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INTRODUCTION:

The City of Chelan has found that future storm water drainage problems may be reduced or avoided if future developers, both private and public, provide for storm and surface water drainage of their respective properties. Storm Drainage Standards and Guidelines are set forth to protect life and property from loss and damage by flooding and to protect streams, creeks, and lakes from pollution and excessive flows.

Any material, design procedure, standard or testing not specifically addressed within this document shall be in conformance with the City's current master drainage plan as now exists or as may hereafter be amended as may be directed by the City engineer. Analysis and improvements shall conform to the guidelines contained in the *Stormwater Management Manual for Eastern Washington* by the Washington State Department of Ecology.

PURPOSE:

The following storm drainage standards and guidelines are intended to reduce and prevent adverse storm drainage impacts. They represent the minimum design standards for the construction of storm drainage facilities and stream channel improvements within Chelan. Compliance with these standards does not relieve the designer, owner, or developer of the responsibility to apply conservative and sound professional judgment to protect the health, safety and welfare of the general public. Special site conditions and environmental constraints and considerations may require a greater level of protection than would normally be required under these standards.

WHEN A DRAINAGE PLAN OR DRAINAGE REVIEW IS REQUIRED:

- A. Plans for permanent drainage and storm water detention facilities shall be provided on property improvements within Chelan in accordance with the Standards for the following types of improvements.
 - 1. All plats (including short plats) where required by the SEPA document.
 - 2. All developments, including remodeling, reconstruction, and new construction adding five thousand (5000) square feet or more of new impervious surfaces, including gravel surfaces.
 - 3. Developments entailing construction which would change the point of discharge of surface waters, discharge surface waters at a higher velocity and/or quantity than that of the pre-development discharge rate, or, tend to add to pollution of surface waters.
 - 4. Any proposed development adjacent to the 100 year flood plain of any stream or lake.

WHEN PLANS ARE EXEMPT:

The plan requirement established in the previous section shall not apply when Public

Works determines that the proposal meets all of conditions A, B and C.

- A. Will not seriously and adversely impact the water quality conditions of any affected receiving bodies of water.
- B. Will not substantially alter the drainage pattern or increase the peak discharge.
- C. Will not cause run-off exceeding the available capacity of the existing drainage system where such system was designed to serve the proposed development area.

A single family residence development with less than 5,000 square feet of impervious surfaces is exempt from plan requirements. However, all buildings with down spouts or other point sources shall provide a drainage plan.

GENERAL REQUIREMENTS:

All persons proposing land development and/or approvals as outlined above shall provide a drainage plan for surface water flows entering, flowing within and leaving the subject property. The plan is to conform to the following standards and requirements:

- A. When required, plans for storm water management shall be prepared by a registered Civil Engineer currently licensed by the State of Washington and qualified by experience and education in the field of hydraulics, hydrology, or a closely related field. Storm drainage plans or revisions to any approved plan shall be reviewed and approved by Public Works prior to any construction.
- B. On-site storm drainage improvements must be sufficient to mitigate impacts on runoff, erosion, sedimentation and pollution.
- C. All drainage system elements must be designed to allow for adequate maintenance and accessibility at all times.
- D. Developer shall meet all applicable laws for water quality prior to discharge to any wetland, stream, or lake.
- E. In no case shall storm sewers be allowed to connect to sanitary sewers.
- F. Storm sewer systems shall generally conform to sanitary sewer design standards. City engineer may specify ductile iron pipe in special circumstances.
- G. No drainage originating inside of a building or structure shall be connected to the storm drainage of surface water systems, with the exception of parking

garages.

- H. Drainage systems shall be designed to meet applicable State and Federal requirements for water quality prior to discharge to any wetland, stream, or lake. The developer shall be responsible for obtaining any Local, State, Or Federal construction or discharge approvals or permits.

BASIC REQUIREMENTS:

- A. **Discharge at Natural Location:** All surface and storm water runoff from a proposed development that would construct new or modify existing drainage facilities should be discharged at the natural location. Diversions may be allowed if it corrects an existing problem.
- B. **Tributary Area Analysis:** Proposed developments should identify the upstream tributary drainage area and provide an analysis of the pre-existing drainage volume and quality and an analysis of the impact of the proposal on the drainage system. The post development peak rate runoff shall not exceed the pre-development peak rates for the site. The methods of peak rate runoff control may include detention, retention and/or infiltration. On site bio-filtration in combination with infiltration systems is the preferred method for management of on-site storm water and shall be considered before transporting storm water off-site.
- C. **Existing System Assessment:** For all proposed development requiring a drainage conveyance system, the conveyance system must be analyzed, designed and constructed to handle existing off-site tributary flows and on-site storm drainage flows caused by development of the project.
- D. **Erosion & Sediment Control:** Developments involving clearing and grading and which require new or modification of existing drainage facilities must include an erosion/sedimentation control plan meeting DOE requirements and providing suitable measures to prevent sediment-laden runoff from leaving the site during construction.
- E. **Maintenance and Operation:** The long-term maintenance & operation of the proposed drainage facilities must be addressed in the plan (who, when & how).
- F. **Adequate easements** shall be provided for operation and maintenance of all drainage facilities located on private property.

DRAFTING STANDARDS AND CONTENTS:

Construction plans for drainage systems shall be prepared in conformance with the City of Chelan's adopted construction plan standards.

DESIGN CRITERIA:

1. Runoff Control

- A. Developments shall be designed and constructed to provide control of the quality and quantity of storm water runoff both during and after construction. Erosion and sedimentation control plans shall be submitted and approved by the City of Chelan prior to the beginning of any construction. Please note that a permit from the DOE is required if 5 or more acres are disturbed. Peak discharge control and detention facilities shall be provided in accordance with the Development Standards.
- B. Maximum allowable release rates from storm water detention systems shall be based upon the pre-development runoff from the development site as described in section below. The allowable release rate shall be determined as specified, and may be modified on a case-by-case basis due to constraints in the drainage system downstream of the point of discharge. Storm precipitation distribution and runoff modeling will conform to the Soil Conservation Service Technical Report 55 or other acceptable method. The "Rational method" used by licensed professional engineers may be used for runoff modeling on parcels under 2 acres, not subject to upstream runoff. T_c minimum shall be 0.1 hours.

Allowable Release Rate:

1. For sites with tributary basins greater than 5 acres or sites less than 5 acres in area which are deemed by Public Works to have significant impacts due to runoff quantity, the discharge shall be limited to the capacity of the receiving conveyance system. Peak runoff rate shall be computed using the Soil Conservation Service TR-55 method, modified Santa Barbara Urban Hydrograph Method or other appropriate models.
 2. Should the proponent desire to discharge at higher flowrates than provided above, then he shall provide for improvements of the downstream conveyance system.
- C. The on-site drainage system including conveyance, flow restriction, detention, pollution control, and emergency overflow elements must be properly designed and sized to handle runoff from the site and conveyance through the site. The design should be carefully analyzed for potential problems, flow impediments, construction or maintenance difficulties, and potential erosion or other property damage. Catch basins shall be required at every intersection and shall be spaced a maximum of :

<u>SPACING (ft)</u>	<u>GRADE (S)</u>
150	S<1.5% or S>12.0%
200	S=1.5% to 3.0% or S=8.0% to 12.0%
300	3%< S < 8%

- D. Impoundment structures shall be designed to the 100 year (3.0"/24hrs.) event. Conveyance structures shall be designed to the 25 year (2.5"/24 hrs.) event.

2. Water Quality Protection

All storm water discharge shall be treated prior to release using best management practices. The applicant should consider the use of vegetative or other natural filtration means. Effluent discharges from any oil removal treatment device to the storm sewer or surface water system shall be in compliance with State Department of Ecology regulations for discharge to storm drains or surface waters. Whenever paved parking is provided for more than 10 vehicles, or for any paved parking or access roadway draining to an open waterway or stream, a City approved oil/grease separation device shall be installed by the Owner. It shall be located at a point where it can be easily maintained and where it will intercept floating contaminants flowing off road rights of way, parking lots, and other sources of pollutants. Selection and sizing of oil separation device type shall be subject to approval of Public Works.

- A. The property owner assumes full responsibility and liability for proper maintenance and operation of the oil separator, unless the separator is a part of a publicly operated drainage system. This statement must appear on the recorded drawings for the development.
- B. Access to the separator shall be maintained.

3. Detention Facilities

- A. Detention facilities will be required when the downstream capacity is inadequate to convey the runoff. All storm water runoff originating from and/or draining from any proposed development shall be controlled and/or conveyed in accordance with all City standards and policies and as described in these Standards.
- B. Storm water detention systems should be designed to maximize reliability,

ease of maintenance, and water quality of runoff and should minimize hazards to persons or property (both on-site and off-site), nuisance values, and risk of failure.

- C. Sufficient detention storage capacity shall be provided to store the excess runoff from the developed site for all storm events up to a "100-year storm".
- D. Sizing: In calculating the storage volume provided, "dead storage" in wet ponds shall be excluded, i.e. that volume of water which must be assumed to be present in the detention system at the commencement of the design storm. Any volume at a level below that of the outfall invert must be presumed to be dead storage, e.g. catchments.
- E. Controlled Overflow Requirements: All detention storage facilities should include a provision for control of overflows, and suitable data shall be provided to support the design. Under no circumstances should the overflow discharge overland or over private property unless drainage easements are acquired.
- F. Site, Soil and Infiltration Data Requirements for Calculating Effective Infiltration Rates to Reduce Storage Requirements.

General Data Requirements:

- a. The proposed site should have favorable topography to preclude high runoff rates. Engineering calculations shall be included with any submittal to show that there will be no adverse impacts due to the reduced storage. Such adverse impacts may include but not be limited to, increased frequency of overflows.
- b. A log of the soils and infiltration test data should be submitted to reveal site soil conditions and infiltration rates.
- c. An adequate number of test holes should be located over the proposed site to substantiate representative conditions for the final layout of the development, and as a minimum condition, test holes shall be located in each area and at the elevation proposed for infiltration.
- d. Groundwater depth, location, flow and general characteristics shall be considered.
- e. The designer shall demonstrate the adequacy of the depth to the impervious layer below the bottom of the proposed infiltration trench or basin.

- f. **Soil Data Requirement:**
A soil log may be required to describe soil type and depth along with a site map showing the location of each test hole. Classification may be in general terms such as loose sand, sandy silt, clay hardpan, rock, etc. or classification may be in specific terms as described by the U.S. Department of Agriculture (Soil Conservation Service). The soil log should include the depth to ground water table, if less than twelve (12) feet in depth. A falling head permeability test or similar method must be used to demonstrate the infiltration capacity of the least pervious soil layer.

REVIEW AND APPROVAL OF THE PLAN:

The drainage plan and supporting calculations will be reviewed by Public Works Department's construction plan review procedures in coordination with all other City land development and/or permit review procedures. The City's review and approval of storm drainage control plan shall not relieve the applicant, owner and/or designer of liability for errors or omissions in the design of storm drainage facilities.

All storm drainage plans prepared shall be submitted for review and approval to the Public Works Department.

Any applicant or property owner proposing an action that may require a storm drainage plan may request a preliminary review of the proposal by the City Engineer and a determination of the need for a drainage plan.

FEES:

Storm drainage plan review and inspection fees are calculated as per Appendix B-2.

BONDS AND LIABILITY INSURANCE:

The Department of Public Works shall require persons constructing storm drainage facilities to comply with the Section on "Bonding and Liability Insurance."

STANDARD DRAINAGE SYSTEM MAINTENANCE:

Maintenance of storm drainage facilities on private property shall be the responsibility of the owner(s), unless otherwise provided for in these standards. This responsibility and the provision for maintenance shall be clearly stated on subdivision and short plat plans, property conveyance documents, and/or drainage improvement plans. In the event the owner(s) does not provide proper maintenance and the City engineer determines the storm drainage facility represents a public safety threat the City engineer will give 30-day notice to the owner(s) to correct the deficiencies. If the deficiencies are not corrected within 30-days the City may enter upon the property to perform the necessary maintenance at the owner(s) expense. This provision for access will be included as a provision of plat or plan

approval.

ACCESS DRAINAGE

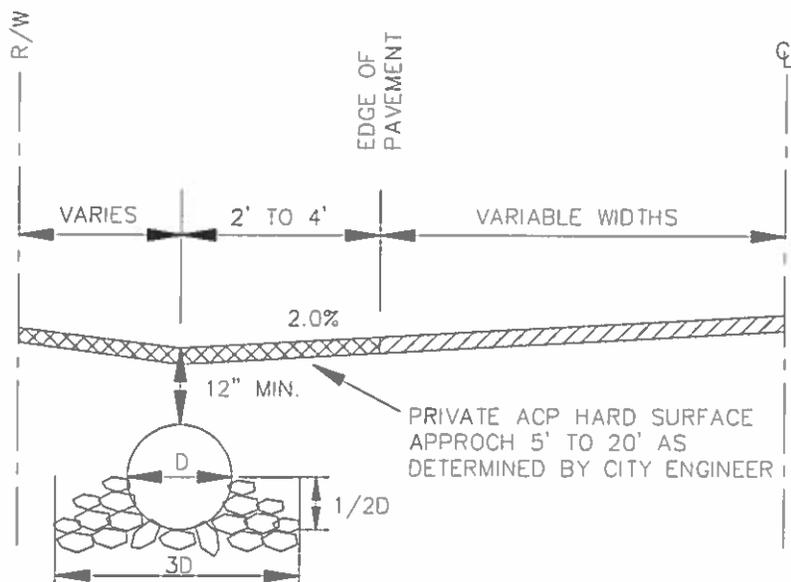
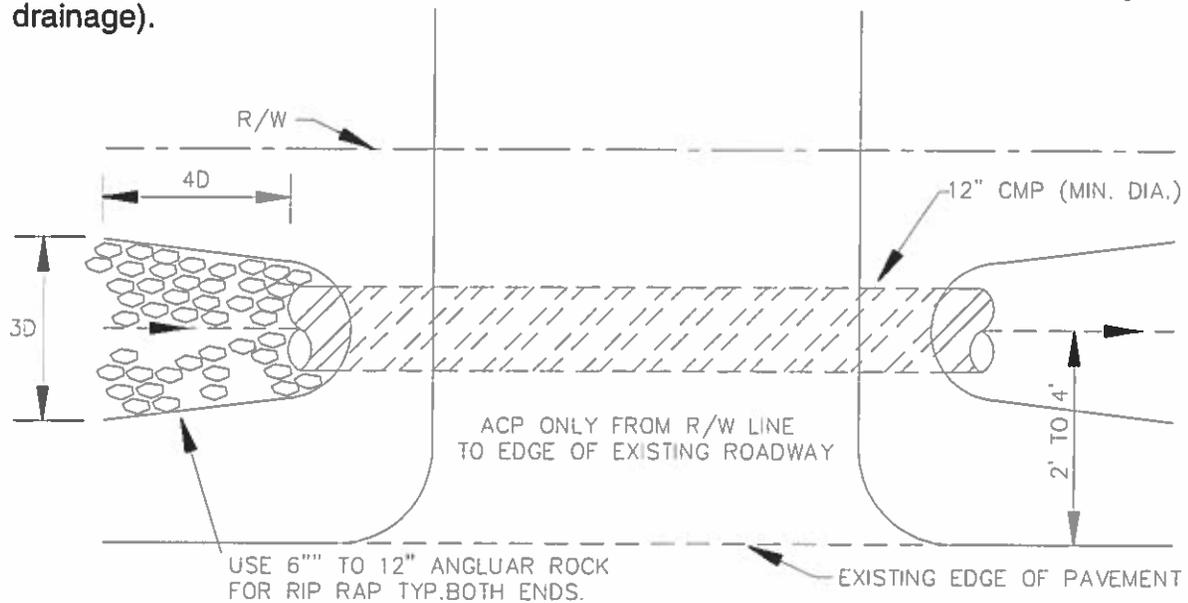
The right to lay a culvert within the street is reserved expressly to the City. A person desiring the installation of a culvert within a street under a driveway or along property frontage shall apply to the City, stating the length, location, and purpose of the culvert. The City engineer, or his authorized representative, shall determine the necessity of a culvert pipe under the driveway approach. In general, a pipe will be required where the approach crossed the roadway ditch, or where a roadside drainage problem exists., or where one will be created by the construction of the road approach. Where a pipe is specified, it shall meet the following requirements:

- a. Inside diameter - 12"
- b. Material - concrete, corrugated steel, or corrugated aluminum, culvert pipe specifications. (Reference WSDOT 1994 standard specifications.) Concrete drain pipe shall meet the requirements of ASTM C118. Zinc coated galvanized steel drain pipe shall meet the requirements of ASSHTO M 36, pipe thickness shall be 0.064 inches. Corrugated aluminum alloy drain pipe shall meet requirements of AASHTO M 196, without perforations. Though generally not allowed for driveway culvert applications, corrugated polyethylene pipe (CPEP) with smooth bore interior is allowed for tight-line storm piping. Piping shall be Hancor Blue Seal, or ADS N-12, with water tight seals, or approved equivalent.
- c. Installation - the flow line of the pipe shall be at the same elevation and alignment as the flow line of the roadway ditch or drainage ditch. Concrete pipe joints may be ungrouted. The pipe shall extend a sufficient distance past the toe of the approach fill to prevent sloughing into the pipe ends.

MINIMUM CULVERT SIZES

The minimum diameter of culvert pipes under City streets shall be 18." Culvert pipes from grated inlets or catch basins under roadway may have a minimum diameter of 12." Culvert pipes under driveway approaches shall have a minimum diameter of 12."

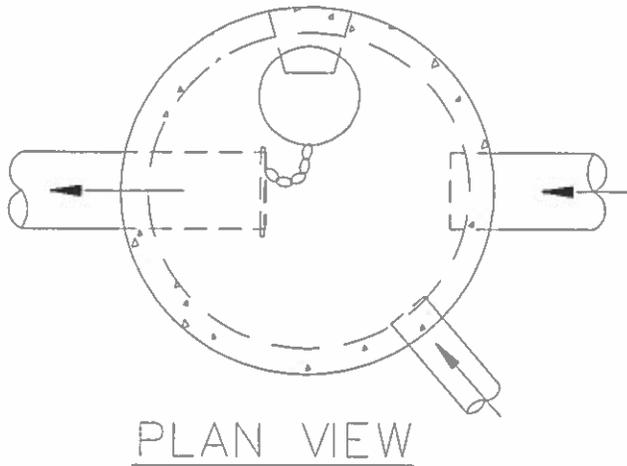
Culvert pipe shall be CMP or concrete as approved by the City engineer. Culvert outlets shall be constructed to provide erosion control. (See Section 7-8, Driveway access drainage).



NOTE: 4' SHOULDER REQUIRED FROM EXISTING PAVEMENT ON UNIMPROVED ASPHALT ROADS.

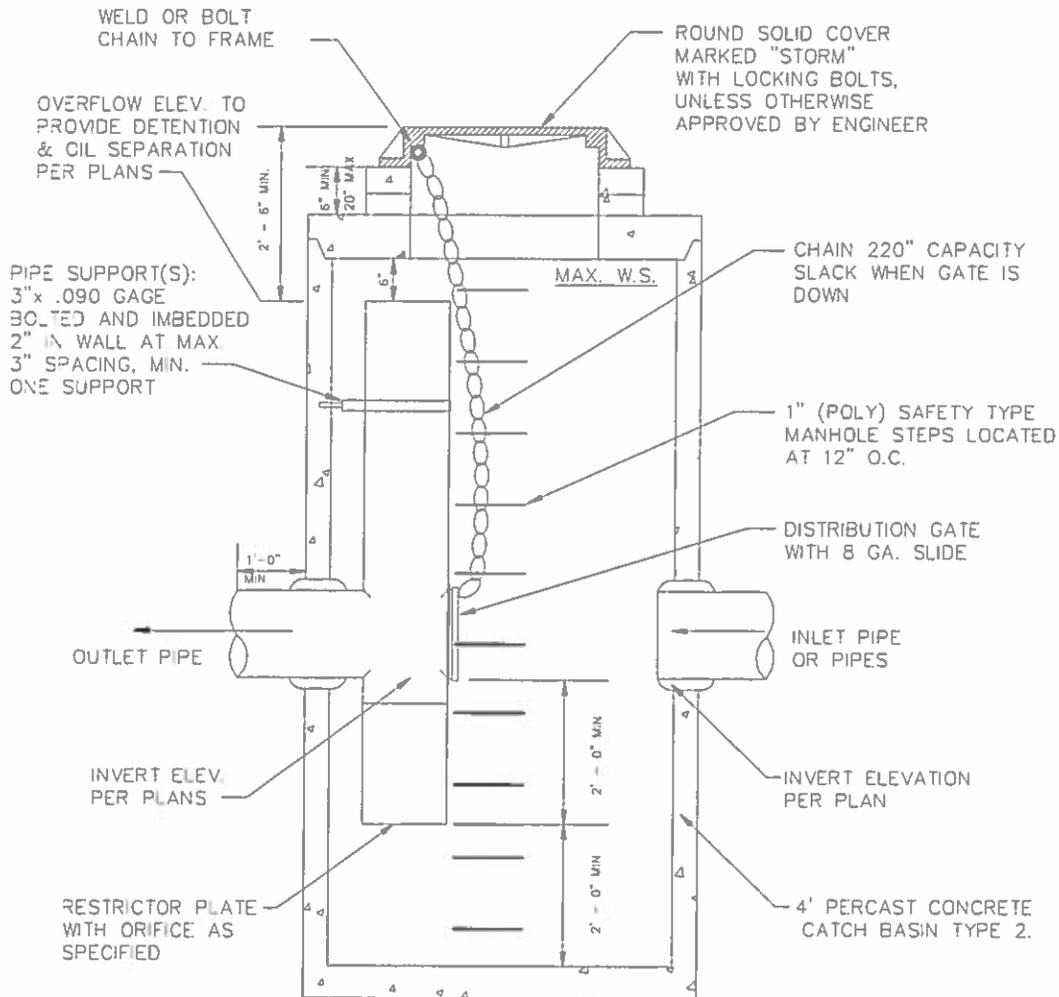
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FLOW RESTRICTOR (Catch Basin Type 2)



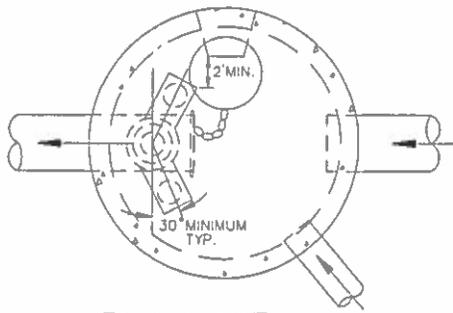
NOTES:

1. PIPE SIZES AND SLOPES: PER PLANS.
2. OUTLET CAPACITY: NOT LESS THAN COMBINED INLETS.
3. METAL PARTS: CORROSION RESISTANT. GALVANIZED PIPE PARTS TO HAVE ASPHALT TREATMENT 1.
4. FRAME AND LADDER OR STEPS OFFSET SO:
 - A. CLEANOUT GATE IS VISIBLE FROM TOP.
 - B. CLIMB-DOWN SPACE IS CLEAR OF RISER AND CLEANOUT GATE.
 - C. FRAME IS CLEAR OF CURB.
5. IF METAL OUTLET PIPE CONNECTS TO CEMENT CONCRETE PIPE, OUTLET PIPE TO HAVE SMOOTH O.D. EQUAL TO CONCRETE PIPE I.D. LESS 1/4".

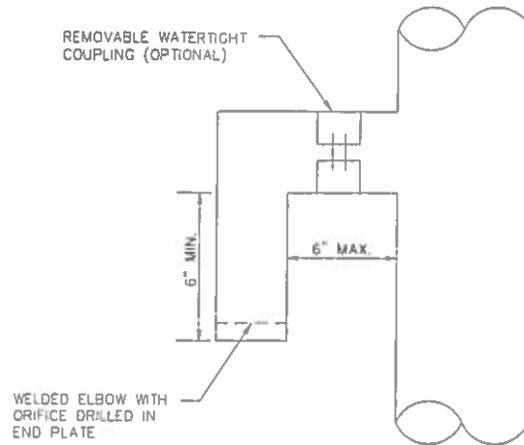


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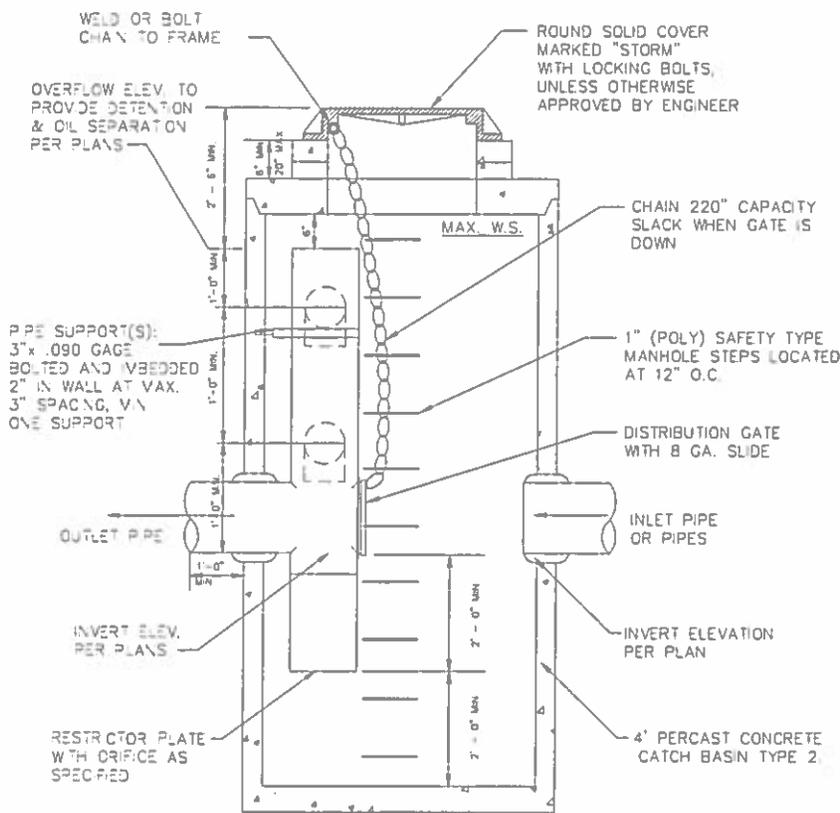
MULTI-ORIFICE FLOW RESTRICTOR (Catch Basin type 2)



PLAN VIEW



ELBOW DETAIL

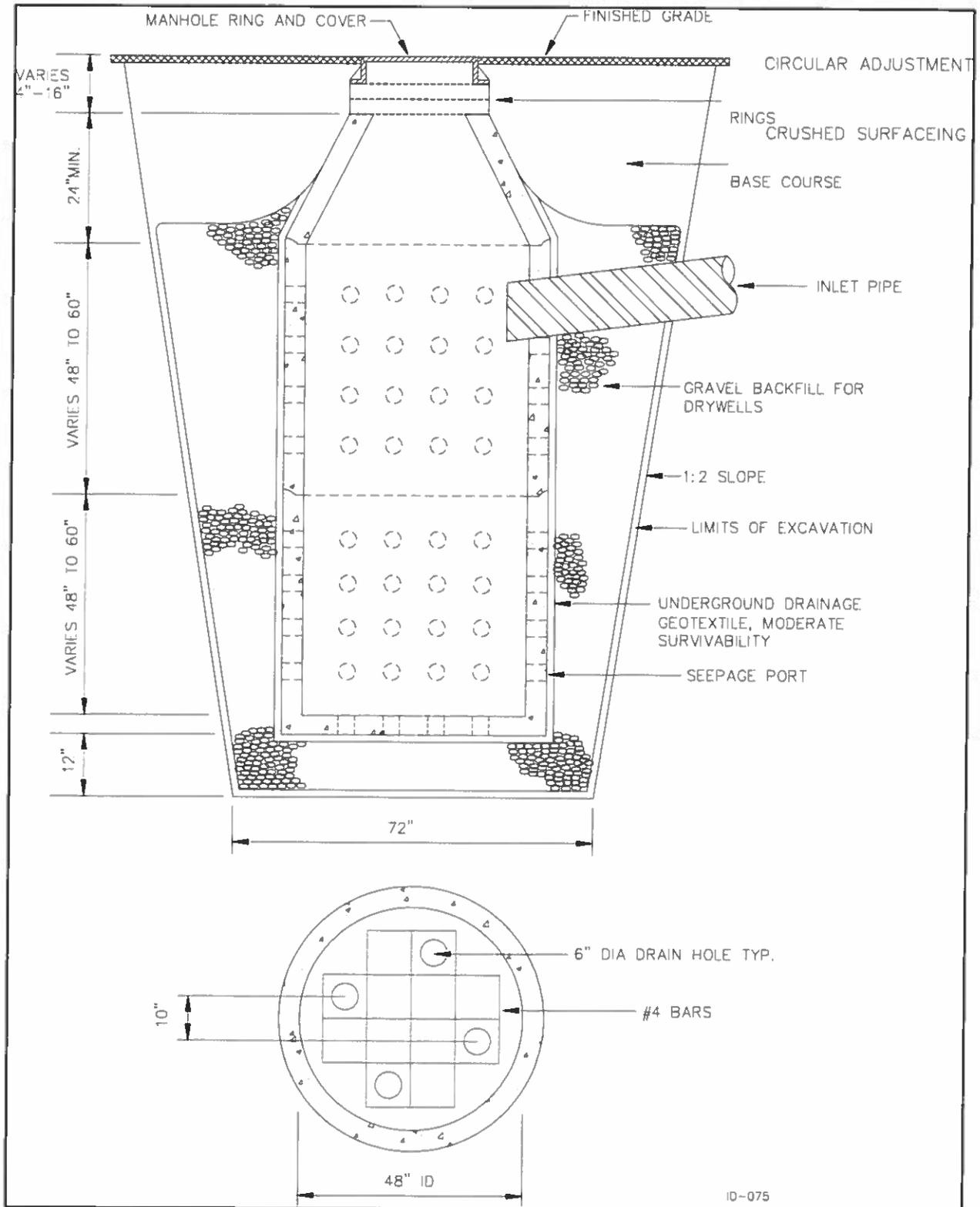


NOTES:

1. PIPE SIZES AND SLOPES: PER PLANS
2. OUTLET CAPACITY: NOT LESS THAN COMBINED INLETS.
3. METAL PARTS: CORROSION RESISTANT. GALVANIZED PIPE PARTS TO HAVE ASPHALT TREATMENT 1.
4. FRAME AND LADDER OR STEPS OFFSET SO:
 - A. CLEANOUT GATE IS VISIBLE FROM TOP.
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 - C. FRAME IS CLEAR OF CURB.
5. IF METAL OUTLET PIPE CONNECTS TO CEMENT CONCRETE PIPE, OUTLET PIPE TO HAVE SMOOTH O.D. EQUAL TO CONCRETE PIPE I.D. LESS 1/4".

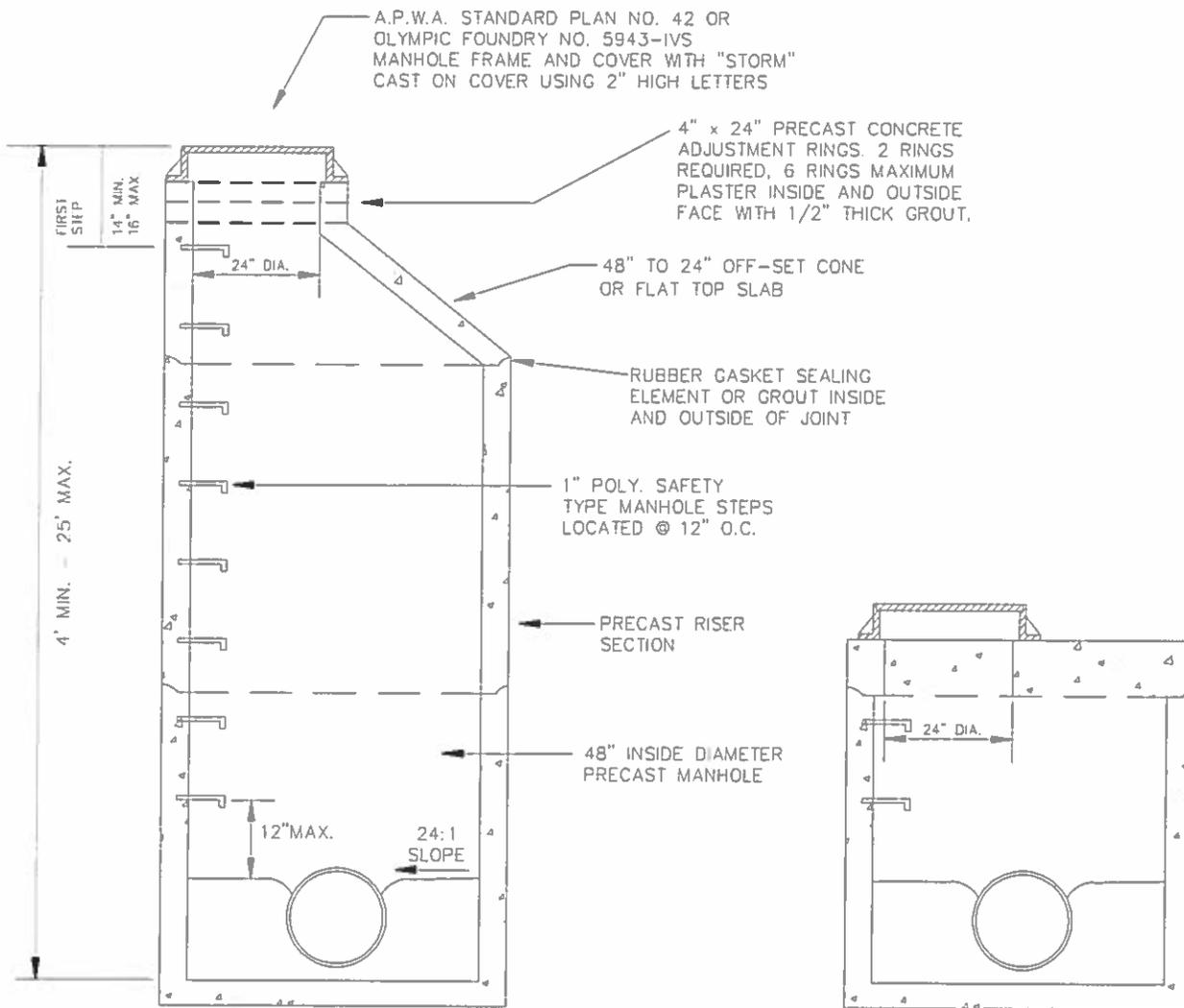
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PRECAST CONCRETE DRYWELL



MANHOLE TYPE 1

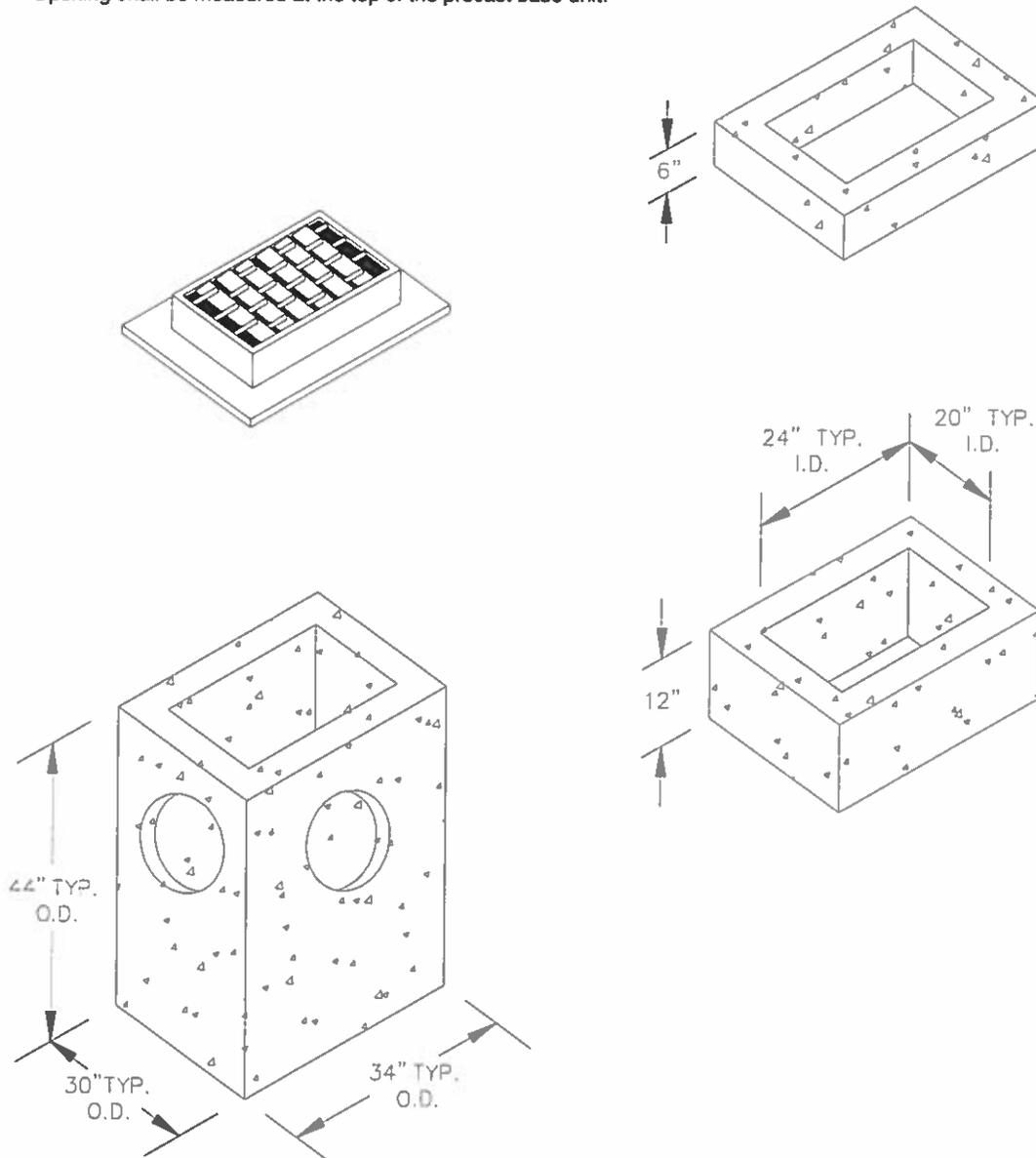
Note: Design shall provide a one-tenth drop from invert inlet to outlet.



ID-074

CATCH BASIN TYPE 1**Notes:**

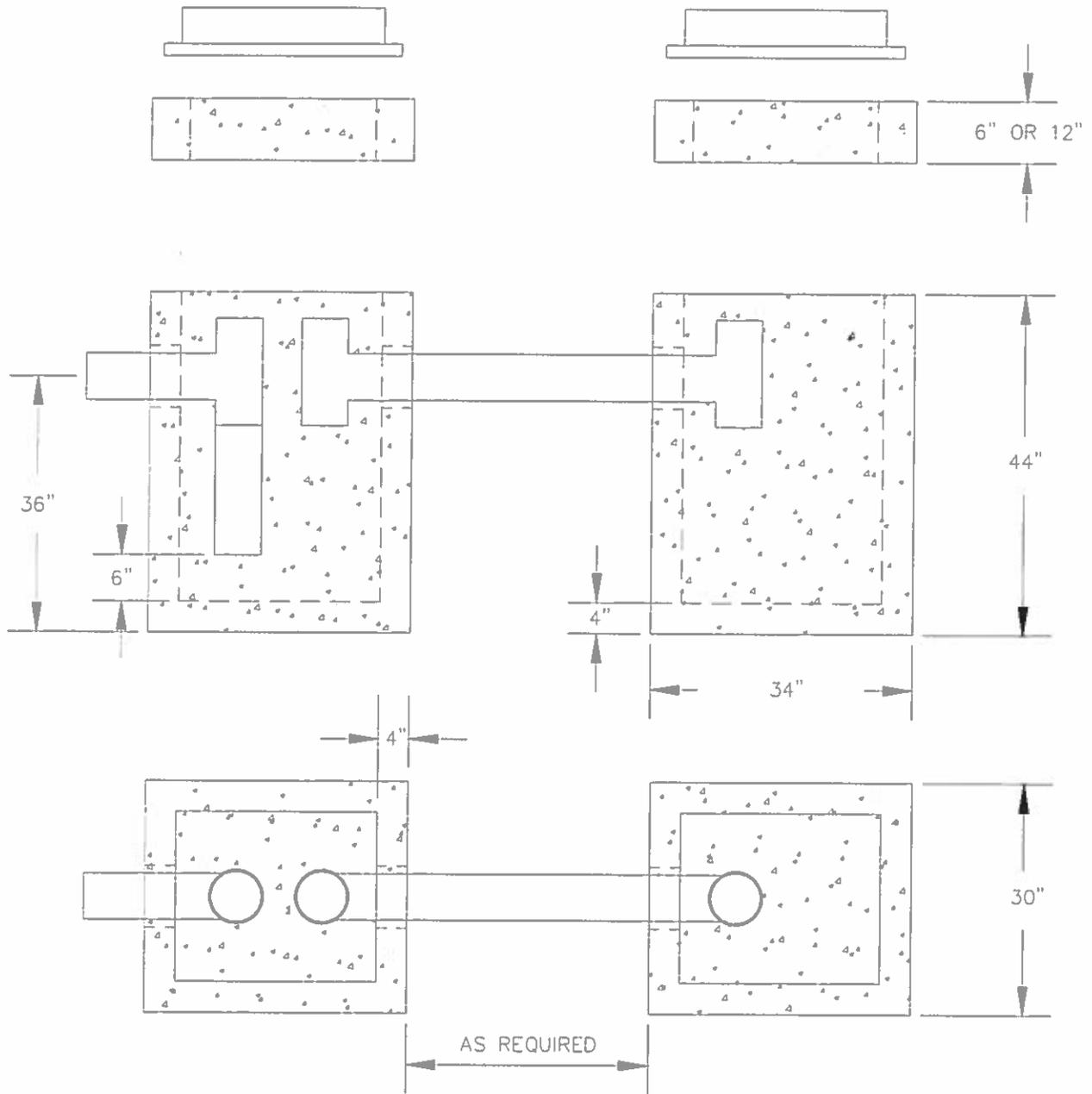
1. As an acceptable alternate to rebar, wire mesh having a minimum area of 0.12 square inches per foot may be used. Wire mesh shall not be placed in knockouts.
2. The knockout diameter shall not be greater than 20". Knockouts shall have a wall thickness of 2" minimum to 2-1/2" maximum.
3. The maximum depth from the finished grade to the pipe invert shall be 5'.
4. Frame and grate may be installed with flange down or cast into adjustment section.
5. The precast base section may have a rounded floor and the walls may be sloped at a rate of 1:24 or steeper.
6. Opening shall be measured at the top of the precast base unit.



10-076

CATCH BASIN TYPE II (Oil Separator)

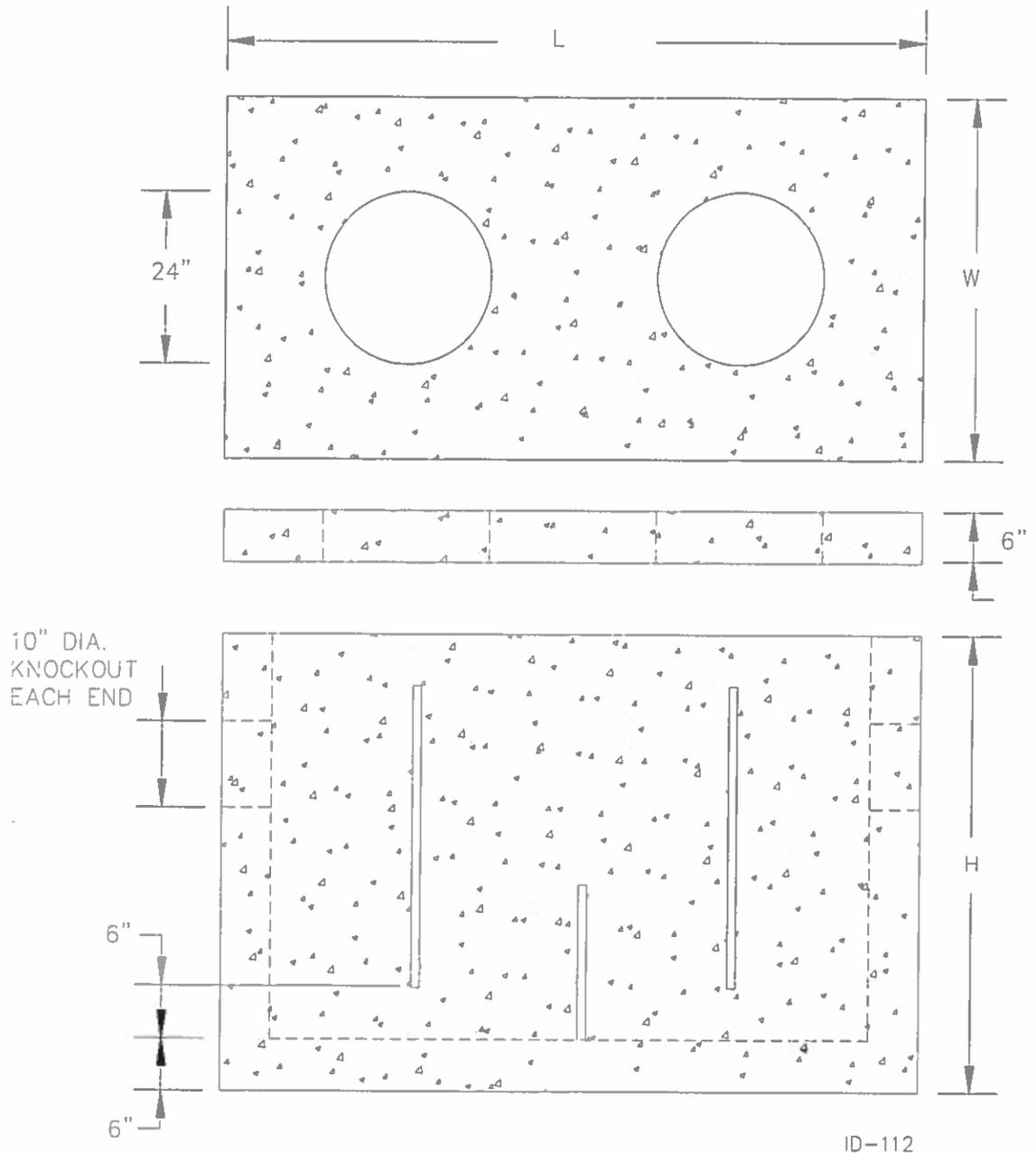
H2 PRE-CAST BIGO OIL SEPARATOR BASE NO. CB1 RISER NOS. SU6 AND SU12 FRAME AND GRATE NOS. FGR AND FGS OR EQUAL. PIPE AND FITTINGS 6" THROUGH 12"DIA. PVC SCH. 40



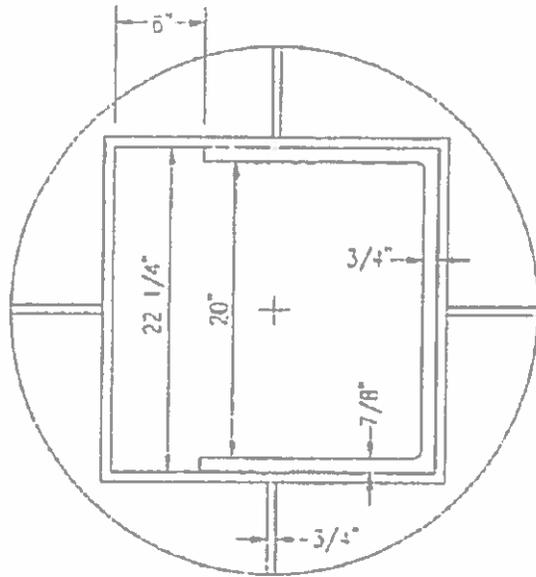
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CATCH BASIN TYPE III (Oil Separator)

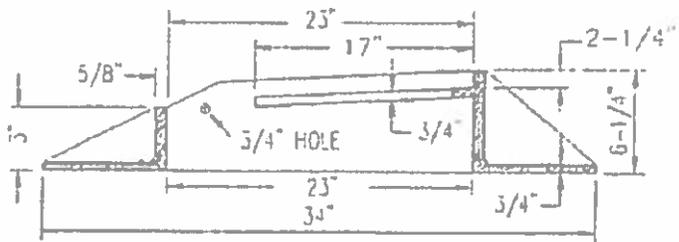
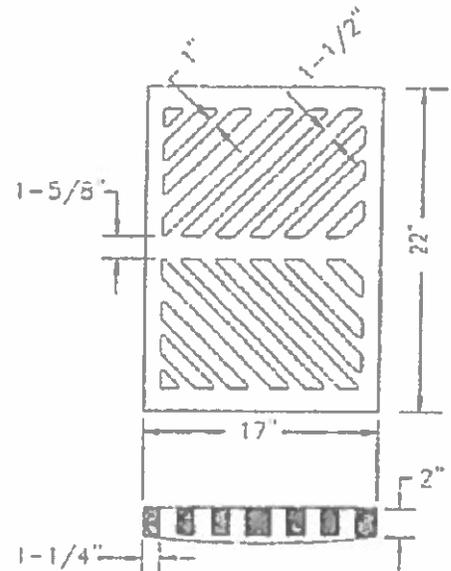
OIL SEPARATOR WITH BAFFLE AND WEIR
SIZE AS PER ENGR ANALYSIS
H2 PRECAST MFG OR APPROVED EQUAL



CATCH BASIN FRAME AND GRATE

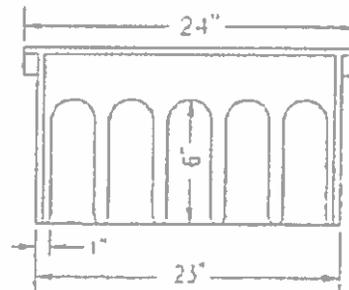
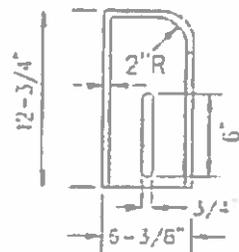


TYPE "A" FRAME

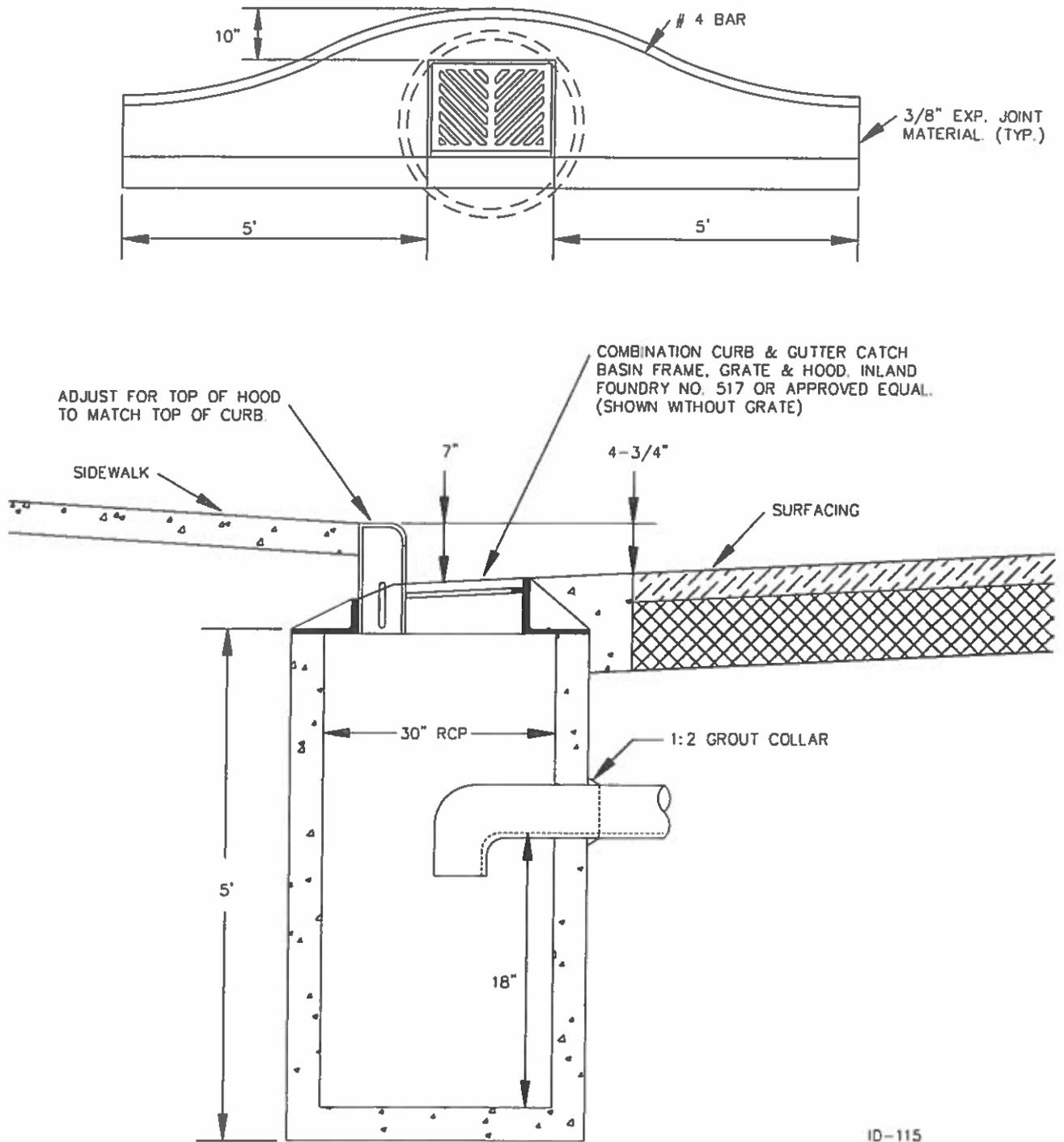


TYPE "A" FRAME

NOTE: THE FRAME, GRATE AND HOOD SHALL BE INLAND FOUNDRY CO NO 517 OR APPROVED EQUAL.



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