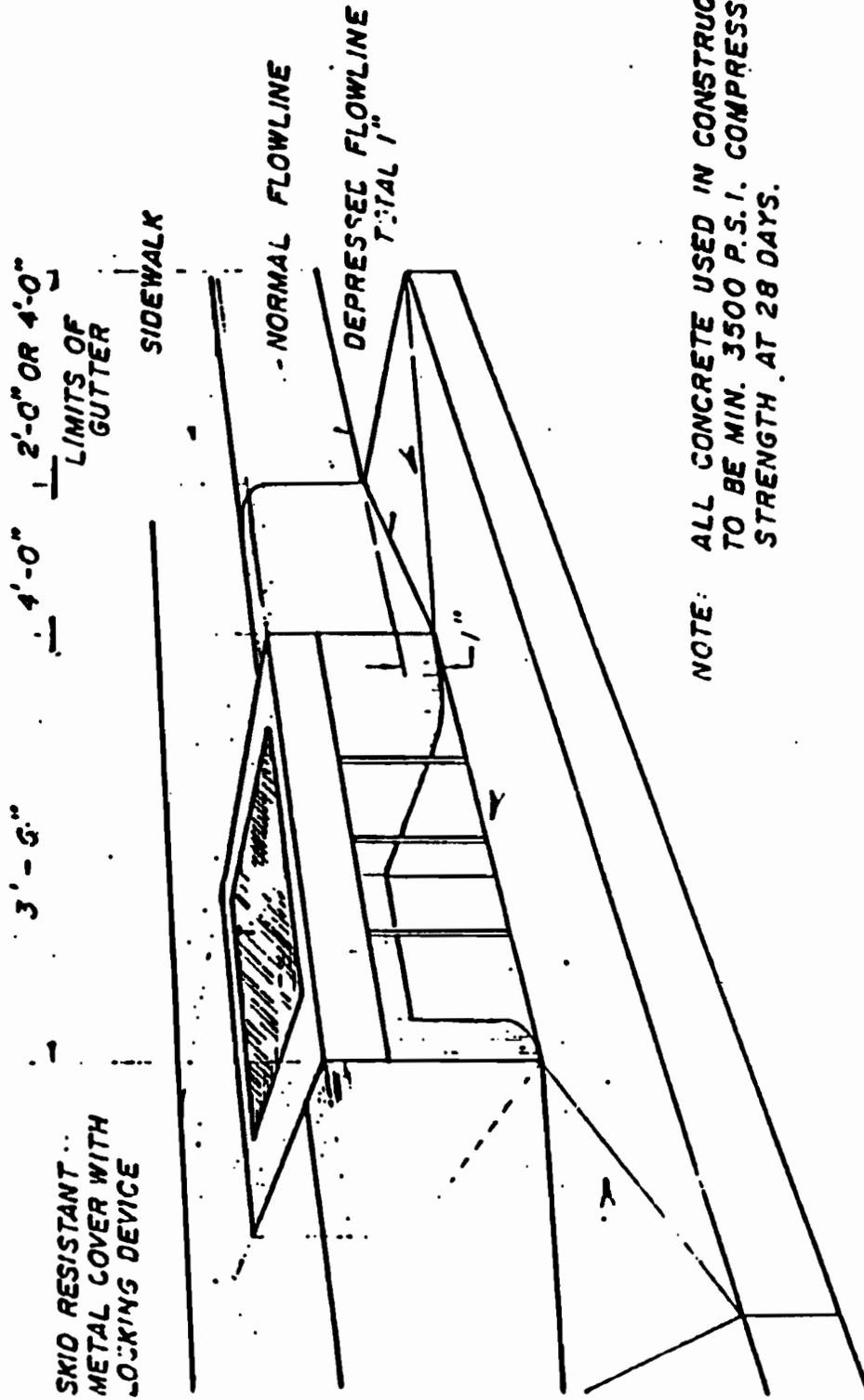
3/8" HEX NUT-WELD TO  
3" L. #3 BAR



**STANDARD DETAIL**

**SIDE INLET CURB DETAIL**

**4 - 6**



NOTE: ALL CONCRETE USED IN CONSTRUCTION TO BE MIN. 3500 P.S.I. COMPRESSIVE STRENGTH AT 28 DAYS.

INLET PERSPECTIVE

**STANDARD DETAIL**

**SIDE INLET CURB DETAIL**