
COPIES OF THESE
ENGINEERING STANDARDS FOR
CONSTRUCTION OF PUBLIC IMPROVEMENTS,
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CITY OF HUNTSVILLE, P. O. BOX 308, HUNTSVILLE, ALABAMA 35804-0308

PRICE PER MANUAL \$20.00

**HUNTSVILLE, ALABAMA
ENGINEERING STANDARDS
FOR
CONSTRUCTION OF PUBLIC IMPROVEMENTS**

Prepared for:

**CITY OF HUNTSVILLE
Huntsville, Alabama**

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May 1991

**HUNTSVILLE, ALABAMA
ENGINEERING STANDARDS
FOR
CONSTRUCTION OF PUBLIC IMPROVEMENTS**

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DRAWINGS

DRAINAGE DETAILS

DR-100 to DR-166

STREET DETAILS

ST-200 to ST-257

SANITARY SEWER DETAILS

SS-300 to SS-330

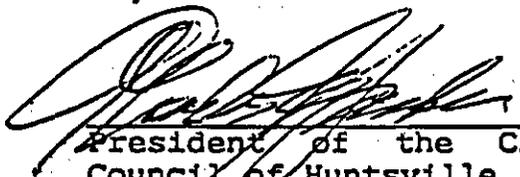
ORDINANCE NO. 93-268

An ordinance amending the City of Huntsville Engineering Standards for Construction of Public Improvements, 1991 Edition.

BE IT ORDAINED by the City Council of the City of Huntsville, Alabama, that the City of Huntsville Engineering Standards for Construction of Public Improvements, 1991 Edition, as adopted by Ordinance No. 91-374, as amended, are hereby further amended as follows:

1. Replace Standard Drawing No. SS-304 with Standard Drawing Nos. SS-304R (Method "A"), SS-304R (Method "B"), and SS-304R (Non-traffic Areas), attached hereto and referred to collectively as Exhibit "A."
2. Replace Standard Drawing No. SS-305 with Standard Drawing Nos. SS-305R (Method "A"), SS-305R (Method "B"), and SS-305R (Non-traffic Areas), attached hereto and referred to collectively as Exhibit "B."
3. Replace Standard Drawing No. DR-166 with Standard Drawing Nos. DR-166R (Method "A"), DR-166R (Method "B"), and DR-166R (Storm Sewers in Non-traffic Areas), attached hereto and referred to collectively as Exhibit "C".
4. Add Standard Drawing No. SS-313 (Bedding and Backfill Procedures Around Manholes and other Drainage and Sanitary Sewer Structures in Traffic Areas), attached hereto as Exhibit "D."
5. Add Standard Drawing No. SS-314 (Bedding and Backfill Procedures Around Manholes and other Drainage and Sanitary Sewer Structures in Non-traffic Areas), attached hereto as Exhibit "E."

ADOPTED this the 13th day of May, 1993.

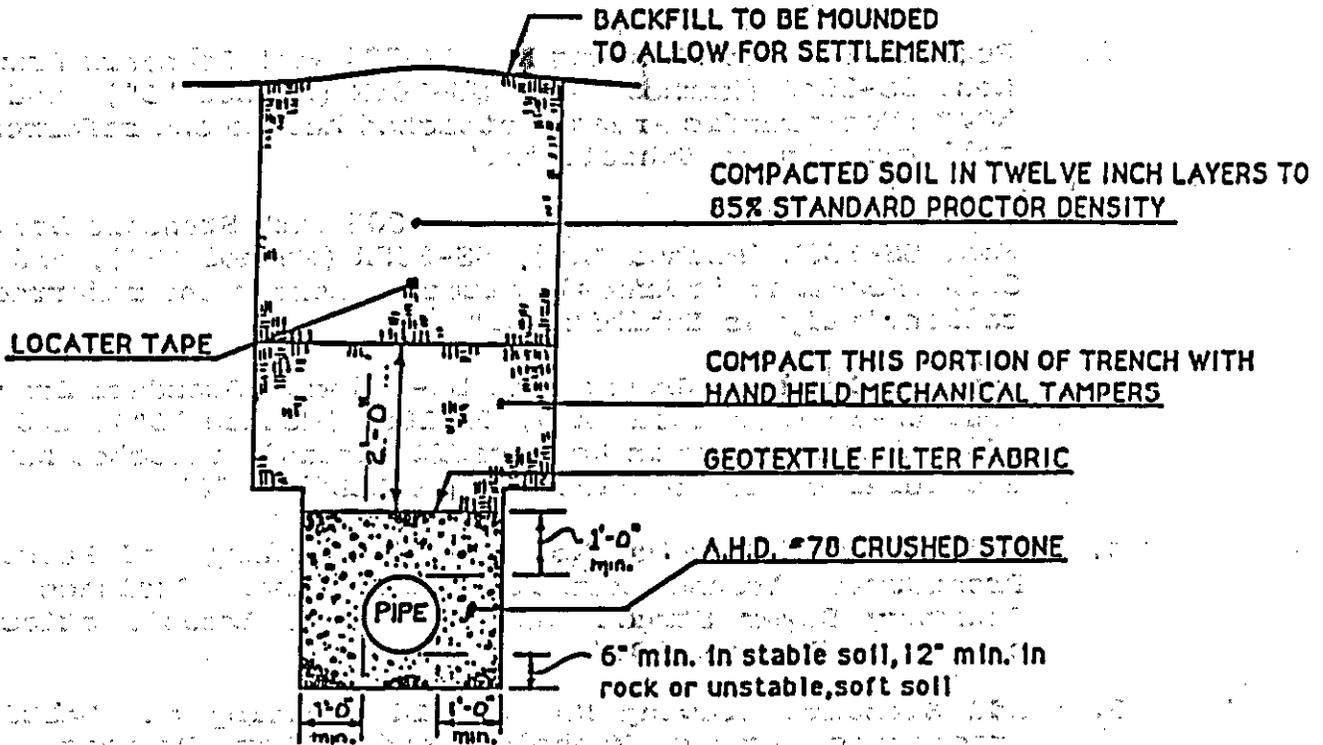


President of the City
Council of Huntsville,
Alabama

APPROVED this the 19th day of May, 1993.

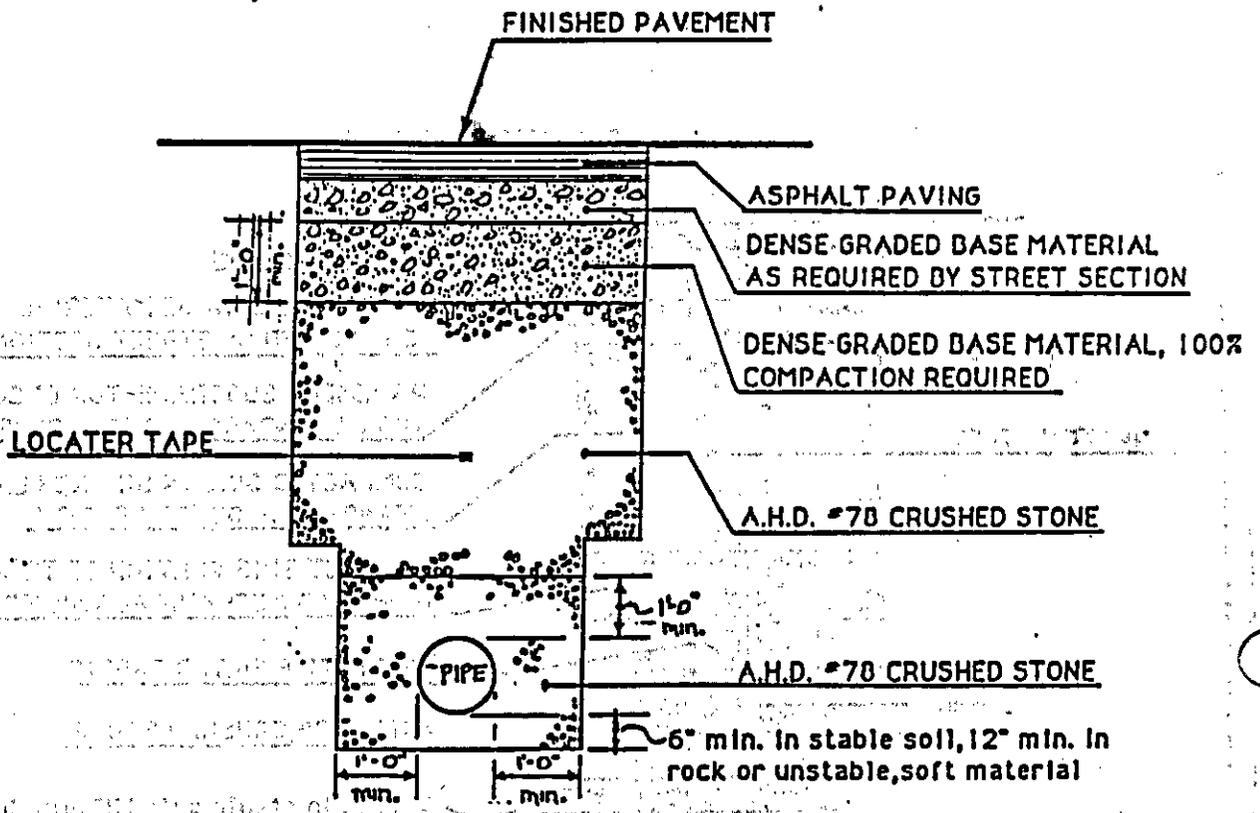


Mayor of the City of
Huntsville, Alabama



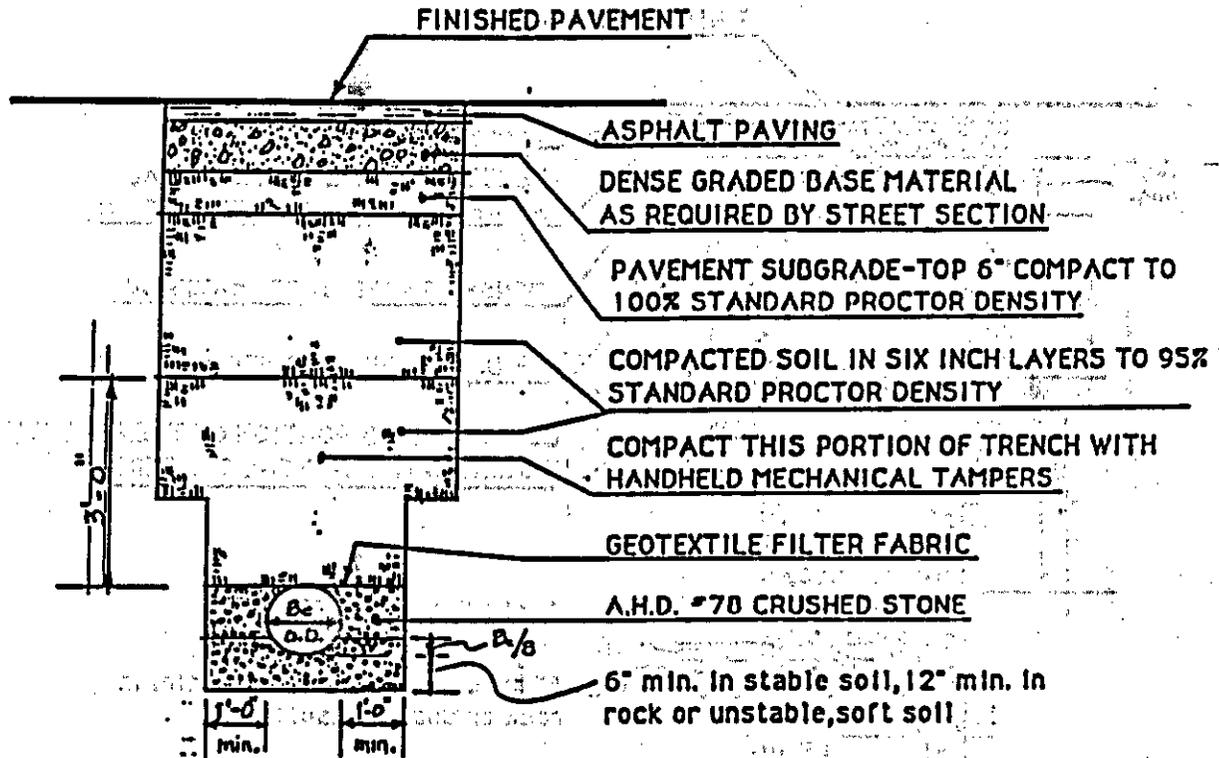
PVC AND FLEXIBLE SANITARY SEWER PIPE IN NON-TRAFFIC AREAS

REVISIONS			CITY OF HUNTSVILLE	
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DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS	SS-304R DRAWING NO.



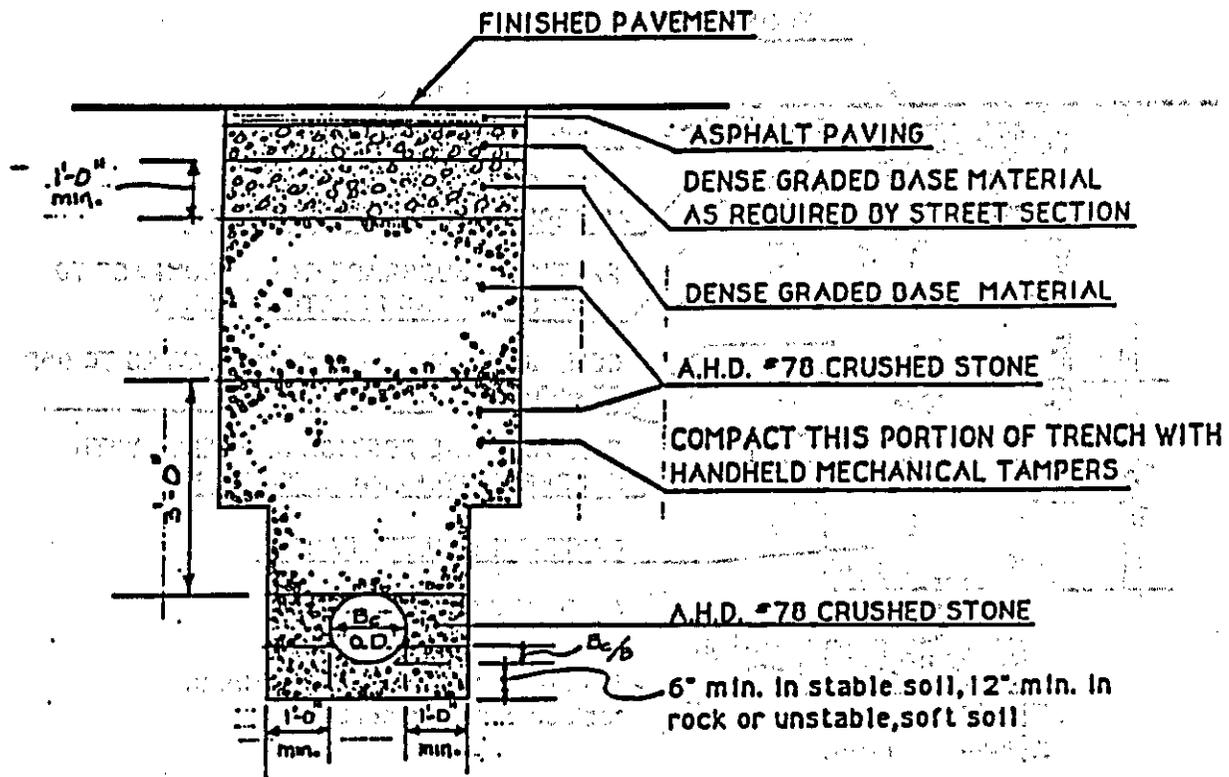
METHOD "B"-PVC AND FLEXIBLE SANITARY SEWER PIPE IN PROPOSED TRAFFIC AREAS OR WITHIN STREET RIGHTS-OF-WAY

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DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS	SS-304R DRAWING NO.



METHOD "A"-DUCTILE IRON SANITARY SEWERS IN PROPOSED TRAFFIC AREAS OR WITHIN STREET RIGHTS-OF-WAY

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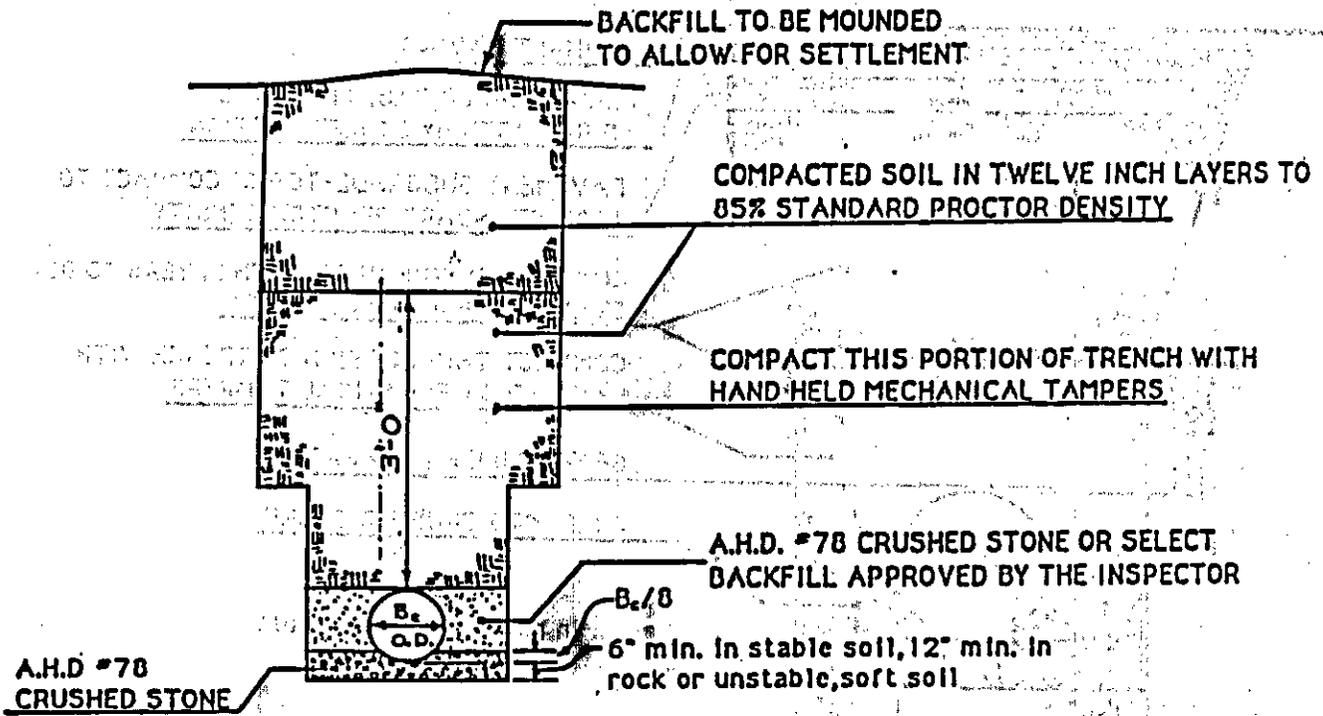
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CITY OF HUNTSVILLE

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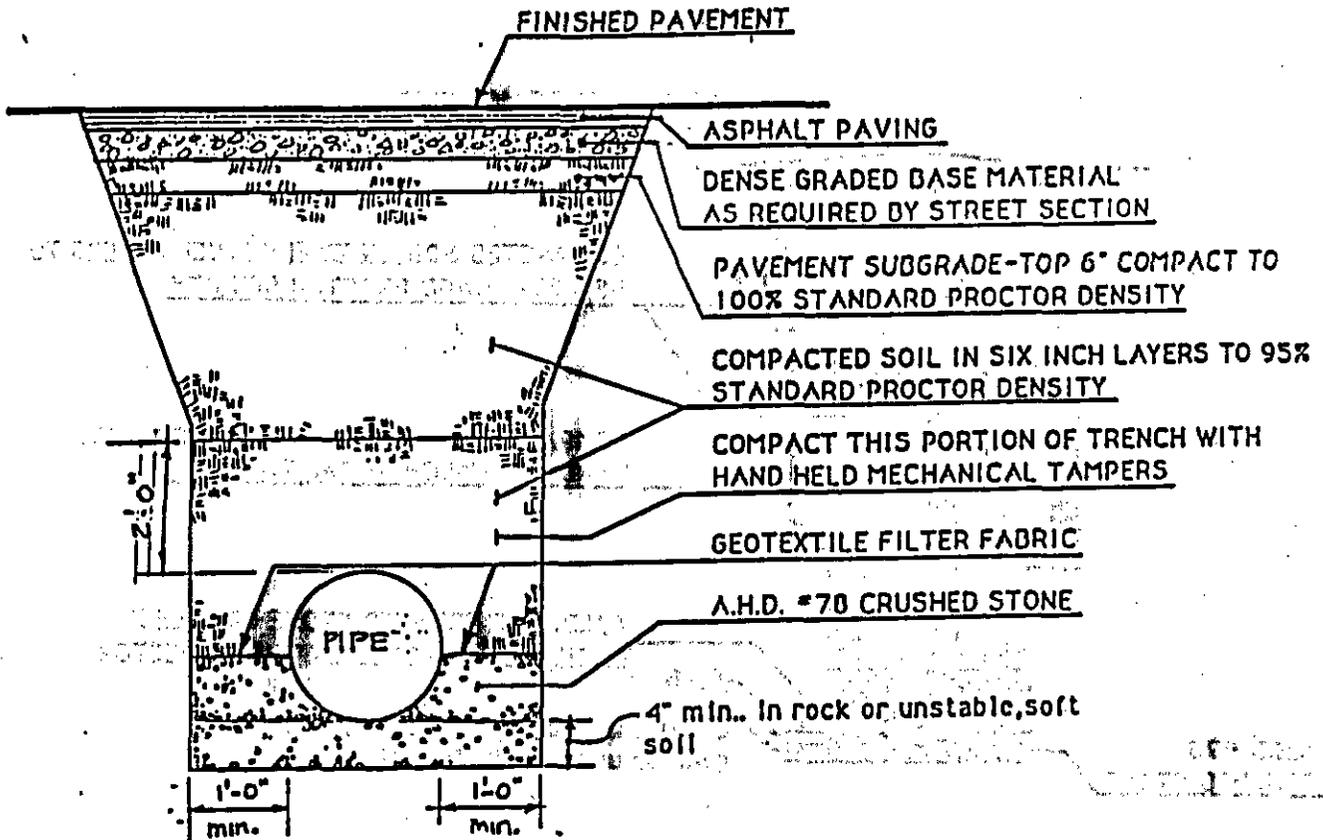
ENGINEER OF PUBLIC WORKS

SS-305R
DRAWING NO.



DUCTILE IRON SANITARY SEWERS IN NON-TRAFFIC AREAS

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			DUCTILE IRON SANITARY SEWER PIPE BEDDING AND BACKFILL DETAIL IN NON-TRAFFIC AREAS	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS	SS-305R DRAWING NO.



METHOD "A"-STORM SEWERS IN PROPOSED TRAFFIC AREAS OR WITHIN STREET RIGHTS-OF-WAY

CITY OF HUNTSVILLE

METHOD "A"-BEDDING AND BACKFILL DETAIL FOR STORM SEWERS IN PROPOSED TRAFFIC AREAS OR WITHIN STREET RIGHTS-OF-WAYS

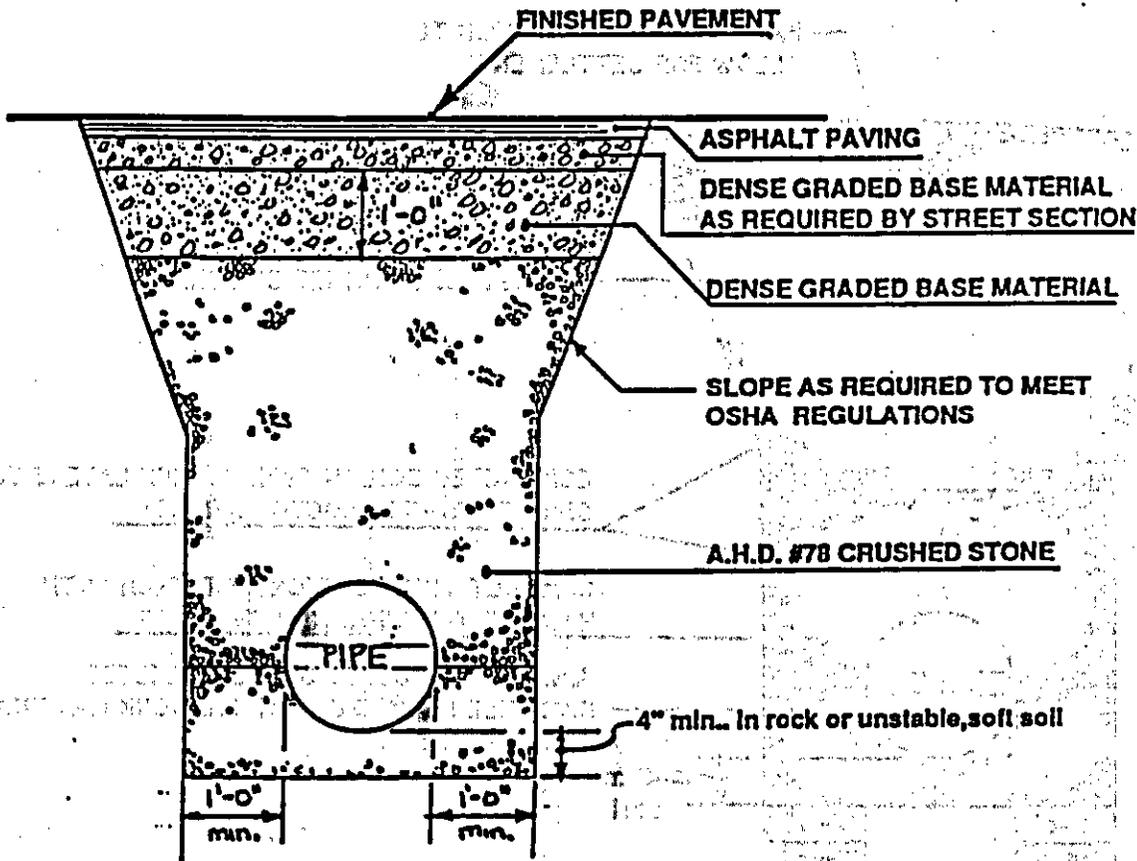
REVISIONS		
DESCRIPTION	NAME	DATE

DIRECTOR

DATE

ENGINEER OF PUBLIC WORKS

DR-166R
DRAWING NO.



METHOD "B"-STORM SEWERS IN PROPOSED TRAFFIC AREAS OR WITHIN STREET RIGHTS-OF-WAYS

REVISIONS

DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

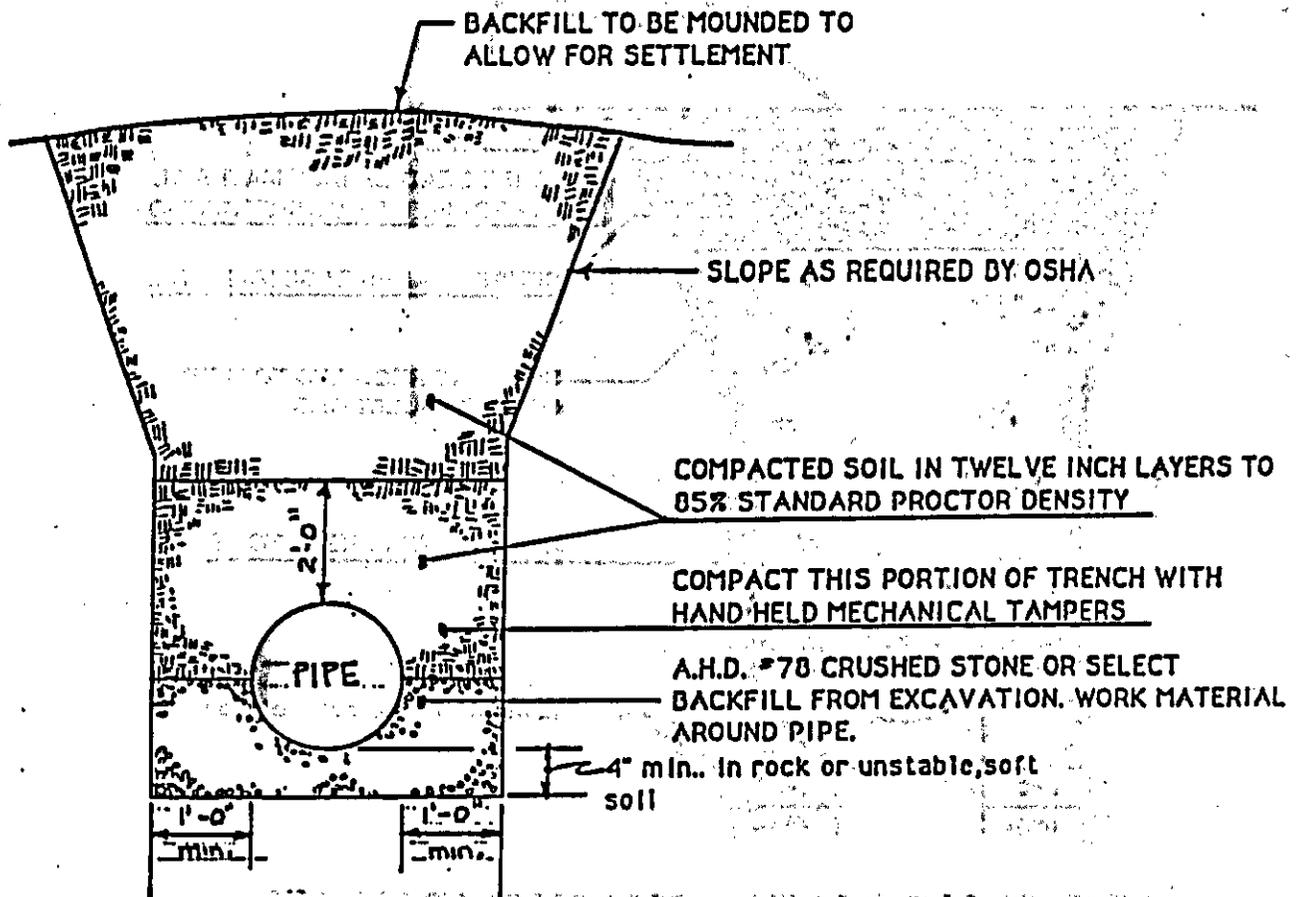
METHOD "B"-BEDDING AND BACKFILL DETAIL FOR STORM SEWERS IN PROPOSED TRAFFIC AREAS OR WITHIN STREET RIGHTS-OF-WAYS

DIRECTOR

DATE

ENGINEER OF PUBLIC WORKS

DR-166R
DRAWING NO.

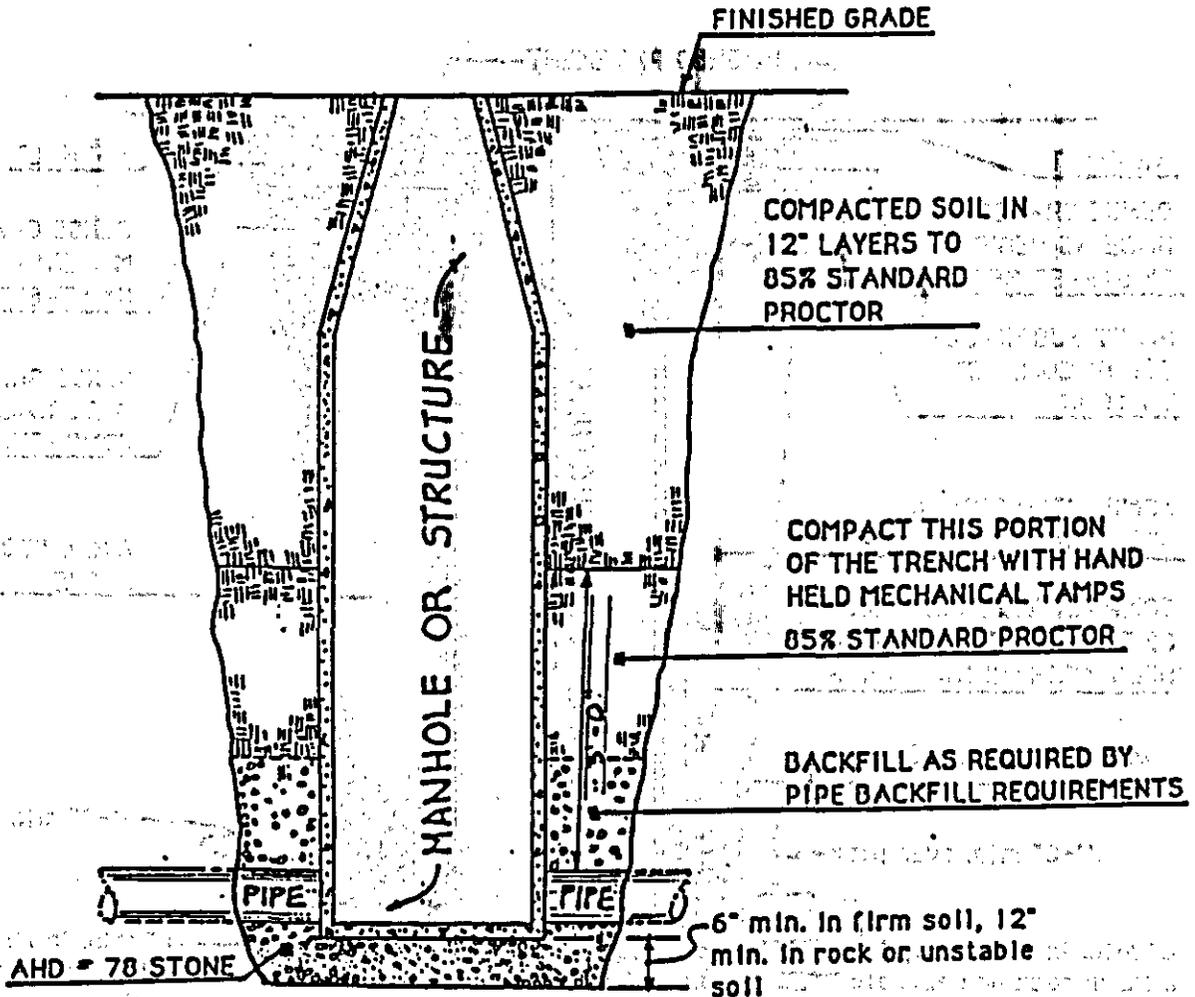


STORM SEWERS IN NON-TRAFFIC AREAS

REVISIONS			CITY OF HUNTSVILLE
DESCRIPTION	NAME	DATE	
			BEDDING AND BACKFILL DETAIL FOR STORM SEWERS IN NON-TRAFFIC AREAS
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS
			DR-166R DRAWING NO.

BEDDING AND BACKFILL REQUIREMENTS AROUND MANHOLES AND OTHER DRAINAGE AND SANITARY SEWER STRUCTURES

2. AREAS OUTSIDE THE STREET RIGHT-OF WAY OR IN NON-TRAFFIC AREAS



REVISIONS			CITY OF HUNTSVILLE
DESCRIPTION	NAME	DATE	
			BEDDING AND BACKFILL REQUIREMENTS AROUND MANHOLES AND OTHER DRAINAGE AND SANITARY SEWER STRUCTURES IN NON-TRAFFIC AREAS
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS
			SS-314 DRAWING NO.

100. BASIS FOR USE OF STANDARDS

The purpose of this document is to assemble in one volume the engineering standards that apply to public improvements. These standards have been arrived at as means of protecting the public health, safety and welfare. Such standards will assure that facilities that are accepted to the City of Huntsville meet the requirements for their long term use and maintenance.

We expect to relate the requirements of public facilities here as clearly as is possible. Construction components not subject to dedication to the public are not discussed in this volume. Designers must still check for compliance of non-dedicable facilities in the companion documents described in the next section.

200. DESCRIPTION OF COMPANION DOCUMENTS

201. Stormwater Management Manual and Ordinances

The City of Huntsville has adopted the Huntsville Stormwater Management Manual to establish regulations and technical guidelines for stormwater management. The manual is oriented principally to the needs of designers and engineers for land development projects.

The manual is a comprehensive technical document, and is based upon Ordinance 87-269, as amended, Floodway - Floodway Fringe District Regulations and Ordinance _____, the Stormwater Management Ordinance. These ordinances are provided as appendices (A and B, respectively) to the manual.

The manual contains a comprehensive summary running a total of 14 pages (S-1 through S-14), and so the manual will not be summarized in detail here. However, the organization of the manual is of importance and is described briefly in the following paragraphs.

Part 1 of the manual is outlined Policy, Permitting and Regulations and is comprised of the first three chapters. This section deals with regulatory, submittal, enforcement and bonding issues, and summarizes the design criteria which are discussed in detail later in the manual.

Part 2 of the manual is entitled Technical Information, and is comprised of Chapters 4 through 10. This section deals with the detailed technical information and methodology for calculations required by the ordinance.

While the Huntsville Stormwater Management Manual deals with the drainage problems and solutions for the storm drainage on a site, it also sets design standards for several aspects of the drainage system, public or private. These standards include side slopes on ditches and swales, inlet and outlet structures, and other similar items. As these standards occur throughout the manual, the reader is cautioned to check appropriate chapters carefully for any standards which may be applied to the project being designed.

Drainage facilities which will be dedicated to the City after completion must be designed in accordance with the technical criteria set forth in these chapters.

202. Subdivision Regulations

The Subdivision Regulations of the City of Huntsville is a document which provides guidance for the subdivision of land within the planning jurisdiction of the City. As such, it deals with conventional subdivision (into numerous smaller lots) and sets requirements for the provision of public services for the new lots. The Subdivision Regulations also address unconventional subdivision situations such as the conveyance of land between immediate family members and the subdivision of multi-family housing projects.

The Subdivision Regulations are comprised of eight (8) articles, as briefly described below. Those areas which are of importance to the design of infrastructure for the public's use are highlighted.

ARTICLE 1 - GENERAL PROVISIONS

Defines the purposes of the regulations, the authority by which they have been promulgated, jurisdiction for their use, procedure for amendment, and the basis for variance from the standards.

ARTICLE 2 - DEFINITIONS

Defines the terms used elsewhere in the regulations. Such terms do not include design standards, but do define organizations whose standards have been adopted by the City of Huntsville as appropriate.

ARTICLE 3 SUBDIVISION APPLICATION PROCEDURE AND PLAT REQUIREMENTS

The title clearly expresses the content of this article. The article does not set any design or engineering standards, but does set out the requirements for the attention of professional engineering during the process of submittal and approval. It provides guidance for the level of engineering study expected in the proposed improvements for both public and private use. The article also sets certification requirements for all engineering plans and subdivision plats.

ARTICLE 4 - REQUIREMENTS FOR IMPROVEMENTS AND DESIGN

This article first sets out all other agencies having jurisdiction over plats in Section 4.1. The remainder of the article, in Sections 4.2 through 4.16, sets out criteria for the design of all aspects of a subdivision.

The following sections are of particular interest to this volume, as they include design criteria having to do with the layout of public improvements.

- 4.5 Roads**
- 4.6 Sidewalks**
- 4.7 Drainage and Storm Sewers**
- 4.8 Sanitary Sewer Facilities**
- 4.9 Water Facilities**
- 4.10 Utilities**
- 4.11 Easements**

These sections set out standards, or refer to other standards which have been adopted by the City of Huntsville. These sections do not deal with materials or means of construction.

ARTICLE 5 - ASSURANCE FOR COMPLETION AND MAINTENANCE OF IMPROVEMENTS

Article 5 establishes the general procedures by which completion of the public and private improvements is assured. The article sets time standards for construction or deferral of required improvements and for bonding these improvements to the satisfaction of City officials.

ARTICLE 6 - MINOR SUBDIVISION APPLICATION PROCEDURE AND PLAT REQUIREMENTS

This article defines certain simple subdivision activities as "Minor Subdivisions" and then sets out standards for the production of the plats required and the procedures to be followed to create the subdivision. The article does not set out any design criteria for public improvements other than to establish when a sidewalk will be required, and actually refers to Article 4 to set the design criteria.

ARTICLE 7 - REQUIREMENTS FOR LAND CONVEYANCE AMONG IMMEDIATE FAMILY MEMBERS

Article 7 is also well titled, and other than a statement regarding minimum lot frontage for newly created lots, does not set up any design-related standards.

ARTICLE 8 - APARTMENT SITE PLAN SUBMISSION REQUIREMENTS

This article establishes procedures for documents, submittals, review and approval for multi-family housing which is to be subdivided into a number of "lots."

203. Zoning Ordinance

The Zoning Ordinance of the City of Huntsville, Alabama was enacted in 1963 and has been amended on numerous occasions subsequent to its original enactment. The original ordinance was recompiled twice, in 1978 and in 1989, to incorporate all the amendments in force at the time of recompilation. Since the 1989 recompilation, there have been further amendments and the process continues to this date.

The purpose of the Zoning Ordinance is to establish districts within the City's corporate limits which allow certain temporary or permanent uses relevant to the City's existing land use pattern and proposed pattern of growth. The establishment of a zoning district establishes not only the uses permitted therein, but also spatial regulations, having to do with the minimum allowable size and configuration of a lot within a district, building bulk and placement on a tract of land, requirements for parking to serve the proposed use, standards for signage, landscape and other such major aspects of the proposed development. However, the Zoning Ordinance does not set out any design standards for public improvements.

The Zoning Ordinance also establishes a review process for dealing with proposed variations in the design or use of a site, where the standards normally enforced create an unnecessary hardship on the property in question.

Finally, the Zoning Ordinance establishes certain procedures for review of plans and issuance of building permits. A certificate of occupancy is required by the ordinance for the use of any structures constructed within the City's corporate limits.

204. Standard Specifications for Construction

The City Engineer has compiled a volume of Standard Specifications for Construction, adopted by the City Council, which deal with materials and methods of construction for public improvements. These specifications are derived in large measure from the Standard Specifications for Highway Construction, 1989 edition, by the State of Alabama Highway Department.

The subject volume is comprised of three major divisions. Division I (General Requirements) contains sections that provide a Definition of Terms, Scope of Work, Control of Work, and Legal Relations and Responsibility to public.

Division II is entitled Construction Details and provides the technical specifications for construction of public improvements. These improvements include:

- Earthwork, including excavation, clearing, etc.
- Bases
- Surfacing and Pavements
- Structures
- Incidentals
- Traffic Control Devices

The detailed list of items covered is reproduced in Section 501 of this document. Each specification section deals with the item being specified in the following ways:

- Description
- Materials
- Construction Requirements

Division III is entitled Materials and provides a detailed description of the materials specified previously in Division II, to include material testing and approvals as set out by nationally recognized authorities.

The construction methodology and material requirements of the Standard Specifications coupled with the Engineering Standards as set forth in this document provide comprehensive guidance for the design and construction of public improvements.

205. Blasting Ordinance

205.1 Purpose

This ordinance established standards intended to eliminate and reduce unnecessary and excessive airblast overpressures, ground vibrations, and dust which are physically harmful and otherwise detrimental to individuals and the

community, in the enjoyment of life, property, and conduct of business. The standards established herein apply to the detonation of explosives used to demolish a structure and to fragment rock for mining, quarrying, excavation, and construction within the city limits of Huntsville and the police jurisdiction thereof.

205.2 Scope of Ordinance (Jurisdiction)

This ordinance in no way replaces or negates the requirements pertaining to explosives as contained in the Fire Prevention Code of the American Insurance Association, 1970 Edition, as the same may be amended, or any rule or regulations of any governmental agency. The Fire Prevention Code is administered by the Chief of the Huntsville Fire Department within the city limits of Huntsville, and by the State Fire Marshal or his authorized representative within the police jurisdiction of Huntsville.

205.3 Definitions

"Explosives" shall mean any substance, chemical compound, or mechanical mixture that is commonly used for the purpose of producing an explosion to demolish a structure and to fragment rock for mining, quarrying, excavation, and construction. Initiating devices (detonators, detonating cords, etc.) are also included under this definition.

"Air Pollution Control Officer" shall mean the Director of the Air Pollution Control Department of the City of Huntsville, or in his absence, the designated Air Pollution Control Officer of the Department of Air Pollution Control.

"Person" shall mean any individual, partnership, firm, association, municipality, public or private corporation or institution, political subdivision or agency of the State, any trust estate or any other legal entity and any successor, representative, agent, or agency of the foregoing.

205.4 Blasting Permits

205.4.1 Any person detonating explosives within the City limits of Huntsville or the police jurisdiction thereof shall first obtain authorization for such activity from the Air Pollution Control Officer in the form of a Blasting Permit.

205.4.2 Blasting Permits shall only be issued to persons possessing a valid Blaster's Certificate issued by the Air Pollution Control Officer. Any blaster receiving certification from any Department or Agency of the State of Alabama, issued after appropriate testing of the qualifications to handle and use explosives, is exempt from having to obtain a Blaster's Certificate from the Air Pollution Control Officer.

205.4.3 Blasting Permits may be issued subject to specific conditions, consistent with standards provided herein, in which the case the conditions shall be specified in writing. The holder of a Blasting Permit shall comply with conditions contained in such permit as well as all applicable provisions of this ordinance. Commencing blasting operations under such a Blasting Permit shall be deemed acceptance of all the conditions specified.

205.4.4 Display of Blasting Permit

A person who has been granted a Blasting Permit shall keep such permit under file at the site or on display at all times where the blasting operation is located and shall make such permit readily available for inspection by the Air Pollution Control Officer or his representative.

205.4.5 Permit Applications

Applications for Blasting Permits required by this ordinance shall be in the form prescribed by the Air Pollution Control Officer and shall give all the information necessary to enable the Air Pollution Control Officer to make the determinations herein required.

205.4.6 Action on Application

The Air Pollution Control Officer shall act, within a reasonable time, on an application for a Blasting Permit and shall notify the applicant in writing of its approval, conditional approval, or denial.

205.4.7 Denial of Application

In the event of a denial of a Blasting Permit, the Air Pollution Control Officer shall notify the applicant in writing of the reason therefor. Service of this notification may be made in person or by mail, and such service may be proved by the written acknowledgement of the persons served or affidavit of the person making the service.

205.4.8 Revocation of Blasting Permits

Any Blasting Permit granted by the Air Pollution Control Officer may be revoked, after notice and hearing, for any of the following causes:

- 1.) Failure to comply with the provisions of this ordinance;
- 2.) Failure to comply with any conditions of the Blasting Permit;
- 3.) For any other cause if, in the judgement of the Air Pollution Control Officer, continuance of the permit is not consistent with the purposes of this ordinance.

205.4.9 Transfer

A Blasting Permit shall not be transferable whether by operation of law or otherwise, either from one location to another, or from one person to another.

205.4.10 Expiration of Blasting Permit

Blasting Permits shall expire on the date specified on the face of the permit. In no event, however, may a blasting Permit be issued which has an expiration date of longer than one year from the date of issuance in the case of blasting operations at limestone quarries or other mining operations, or three calendar months from the date of issuance for blasting operations at all other locations.

205.4.11 Permit Fees

Permit fees shall be paid at the time of application in the amount of \$100 for each Blasting Permit issued for operations at limestone quarries or other mining operations and \$25 for each Blasting Permit issued for operations at other locations. Fees shall be made payable to the City of Huntsville and shall be non-refundable.

205.5 Blaster's Certification

205.5.1 General

Blaster's Certificates, whether issued in the name of an individual or of a corporation or other entity, shall bear the name, address, and photograph of the person whose qualifications have been tested with respect to such Certificate. Any such Certificate issued to a corporation or other entity shall be valid only during the time that the qualifying individual is supervising the blasting operations being conducted. Blaster's Certificates are valid for three (3) years from the date of issuance. In addition to the qualifications specified in paragraph 205.5.2 in this Section, such person must satisfy each of the following qualifications:

- 1.) Present evidence of training, knowledge and experience in the handling and use of explosives,
- 2.) Be knowledgeable of federal, state and local laws and regulations pertaining to explosives,
- 3.) Pass a qualifying written or oral examination demonstrating such training, experience, and knowledge, and
- 4.) Demonstrate a minimum of one years hands-on experience in the handling and use of explosives.

205.5.2 Qualifications

A Blaster's Certificate shall not be issued unless:

- 1.) The applicant is at least 21 years of age,
- 2.) The applicant has not within three (3) years from the date of said application been convicted of a willful violation of any provision of this ordinance,
- 3.) The applicant has not knowingly withheld information and has not made false or fictitious statement intended or likely to deceive in connection with the application.

205.5.3 Application for Certificate

Applications for a Blaster's Certificate shall be filed in a manner and form prescribed by the Air Pollution Control Officer and shall give all the information necessary to enable the Air Pollution Control Officer to make the required determinations.

205.5.4 Certificate Fee

A fee of \$100 shall be paid at the time the application for a Blaster's Certificate is submitted. Fee shall be made payable to the City of Huntsville. Any applicant failing to obtain a Certificate because of not passing the qualifying examination before re-examination, must submit a new application and fee.

205.5.5 Revocation of Blaster's Certificate

Any Blaster's Certificate issued by the Air Pollution Control Officer may be revoked by said Officer, after notice and hearing, for any of the following causes:

- 1.) A willful violation of any provision of this ordinance,
- 2.) Unintentional but repeated violations of any of the provisions of this ordinance,
- 3.) Conviction of a felony by a court of law, and

- 4.) Willful and intentional falsification of information submitted on an application for a Blasting Permit or and application for a Blaster's Certificate.

205.6 Bond Required

Before a Blasting Permit is issued, the applicant shall file with the Air Pollution Control Officer a corporate bond in the principal sum of five hundred thousand dollars (\$500,000), or a public liability insurance policy, including explosion, collapse, and underground coverage with identical limits, for the purpose of the payment of all damages to persons or property which may arise from, or be caused by, the conduct of any act authorized by the Blasting Permit upon which any legal judgement results. The principal sum of the bond shall be increased to one million dollars (\$1,000,000) if a person applies for more than one Blasting Permit at a time. The Air Pollution Control Officer may specify a greater or lesser amount when, in his opinion, conditions at the location of the proposed blasting operation indicate a greater or lesser amount would be sufficient for the purposes of payment of all damages to persons or property which may arise from, or be caused by the conduct of such blasting. Public agencies may exempt from the bond requirements of this ordinance.

205.7 Vibration and Airblast Overpressure Levels

Except as otherwise authorized herein, the allowable ground vibration and airblast overpressure levels resulting from the detonation of explosives are:

205.7.1 Ground Vibration

Levels not to be exceeded at any time: 0.50 inches/second peak particle velocity for frequencies below 40 hz and 2.00 inches/second for frequencies equal to and greater than 40 hz; except that, if the measured ground vibration level continuously exceeds 0.50 inches/second particle velocity after a period of one (1) second following the maximum particle velocity, the charge weight per delay shall be reduced so that the particle velocity does not exceed 0.50 inches/second.

205.7.2 Airblast Pressure

Level not to be exceeded at any time:

129 peak dB_L (linear) - 0.1 hz high-pass system

128 peak db_L (linear) - 2 hz high-pass system

124 peak db_L (linear) - 5 or 6 hz high-pass system

The requirements established within Section 207 apply to any property of concern but no closer than at or beyond the property line of property under the control – through ownership or lease or other contractual agreement – of persons having the blasting operation performed. Where a conflict exists regarding the location or determination of which property line applies, then the nearest building structure shall be considered as being at or beyond the property line of persons having the blasting operation performed.

205.8 General Provisions

205.8.1 Flyrock. When blasting operations, other than blasting operations at limestone quarries, are performed within 1500 feet of any structure, railway or highway, the blast shall be covered before firing with a mat constructed so that it is capable of preventing fragments from being thrown.

205.8.2 Blasting detonations are allowed only during daylight hours, but not earlier than 7:00 a.m. local time.

205.8.3 A certified blaster and at least one other person shall be present during the firing of all blasts.

205.9 Notifications

Any person detonating explosives shall first notify the Air Pollution Control Officer that a blast is planned. Such notification shall be received at least four (4) hours prior to the planned detonation and shall give the time (within ± 30 minutes), location where the blasting is to be done, the amount of explosives to be used, and the name and business address of the person responsible for the blasting operation. Twenty-four (24) hour notification is required for blasting operations to

be conducted on Saturdays and Sundays and for those blasting operations performed after 5:00 p.m. local time on weekdays. This additional notification period is needed to allow sufficient time to coordinate monitoring of the blast at times which are not considered by personnel of the Air Pollution Control Department to be normal work hours. The notification may be given orally over the telephone; however, the burden of proof as to whether the notification was in fact received rests with the person responsible for the blasting operation. The Air Pollution Control Department Office which is currently located at 2033-C Airport Road, Huntsville, Alabama 35801 is normally open for business between 8:00 a.m. and 5:00 p.m. on weekdays. The current telephone number is (205) 881-7803.

205.10 Instrumentation

A three component direct-reading velocity instrument with a frequency response of 5 hz or below to 200 hz and adhering to the design criteria for portable seismographs as outlined in U.S. Department of Interior, Bureau of Mines report RI 8506, "Measurement of Blast-Induced Ground Vibrations and Seismograph Calibration" shall be used for determining compliance with the ground vibration limits specified in Section 205.7. The minimum frequency ranges for ground vibration instrumentation are 2 to 150 hz for quarry blasting and 5 to 200 hz for construction and excavation blasting. The maximum allowable peak particle velocity shall apply to each of the three components.

An airblast channel having a frequency range of 0.1 to 200 hz, 2 to 200 hz, or 5 or 6 hz to 200 hz on a blasting seismograph shall be used for determining compliance with the airblast overpressure levels specified in Section 205.7. The instrumentation shall adhere to the design criteria and operational guidelines as outlined in U.S. Department of Interior, Bureau of Mines report RI8508, "Airblast Instrumentation and Measurement Techniques for Surface Mine Blasting."

Instruments shall be operated in accordance with the instrument manufacturer's instructions. Instrument measurements shall be considered valid only when ambient levels are less than 0.1 inches/sec and 10 dB lower than the levels of the explosive blast being measured.

205.11 Inspection and Monitoring

The Air Pollution Control Officer, or his authorized representative may conduct tests and observe any authorized blasting operations, and may also order that persons holding Blasting Permits measure the ground vibration and airblast overpressure during blasting operations using approved instrumentation.

205.12 Compliance Schedule

All provisions of this ordinance shall be in effect and in force immediately upon its passage and approval (adoption), except that any requirements regarding blaster certification (Blaster's Certificates) shall take effect and be in force from and after one hundred twenty (120) days following said effective date.

205.13 Records

Persons responsible for blasting operations shall maintain a record of each blast. All records shall be retained at least three (3) years and shall be available for inspection by the Air Pollution Control Officer and shall contain the following minimum data:

- A. Name of person responsible for the blasting operation.
- B. Location, date and time of blast.
- C. Name of blaster in charge.
- D. Type of material blasted.
- E. Number of holes, burden and spacing.
- F. Diameter and depth of holes.
- G. Types of explosives used.
- H. Amount of explosives used.
- I. Maximum amount of explosives per delay period of eight milliseconds or greater.

- J. Maximum number of holes per delay period of eight milliseconds or greater.
- K. Method of firing and type of circuit.
- L. Weather conditions (including such factors as wind directions, etc.).
- M. Height or length of stemming.
- N. Buff-mats or other protections were used.
- O. Type of detonators used and delay periods used.
- P. Seismograph and airblast readings when measured.

205.14 Reports

Persons possessing valid Blasting Permits shall submit a report each month to the Air Pollution Control Officer. The report shall be submitted no later than the seventh of each month and shall contain for each Blasting Permit:

- A. The amount of each type of explosive used,
- B. The number of blasts (firings),
- C. The location of the blasts, and
- D. The maximum ground vibration and airblast overpressure levels measured for each blast and the approximate distance of the seismograph from the blast.

205.15 Penalties

Any person who violates or fails or refuses to obey or comply with any provision of this ordinance or submits any false information required by this ordinance shall be guilty of a misdemeanor and upon conviction shall be punished as provided by law.

205.16 Method of Enforcement

The Air Pollution Control Officer and any person acting under his supervision is hereby authorized to issue citations to appear in Recorder's Court to answer charges of violations of any of the provisions of this ordinance.

205.17 Exceptions Based on Undue Hardship

Applications for a permit for exception from the standards or requirements designated in this ordinance may, on the basis of undue hardship, be made to the Air Pollution Control Officer. Any permit granted hereunder shall contain all conditions upon which said permit has been granted and shall specify a reasonable time that the permit shall be effective. The Air Pollution Control Officer may grant the exception as applied for only if:

A. The activity or operation will be of a temporary duration; i.e., a limited number of blasts at a specific site; and cannot be done in a manner that would comply with this ordinance; and,

B. No other, reasonable alternative is available to the applicants; and,

C. Applicants represent, and the Air Pollution Control Officer finds, that the blasting as permitted will not violate recognized safety standards.

Upon the issuance of any exception permit, the Air Pollution Control Officer may prescribe any reasonable conditions or requirements he deems necessary to minimize adverse effects upon the community.

205.18 Exemptions

Nothing contained in this ordinance shall be construed as applying to the regular military or naval forces of the United States, the duly authorized militia of the State, or to the police and fire departments in the proper performance of their duty.

205.19 Severability

If any provision of this ordinance is declared unconstitutional or held invalid, it shall not affect any other section, clause, or provision thereof, but the same shall remain in full force and effect.

300. SUBMITTAL PROCESS AND REQUIRED FEES

The following sections will describe the submittal requirements leading ultimately to the approval of the public facilities or those that will be dedicated to the City of Huntsville as public facilities. Any facilities that are constructed which will be dedicated as public facilities to the City of Huntsville must be formally accepted by the City of Huntsville before the City will perform any maintenance on the facilities. The procedure for acceptance of improvements and facilities by the City of Huntsville area described in Section 600 of this document.

300.1 The City of Huntsville requires that the documents are prepared under the direction of design professionals and surveyors who are licensed practitioners in the State of Alabama.

300.2 The City of Huntsville requires that any engineering firm designing public improvements carry professional liability insurance as follows:

Contracts with total costs less than \$500,000
Limit equal to \$500,000 per claim

Contracts with total costs in excess of \$500,000
Limit equal to \$1,000,000 per claim

Non-standard contracts or contracts with total costs exceeding \$3,000,000 (i.e., bridges, overpasses, tunnels, etc), refer to Risk Management for the insurance limit.

300.3 The City of Huntsville requires that any contractor constructing public improvements be properly licensed, and maintain liability insurance no less than the following:

a. **General Liability: Commercial General Liability per occurrence for bodily injury and property damage:**

\$3,000,000	General Aggregate Limit
\$3,000,000	Products- Completed Operations Aggregate
\$3,000,000	Personal & Advertising Injury
\$3,000,000	Each Occurrence

b. Owners, Contractors, Protective: Contracts with total costs less than \$500,000:

\$1,000,000 Aggregate
\$1,000,000 Per Occurrence

Contracts with total costs of \$500,000 or more:

\$3,000,000 Aggregate
\$3,000,000 Per Occurrence

c. Automobile Liability: \$3,000,000 Combined Single Limit per accident for bodily injury and property damage.

d. Workers' Compensation: As required by the State of Alabama Statute.

e. Employers Liability:

\$500,000 Bodily Injury, by Accident or Disease
\$500,000 Policy Limit

f. Professional Liability: Contracts with total cost less than \$500,000. Limits equal to \$500,000 per claim.

Contracts with total costs in excess of \$500,000. Limits equal to \$1,000,000 per claim.

Non-standard contracts or contracts with total costs exceeding \$3,000,000 (i.e., bridges, overpasses, tunnels, etc.), refer to Risk Management for the Insurance limit.

301. Planning Commission

Submittals to the Planning Commission of the City of Huntsville will be in the form of subdivision submittals, and are described in detail in the Subdivision Regulations (Article 3). These submittals occur at three points in the subdivision process: Layout Approval; Preliminary Approval; and, Final Approval. Each of the submittals will require approvals by other departments or agencies, and in order to gain these signatures, plan submittal and review must be coordinated with the other departments or agencies. Those submittals are detailed in Sections 302 through 305 of this document.

The first submittal is for Layout Approval. At that time, the consultant will submit:

301.1 An application, on a form available at the office of the Director of the Planning Department.

301.2 Three (3) copies of the following required documents as detailed in the Subdivision Regulations:

- 301.2.1 Sketch Plat
- 301.2.2 Slope Map
- 301.2.3 Site Assessment Map
- 301.2.4 Site Assessment Report

301.3 A vicinity map.

301.4 One copy of the documents (301.2 above) reviewed and approved by the Director of the Transportation Department.

301.5 A Geotechnical Investigation and Testing Plan is required where the Site Assessment Map Plan indicates potential geotechnical problems. No fees are required for the submittal for Layout Approval.

The submittal for Layout Approval will be reviewed by the Subdivision Committee of the Planning Commission which will submit its recommendation to the full Planning Commission. The Planning Commission will consider the application at its next regular meeting and may require a public hearing. The Planning Commission may ask the applicant for certain additions and changes to be made.

Approval allows the applicant to proceed to the next stage, which is submittal for Preliminary Approval. This submittal will take the proposed project to the "construction document" level, so the coordination of other agencies to gain their approval will be increased over that of the submittal for Layout Approval. The consultant will submit:

301.1 An application, on a form available at the Office of the Director of the Planning Department.

301.2 Three copies of the preliminary plat with certificates.

301.3 One copy of the construction drawings (to include the plat) with all required certifications.

301.4 Three copies of the Geotechnical Investigation and Testing report (if required as a result of Layout Approval).

The Subdivision Regulations contain requirements for both the preliminary plat and the construction documents, and a list of certifications for both documents as well as the Geotechnical Investigation and Testing Report. Separate requirements and certifications are provided for:

- 301.1 Geotechnical Investigation and Testing Report
- 301.2 Vegetation Plan
- 301.3 Grading Plan
- 301.4 Erosion and Sedimentation Control Plan
- 301.5 Street Plan
- 301.6 Stormwater Drainage Plan
- 301.7 Sanitary Sewer Plan
- 301.8 Septic Tank Plan (if applicable)
- 301.9 Utilities, except natural gas
- 301.10 Natural Gas
- 301.11 Wells

In addition, there is a fee to be paid at the time of submittal. That fee is set out in paragraph 3.3(1)(ii) of the Subdivision Regulations and is One Hundred Dollars (\$100) plus Five Dollars (\$5) per lot. Separate review fees for review and certification of the items listed above may be listed by the reviewing agencies.

The submittal for Preliminary Approval will be studied by the Subdivision Committee of the Planning Commission which will submit its recommendation to the full Planning Commission. The Planning Commission will consider the submittal at its next regular meeting and will hold a public hearing in conjunction with their deliberations. The Planning Commission will act upon the submittal (to approve or disapprove the preliminary plat) and, if approved, the developer may commence construction of the project.

Final Approval is the last of the three major steps at the Planning Commission and is the step which is required prior to the sale of any of the parcels within the subdivision. This step should be taken after the construction and approval of the required public improvements, but may be advanced in time by providing a bond which will guarantee sufficient funds to cover the cost of public improvements in the event of developer default.

The consultant will submit:

- 301.1 An application on a form available at the Office of the Director of the Planning Department.
- 301.2 Three copies of the Final Plat with certificates.
- 301.3 Closure computations for the boundary.

301.4 A Performance Bond for any public improvements not yet completed.

The Final Plat requires numerous certifications and the signature of numerous officials. The Final Plat will be reviewed in a regularly scheduled meeting by the Planning Commission and will be approved if in compliance with all requirements of the Subdivision Regulations (or if disapproved, the reasons will be stated). After approval of the Final Plat by the Planning Commission, the plat must be recorded within six (6) months, and the public improvements (if bonded in lieu of completion prior to final approval) must be installed within two (2) years.

302. Public Works

The submittals to the City Engineer and his staff are also set out in the Subdivision Regulations and are a part of the approval process for land development projects. Those submittals are:

302.1 At Preliminary Plat Approval, submit the Preliminary Plat, the Construction Documents, and the Geotechnical Investigation and Testing Report (if required).

The City Engineer must sign certificates of approval on:

- a. The Grading and Drainage Plan
- b. The Erosion and Sedimentation Control Plan
- c. The Street Plan
- d. The Stormwater Drainage Plan
- e. The Sanitary Sewer Plan

302.2 At Final Plat Approval, submit the Final Plat and Estimate of cost for items to be bonded. The City Engineer must sign certificates of approval on Final Plat.

- a. These certificates are for approval of the plat itself, and either acceptance of public improvements or authorization of a bond for unbuilt public improvements.

302.3 Non-subdivision Related Construction.

There are also submittal requirements to the City Engineer for construction of related public facilities outside the subdivision. All plans should also be submitted to the Huntsville Department of Natural Resources and Environmental Management. These include the development of a single existing lot or project where no approval has been granted for the overall project, and where the grading exceeds the minimum standards set out in Chapter 2 (Policy and Permitting) of the Stormwater Management Manual of the City of Huntsville. Chapter 2 also describes the required application process and documentation requirements. The registered engineer shall submit an estimate of cost for these items and a bond shall be posted in this amount prior to commencement of construction. Construction plans for non-subdivision roads and utilities shall be in accordance with these guidelines and shall include the following sheets, if applicable:

- a. The Grading and Drainage Plan
- b. The Erosion and Sedimentation Control Plan
- c. The Street Plan
- d. The Stormwater Drainage Plan
- e. The Sanitary Sewer Plan

A site assessment map and report in accordance with the Subdivision Regulations shall be submitted with all construction plans.

303. Huntsville Utilities

The submittals to Huntsville Utilities are set out in the Subdivision Regulations and are part of the approval process for land development projects. Those submittals are:

303.1 At Preliminary Plat Approval, submit the Preliminary Plat, the Construction Documents, and the Geotechnical Investigation and Testing Report (if required). The utility service must sign certificates of approval indicating availability of service for water service (if within the water service area) and electrical service.

303.2 At Final Plat Approval, submit the Final Plat. The utility service must sign a certificate approving the plat for recording. Huntsville Utilities must also sign a certificate acknowledging proper completion of the water system, or a certificate recommending the bond amount for unconstructed systems.

304. Department of Transportation

The submittal to the Huntsville Department of Transportation includes:

304.1 At the Layout Approval, submit the sketch plat for review. The Director of the Department must sign a certification that he has reviewed the sketch plat.

304.2 At the Preliminary Plat Approval, submit the Preliminary Plat, the Construction Documents. The Director of the Department of Transportation must sign a certificate acknowledging his acceptance of the design of the streets (geometrics) and the use of the street names.

305. Other Departments

There are other agencies having review authority under the Subdivision Regulations.

Specifically, in areas outside the service areas for Huntsville Utilities water service, water supply must be approved by the serving authority, if there is one, or by the County's Public Health Department if wells are required. If sewers are not provided by the Department of Public Works sewer service, the Septic Tank Plan must be approved by the Health Department. Certifications of approval will be required at the Preliminary and Final Plat Approvals.

Other utility systems must also review and approve the plats and construction documents. These include the local telephone and cable television companies and the Natural Gas Department of the City of Huntsville. These reviews require submittal of Preliminary Plat and Construction Documents and will require signatures on certificates of approval at the Preliminary Plat Approval level.

400. DESIGN REVIEW SCHEDULES

The design review schedule is a key element of the project management plan. It defines the timing and sequence of design reviews, which are critical to ensuring the quality and success of the project. The schedule should be developed in collaboration with the project team and approved by the sponsor and steering committee.

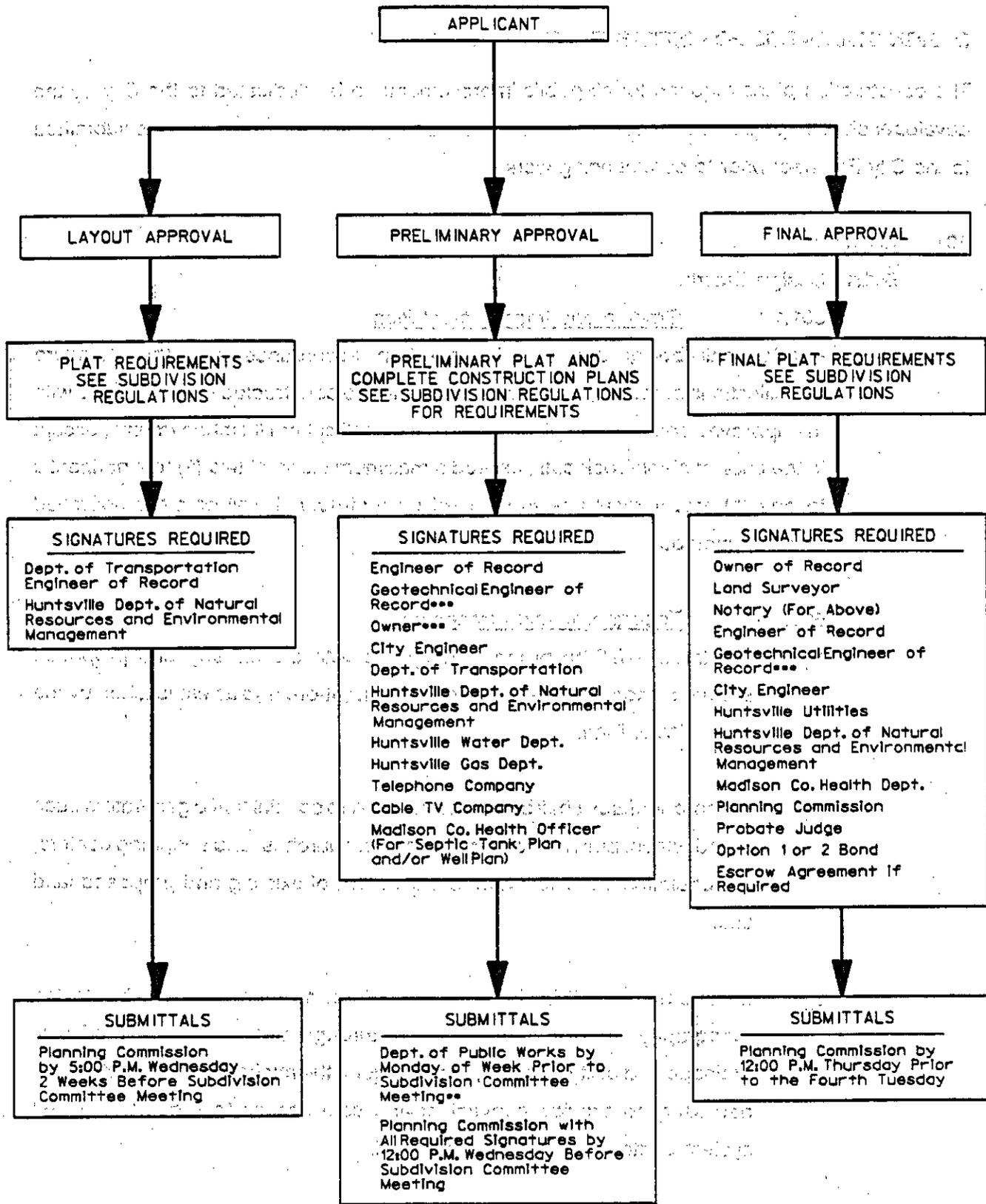
The design review schedule should be updated as the project progresses and new information becomes available. It should be a living document that reflects the current state of the project and the needs of the project team.

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Meeting Dates

Planning Commission - Fourth Tuesday of Each Month
 Subdivision Committee - Third Wednesday of Each Month

- Required If Not in Huntsville City Limits
- Signature of Other Authorities Not Required Before Submittal to the Dept. of Public Works
- For Geotechnical Investigation and Testing Plan (Optional Depending Upon Site Character)

Design Review Schedule

500. DESIGN STANDARDS FOR INFRASTRUCTURE ITEMS

The construction plans required for all public improvements to be dedicated to the City by the developer shall be prepared in accordance with these "Design Standards" and shall be submitted to the City Engineer prior to commencing work.

501. Roadways

501.1 Design Criteria

501.1.1 Grading and Improvement Plan

Roads shall be graded and improved in accordance with the Standard Specifications of the City of Huntsville and shall be constructed in accordance with the approved construction plans. In no case shall cut or fill embankments, except in the case of stable rock cuts, exceed a maximum slope of two (2) feet horizontal to one (1) foot vertical unless retained by a structural wall or other approved retaining method.

501.1.2 Topography and Arrangement

- 1.) All streets shall be properly integrated with the existing and proposed system of thoroughfares and dedicated right-of-ways as established by the Major Street Plan.
- 2.) All thoroughfares shall be properly related to special traffic generators such as industries, business districts, schools, churches, and shopping centers; to population densities; and to the pattern of existing and proposed land uses.
- 3.) Local streets shall be laid out to conform as much as possible to the topography, to discourage use by through traffic, to permit efficient drainage and utility systems, and to require the minimum number of streets necessary to provide convenient and safe access to property. A grid system of street layout is discouraged.

4.) Subdivisions which abut or have included within the proposed area to be subdivided any major collector or arterial street shall provide screening in accordance with the Subdivision Regulations.

501.1.3 Street Plans

All street plans shall meet the following the requirements:

1.) Detail plans plotted on plan and profile sheets to a minimum scale of 1"=100' horizontal, and 1"=10' vertical.

2.) Plan section including the street and right-of-way plotted to the proper scale with stationing shown, and matching that of the profile section as nearly as possible.

3.) Typical roadway sections, as appropriate.

4.) Where conventional roadway sections are used, the stabilization required for the roadside ditches, including the linear extent and type of stabilization required.

5.) Profile section plotted to the same scale as identified above and including the proposed centerline finish grade profile, in addition to the existing centerline profile.

6.) Where curb type sections are to be used, existing ground profile at 25 feet left and right of centerline, including the centerline, in accordance with the Subdivision Regulations.

7.) All vertical control points on or pertaining to the proposed centerline profile such as PVC, PVI and PVT; all low points and streets intersections as to station and elevation.

8.) All percent grades and vertical curve data, both balanced and unbalanced, K-values and roadway design speed.

9.) Centerline finished grade elevations every 50 feet to the nearest hundredth of a foot, at the bottom of the profile sheet.

10.) Plan and profile sheets shall be signed and sealed by a registered engineer.

501.1.4 Reserve Strips

Unusable reserve strips controlling access to streets shall be prohibited. Land shall not be subdivided in a manner which omits part of the original tract to avoid drainage improvements.

501.1.5 Dead-end Roads

1.) The arrangement of streets shall provide for the continuation of streets between adjacent properties when such continuation is necessary for convenient movement of traffic, coordinating the layout of the subdivision with the existing layout or most advantageous future development of adjacent tracts, effective access for emergency services including police, fire and ambulances, effective provision of utilities, or where such continuation is in accordance with the Major Street Plan. If the adjacent property is undeveloped and the street must be a dead-end street temporarily, the street and right-of-way shall be extended to the property line.

2.) Where a road does not extend to the boundary of the subdivision and its continuation is not required by the Planning Commission for access to adjoining property, its terminus shall normally not be nearer to such boundary than fifty (50) feet. However, the Planning Commission may require the reservation of an appropriate easement to accommodate drainage facilities, pedestrian traffic or utilities. A cul-de-sac turnaround

shall be provided at the end of a permanent dead-end street. For greater convenience to traffic and more effective police and fire protection and emergency service, permanent dead-end streets shall, in general, be limited in length in accordance with the design standards of these regulations.

501.1.6 General Design Standards

In order to provide for roads of suitable location, width and improvement, to accommodate prospective traffic and afford satisfactory access to police, firefighting, sanitation, and road maintenance equipment, and to coordinate roads so as to compose a convenient system and avoid undue hardships to adjoining properties, the following design standards for roads are hereby required. Road classification shall be as indicated on the Major Street Plan or as determined by the Planning Commission. Typical sections for all road classifications are included in the Drawings (ST250 - ST257). However, the sections shown for Arterials and Collectors provide for minimum requirements only. The developer's engineer shall provide an actual pavement design in accordance with the AASHTO Method of Flexible Pavement design, Caltrans Method of Flexible Pavement Design, or another method if approved by the City Engineer.

The pavement sections are based on a stable subgrade as defined in Section 201 of the Standard Specifications. Specifically, the subgrade material will consist of selected compactible soil from Unclassified Excavation or Borrow, or Class I or Class II rock as specified in Section 105 of the Standard Specifications, or suitable compactible in-place soil. Subgrade soil must have a Plasticity Index (PI) of 30 or less, and a Liquid Limit (LL) of 55 or less. Soils which do not meet these limits as determined by an approved soil testing laboratory will not be approved as a suitable subgrade material. The City Engineer will consider a modified roadbed and pavement design; otherwise, all unsuitable subgrade soil will be removed and replaced with a material or solid that will meet all the subgrade requirements.

No construction materials such as concrete and brick will be allowed in the subgrade material. Solid rock may be allowed in the subgrade if approved by the Engineer of Record and is at least 12 inches below the finished subgrade elevation.

The subgrade shall be constructed so that it will have, as nearly as practical, uniform density throughout. No base course, surfacing or pavement shall be constructed on the subgrade until the specified density is obtained (as confirmed by a Soils Testing Laboratory), and the elevations are in close conformity to that specified by the plans (i.e., plus or minus five hundredths of a foot (0.05') from the designated grade and slope elevations) and until all test reports required by these specifications are checked and the subgrade construction is approved by the Engineer of Record and the City Engineer. If the density requirements are not met, then the Contractor will rework the failed sections of the subgrade until the required density is obtained.

Any pumping of subgrade will be reworked by removing the underlying wet material replacing with a suitable subgrade material, compacted to the required density and reshaped and graded to the planned elevation and grade. Where undercutting is required to remove unsuitable subgrade material, all the unsuitable soil shall be removed and replaced with suitable soil.

The subgrade in both cuts and fills shall be compacted to a density of one hundred (100) percent of the maximum density in the top six (6) inch layer, and ninety-five (95) percent of the maximum density below six (6) inches in depth as determined by the AASHTO T-99 Compaction Test.

Moisture content at the time of in-place density tests shall be within + or -2% of the optimum moisture content established during the control density test.

The standard pavement width for local streets shall be twenty-six (26) feet measured from edges of asphalt pavement. However, the Planning Commission may require an additional 3 feet of pavement width upon recommendation by the Director of Department of Transportation pertaining to those local streets that either connect with collector or arterial streets, or for local streets which will connect with other as yet to be developed property(ies). The required right-of-way, minimum pavement width, and maximum grade for all road classifications are listed in the Subdivision Regulations. Required classifications shall be provided by the Planning Commission based on the major street plan. No on-street parking shall be permitted on said streets having a pavement width less than twenty-seven feet (27').

Those geometrics dealing with vehicular safety shall be developed in accordance with AASHTO (American Association of State Highway and Transportation Officials) geometric design policy, current editions, for streets and highways which will include radius of curvature, length of vertical curve, and all applicable sight distances. Exceptions to AASHTO 25 m.p.h. design criteria requirements may be granted for cul-de-sacs and loop roadways serving 50 (fifty) dwelling units or less in mountainous terrain. Criteria for minimum length of tangents between reverse curves, maximum length of cul-de-sacs, and minimum radius of cul-de-sac turnarounds are provided in the Subdivision Regulations. Tables 1, 2, and 3 provide design guidelines from AASHTO for minimum curve radius and minimum stopping sight distance. In addition, the sight distance section of Chapter 9, At-Grade Intersections, should be used to determine the required intersection sight distance.

TABLE 1
VALUES FOR DESIGN ELEMENTS RELATED TO DESIGN SPEED
AND HORIZONTAL CURVATURE

D	R (ft)	V = 30 mph			V = 40 mph			V = 50 mph			V = 60 mph				
		L (ft)		e	L (ft)		e	L (ft)		e	L (ft)		e		
		Two Lanes	Four Lanes		Two Lanes	Four Lanes		Two Lanes	Four Lanes		Two Lanes	Four Lanes			
0°15'	22,918	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
0°30'	11,459	0	0	NC	0	0	NC	0	0	NC	0	0	NC	175	265
0°45'	7,639	0	0	NC	0	0	NC	150	225	RC	175	265	RC	175	265
1°00'	5,730	0	0	NC	0	0	NC	125	190	RC	150	225	RC	175	265
1°30'	3,820	100	150	NC	125	190	RC	125	190	.024	150	225	.029	175	265
2°00'	2,865	100	150	NC	125	190	RC	125	190	.027	150	225	.033	175	265
2°30'	2,292	100	150	RC	125	190	.022	125	190	.030	150	225	.036	175	265
3°00'	1,910	100	150	.020	100	150	.025	125	190	.033	150	225	.039	175	265
3°30'	1,637	100	150	.022	100	150	.027	125	190	.035	150	225	.040	175	265
4°00'	1,432	100	150	.024	100	150	.028	125	190	.037	150	225	$D_{max} = 3°45'$		
5°00'	1,146	100	150	.026	100	150	.030	125	190	.039	150	225			
6°00'	955	100	150	.028	100	150	.033	125	190	.040	150	225			
7°00'	819	100	150	.030	100	150	.035	125	190	.037	150	225			
8°00'	716	100	150	.031	100	150	.037	125	190	.039	150	225			
9°00'	637	100	150	.033	100	150	.040	125	190	.040	150	225			
10°00'	573	100	150	.034	100	150	.035	125	190	$D_{max} = 10°00'$					
11°00'	521	100	150	.035	100	150	.036	100	150						
12°00'	477	100	150	.036	100	150	.037	100	150						
13°00'	441	100	150	.037	100	150	.038	100	150						
14°00'	409	100	150	.038	100	150	.039	100	150						
15°00'	358	100	150	.039	100	150	.040	100	150						
18°00'	318	100	150	.040	100	150		100	150						
19°00'	302	100	150	.040	100	150		100	150						
				$D_{max} = 19°00'$											

NOTES:

- D = degree of curve
- R = radius of curve
- V = assumed design speed
- e = rate of superelevation
- L = minimum length of runoff
- NC = normal crown section
- RC = remove adverse crown, superelevate at normal crown slope

Spirals are not required unless special situations are indicated by the City Engineer.
 Superelevation runoff shall be accomplished by having 2/3% in the tangent and 1/3% in the curve.
 Lengths rounded in multiples of 25 or 50 ft permit simpler calculations.
 In recognition of safety considerations, use of $e_{max} = 0.04$ should be limited to urban conditions.

**TABLE 2
DESIGN CONTROLS FOR CREST VERTICAL CURVES BASED ON
STOPPING SIGHT DISTANCE**

Design Speed (mph)	Assumed Speed for Condition (mph)	Coefficient of Friction, f	Stopping Sight Distance, Rounded for Design (ft)	Rate of Vertical Curvature, K ^a (length (ft) per percent of A)	
				Computed ^b	Rounded for Design
20	20 - 20	0.40	125 - 125	8.6 - 8.6	10 - 10
25	24 - 25	0.38	150 - 150	14.4 - 16.1	20 - 20
30	28 - 30	0.35	200 - 200	23.7 - 28.8	30 - 30
35	32 - 35	0.34	225 - 250	35.7 - 46.4	40 - 50
40	36 - 40	0.32	275 - 325	53.6 - 73.9	60 - 80
45	40 - 45	0.31	325 - 400	76.4 - 110.2	80 - 120
50	44 - 50	0.30	400 - 475	106.6 - 160.0	110 - 160
55	48 - 55	0.30	450 - 550	140.4 - 217.6	150 - 220
60	52 - 60	0.29	525 - 650	189.2 - 302.2	190 - 310
65	55 - 65	0.29	550 - 725	227.1 - 394.3	230 - 400
70	58 - 70	0.28	625 - 850	282.8 - 530.9	290 - 540

^aDifferent K values for the same speed result from using unequal coefficients of friction.

^bUsing computed values for stopping sight distance.

NOTE: Designers shall also refer to intersection stopping sight distance in AASHTO, Chapter 9, At-Grade Intersections.

**TABLE 3
DESIGN CONTROLS FOR SAG VERTICAL CURVES BASED ON
STOPPING SIGHT DISTANCE**

Design Speed (mph)	Assumed Speed for Condition (mph)	Coefficient of Friction, f	Stopping Sight Distance, Rounded for Design (ft)	Rate of Vertical Curvature, K ^a (length {ft} per percent of A)	
				Computed ^b	Rounded for Design
20	20 - 20	0.40	125 - 125	14.7 - 14.7	20 - 20
25	24 - 25	0.38	150 - 150	21.7 - 23.5	30 - 30
30	28 - 30	0.35	200 - 200	30.8 - 35.3	40 - 40
35	32 - 35	0.34	225 - 250	40.8 - 48.6	50 - 50
40	36 - 40	0.32	275 - 325	53.4 - 65.6	60 - 70
45	40 - 45	0.31	325 - 400	67.0 - 84.2	70 - 90
50	44 - 50	0.30	400 - 475	82.5 - 105.6	90 - 110
55	48 - 55	0.30	450 - 550	97.6 - 126.7	100 - 130
60	52 - 60	0.29	525 - 650	116.7 - 153.4	120 - 160
65	55 - 65	0.29	550 - 725	129.9 - 178.6	130 - 180
70	58 - 70	0.28	625 - 850	147.7 - 211.3	150 - 220

^aDifferent K values for the same speed result from using unequal coefficients of friction.

^bUsing computed values for stopping sight distance.

NOTE: Designers shall also refer to intersection stopping sight distance in AASHTO, Chapter 9, At-Grade Intersections.

501.1.7 Sidewalks

1.) Required Improvements:

- a.) Sidewalks shall be constructed in accordance with the Standard Specifications of the City of Huntsville Public Works Department. A median strip of grassed or landscaped area at least three feet and six inches (3'-6") wide shall separate all sidewalks from adjacent curbs; provided however, this distance may be reduced to two feet (2') upon recommendation by the City Engineer in order to overcome specific problems with topography or engineering design. See Standard Detail ST-210.
- b.) Sidewalks abutting all streets shall be constructed with curb ramps at intersections and at other locations where curb cuts are made that would otherwise restrict access by wheelchair users.

501.1.8 Road Dedication and Reservations

The road dedication and reservations shall be as contained in the Subdivision Regulations.

501.1.9 Road Surfacing and Improvements

- 1.) The applicant shall construct roadways in accordance with the standards prescribed in these regulations; provided, however, that the applicant shall not be required to pay the full cost of any arterial or collector street, but shall participate in the cost of these improvements in the amount that a local street plus 3 feet of pavement width would cost if situated where such arterial or collector street is located. Adequate provision shall be made for culverts, drains and bridges. The City of Huntsville will either pay the difference or allow the developer to construct a local street but dedicate the right-of-way as required for the arterial or collector.

- 2.) All road pavement, drainage improvements and structures, curbs, turnarounds, and sidewalks shall conform to all construction, design and geometric standards as adopted by the Planning Commission, Director of Department of Transportation, the City Engineer of the City of Huntsville, or the City of Huntsville and shall be incorporated into the construction plans required to be submitted by the applicant. Details for these improvements are included in the Appendix.

- 3.) All roads shall have standard curbs and gutters as required in Detail ST-200 or ST-201 with appropriate underground drainage facilities placed on both sides of streets in accordance with the City of Huntsville's standard specifications and the Stormwater Management Manual.

501.1.11 Intersections

- 1.) Streets shall be laid out so as to intersect as nearly as possible at right angles. A proposed intersection of two (2) new streets at an angle of less than 75 degrees shall not be acceptable. Not more than two (2) streets shall intersect at any one point unless specifically approved by the Planning Commission.
- 2.) Minimum radii of intersections of property lines (R.O.W.) at arterial and major street intersections shall be rounded with a radius of thirty-five feet (35'). An increased radius may be required by the Director of the Department of Transportation based on AASHTO geometric design policy when the angle of intersection is less than 90 degrees or when the intersection involves an arterial or major street, or anticipated movement of trailer trucks.
- 3.) Proposed new intersections along one side of an existing street shall not be closer than 250 feet and, where applicable, shall coincide with any existing intersections on the opposite side of such street. Street jogs with centerline offsets of less than 125 feet shall not be permitted, except where the intersected street is a divided highway without a median break at the existing intersection.
- 4.) Intersections shall be designed to meet current AASHTO geometric design policy.
- 5.) Where any street intersection will involve earth banks or existing vegetation inside any lot corner that would create a traffic hazard by limiting intersection sight distance, the developer shall cut such ground and/or vegetation (including trees) in connection with the grading of the public

right-of-way to the extent deemed necessary to provide a sight distance consistent with design speed as specified by AASHTO geometric design policy, Chapter 9, At-Grade Intersections.

501.2 Mountainside Development Zoning District Design Criteria

501.2.1 Natural slopes in excess of 35 percent shall not be graded except as needed to provide for utility service to developable areas of less than 35 percent slope and/or other officially adopted public facilities except that in no case shall any building or structure be allowed.

501.2.2 Grading on natural slopes of 25 percent or greater shall only be permitted for the construction and installation of roads, utilities and other limited foundation grading, which can be shown to be sensitive to the existing terrain.

501.2.3 No cut and no fill shall be allowed on any lot except for:

- 1.) The construction of utilities provided all said areas of cut are restored to natural grade and revegetated to conform to the character of the surrounding natural terrain. In order to reduce grading disturbance during utility installation, all utilities shall be incorporated in common trenches, where practical, utilizing duct banks designed and constructed to current standards of Huntsville Utilities as the same may from time to time be amended, or
- 2.) The testing of land, as required by the regulations of the City of Huntsville, or other bona fide geotechnical or geological testing provided that a testing plan consistent with the provisions of the Subdivision Regulations of the City of Huntsville is submitted to and approved by the Building Inspector prior to any cut or fill operation.

501.2.4 Mass grading of hilltops, ridges and ravines shall be prohibited.

501.2.5 All slopes to be stabilized shall conform to the surrounding natural terrain and shall be revegetated so as to conform to the natural character of the surrounding area.

501.2.6 Road alignment shall follow natural terrain and no otherwise unnecessary cuts or fills shall be allowed for the sole purpose of creating additional lots or building sites.

501.2.7 A restricted use area shall extend a minimum of fifty feet (50') from the following features:

1.) Landslides. Setback measured from mapped boundary of landslide.

2.) Cave entrances. Setback measured from edge of cave entrance.

3.) Sinkholes. Setback measured from edge of those sinkholes that exhibit three feet (3') or greater depth of closed depression.

4.) Perennial Springs. Setback measured from perimeter of spring.

5.) Perennial streams and major drainageways including, but not limited to, all streams and drainageways delineated by the U.S. Geological Survey and Tennessee Valley Authority on the 7.5 minute (7.5') quadrangle Topographic Map Series. Drainageways that have been modified by man or by natural processes so that they are different from those delineated on the 7.5 minute (7.5') quadrangle maps shall be set back from as defined herein. In addition, some manmade drainageways as designated by the City Engineer shall be set back as defined herein.

The fifty foot (50') setbacks shall extend landward from the banks or normal highwater points of the drainageways.

6.) Bluffs of greater than twenty feet (20') of relief. Setbacks shall extend from a line defining the top and bottom of said bluff.

7.) Abandoned quarries. Setbacks shall extend from the top and bottom of quarry face.

8.) Historical and archeological sites. Setbacks shall extend from the boundaries of significant historical or archeological sites as determined by the Alabama Historical Commission.

9.) Wetlands. Setbacks shall extend from the boundary of the wetland. Wetlands shall be determined in accordance with the U.S. Army Corps of Engineers' current definition for administering Section 404 of the Clean Water Act.

Said area within the setbacks shall be retained in its existing state and be restricted from all development except for hiking trails, provided such trails neither create nor increase a public hazard, and except for certain minimum grading within said setback, provided the following conditions are met:

10.) Minimal grading is required to construct public utility service and/or roadways to adjacent properties.

11.) No technically feasible alternative route or construction method exists.

501.2.8 The site shall be suitable for development in the manner proposed, without hazards to persons or property on or off the tract, from probability of flooding, erosions, subsidence or slipping of the soil, or other geologic dangers. Condition of soil, groundwater level, drainage, and topography shall be appropriate to both kind and pattern of such intended development.

501.2.9 The natural terrain shall not be disturbed, cut, filled, graded or rearranged by either the developer or subsequent property owners beyond that necessary for the construction of buildings and infrastructure to the extent herein permitted.

501.2.10 Safety Factors for Stability

The following design standards shall be used for roadway design.

- 1.) Minimum safety factor of 1.5 with adequate data, including triaxial shear tests, multiple analyses (sliding wedge infinite slope and slip circle analyses) and confident ground water (piezometer) measurements and control.
- 2.) Where soil and rock data indicates a large variation in strength, analyses should be reported for the worst conditions encountered.

3.) Minimum safety factor of 3.0 for bearing capacity.

4.) Roadway embankment slopes of 2(H):1(V) are typical for roadways.

501.2.11 All plans for design shall be based on site specific studies. The study must provide for the following.

- 1.) Review Plans
 - a.) Natural topography.
 - b.) Planned improvements: highest, lowest and average embankment configurations
 - c.) Adjacent property conditions/structures.
- 2.) Review Maps and Aerial Photographs
 - a.) Geologic maps.
 - b.) Hazards maps.
 - c.) Aerial photographs of area (black and white and/or Infrared).

3.) Perform Studies

a.) **Geologic evaluation:**

(i) identify all geologic formations

(ii) locate anomalies and surface features

-rock outcrops

-bluffs

-sinkholes

-caves

-landslides

-springs

-streams

-soil types: colluvium, alluvium, residuum

(iii) locate manmade hazards

-mines

-spoil areas

-dump sites

-old fill

-retention areas

(iv) indicate all hazards on final plans with details of size and conditions

b.) **Geotechnical studies: field and laboratory.**

(i) field studies

-soil borings for:

roadways - maximum boring spacing of 500 linear feet; minimum of four borings per study

-acceptable subsurface exploration methods

test pit excavations

soil test borings

mechanical or electrical cone borings

-rock corings if required - minimum of 5 feet of rock corings per boring

-soil and rock classification according to ASTM procedures

(ii) minimum soil properties tests (natural or fill soils)

-shear strength (as required for analysis)

-standard classification tests (ASTM)

-consolidation tests (as required)

-shrink/swell potential (if applicable)

(iii) ground water data

-each boring shall be measured for ground water

-piezometers should be placed in the right-of-way and measured periodically for high ground water levels

4.) Analyze Slope Stability and Structure Performance

a.) Stability analyses should be performed on the best, worst, and average soil and embankment conditions.

- (i) sliding wedge and slip circle analyses should be performed on the uphill side of any cut embankment
- (ii) slip circle analyses should be performed on all fill embankments
- b.) Based on the analyses, the lowest safety factors should be reported for each method along with all of the design conditions.
- c.) Structure performance should be analyzed with respect to bearing capacity and settlement.

5.) Report Results

- a.) A geological and geotechnical description of the surface conditions including:
 - (i) locations and description of all the geologic and manmade hazards
 - (ii) a description of the site topography and drainage characteristics
 - (iii) a description of the site vegetation
- b.) A geologic summary of all rock formations.
- c.) A geotechnical description of all soil and rock formations.
- d.) A listing of the encountered and anticipated ground water conditions.
- e.) A description of the proposed development (embankment slopes and heights).
- f.) A listing of all geotechnical engineering recommendations:
 - (i) stability conclusions
 - (ii) recommendations for dealing with all geologic hazards
 - (iii) earthwork recommendations
 - embankment slopes
 - fill soil properties and compaction procedures
 - special concerns (stripping and benching)
- g.) Construction monitoring recommendations, including:
 - (i) type
 - (ii) frequency

6.) **Quality Assurance**

- a.) The Geotechnical Engineer of Record shall review all quality control data.
- b.) The contractor shall advise the City Engineering Department and the project, civil, and geotechnical engineers of any unanticipated or undiscovered problems or hazards found during construction.
- c.) The geotechnical engineer shall document that all recommended procedures and recommendations have been followed throughout the course of the construction.
- d.) All development of individual lots within any development shall adhere to the stated standards of this report and to all applicable requirements of the development design.
- e.) Future development shall not be allowed to reduce the stability of the roadways or adjacent properties.

501.3 Standard Specifications

All roadway work shall be constructed in accordance with the rules, regulations and standards of the City of Huntsville. The following is a list of the applicable sections in the Standard Specifications:

DIVISION II - CONSTRUCTION DETAILS

Part 1 - Earthwork

- Section 101 Clearing and Grubbing
- Section 103 Removal of Miscellaneous Existing Drainage and Other Facilities
- Section 105 Excavation and Embankment
- Section 107 Structure Excavation and Backfill for Drainage Structures and Minor Structures

Part 2 - Bases

- Section 201 Subgrade
- Section 205 Dense Graded Aggregate Base Course
- Section 206 Density Requirements for Compaction

Part 3 - Surfacing and Pavements

- Section 401 Bituminous Surface Treatment
- Section 402 Slurry Seal Coat
- Section 405 Tack Coat
- Section 406 Repaved Bituminous Pavements
- Section 408 Planing (Milling) of Existing Pavement

- Section 410 Bituminous Plant Mix Pavements
- Section 411 Hot Bituminous Pavement
- Section 414 Bituminous Concrete Binder Layer
- Section 416 Bituminous Concrete Wearing Surface

Part 4 - Structures

- Section 501 Structural Portland Cement Concrete
- Section 503 Steel Reinforcement
- Section 505 Structure Foundation
- Section 523 Reinforced Concrete Box Culverts
- Section 527 Storm Sewer Pipe

Part 5 - Incidentals

- Section 603 Pipe Underdrain
- Section 605 Riprap
- Section 607 Mortar for Masonry
- Section 609 Rubble Masonry
- Section 611 Brick and Concrete Block Masonry
- Section 613 Slope Paving
- Section 615 Grouted Riprap
- Section 617 Concrete Sidewalks and Driveways
- Section 619 Pipe Culvert End Treatments
- Section 620 Minor Structure Concrete
- Section 621 Inlets, Junction Boxes, Manholes and Miscellaneous Drainage Structures
- Section 625 Curb, Gutter and Combination Curb and Gutter
- Section 649 Topsoil
- Section 651 Ground Preparation and Fertilizers for Erosion Control
- Section 653 Seeding
- Section 655 Solid Sodding
- Section 657 Mulching
- Section 659 Hydro-seeding and Mulching
- Section 661 Erosion Control Netting

Part 6 - Traffic Control Devices and Street Lighting

- Section 701 Traffic Stripe
- Section 703 Traffic Control Markings and Legends
- Section _____ Signals

DIVISION III - MATERIALS

- Section 800 Materials
- Section 801 Course Aggregate
- Section 805 Fine Aggregate
- Section 807 Bituminous Materials
- Section 808 Mineral Filler, Hydrated Lime, Calcium Chloride, Brick and Blocks
- Section 809 Fly Ash
- Section 811 Water
- Section 817 Geotextiles
- Section 819 Masonry Stone
- Section 821 Riprap Materials
- Section 823 Cement
- Section 825 Selected Materials for Bases
- Section 826 Crushed Aggregate Base Materials
- Section 831 Concrete Joint Fillers, Sealers and Waterstop Materials
- Section 845 Round and Arch Corrugated Steel Roadway and Sidedrain Pipe
- Section 847 Pipe Culvert Joint Sealers
- Section 849 Circular and Arch Concrete Roadway Pipe
- Section 853 Pipe Underdrain
- Section 861 Traffic Marking Materials
- Section 862 Fast-Dry Traffic Paint

502. Sanitary Sewers

502.1 Design Criteria for Gravity Sanitary Sewers

502.1.1 Adequate sanitary sewer facilities shall be provided for all subdivisions as prescribed by these regulations. All facilities shall be designed in accordance with the rules, regulations, and standards of the City Engineer, Alabama Department of Environmental Management, and other appropriate agencies.

502.1.2 Where public sanitary sewer facilities are available, the proposed sanitary sewer facilities shall connect with them.

1.) Sewers shall be installed to serve each lot with service connection laterals for each lot installed to the future right-of-way line or easement line.

2.) Sanitary sewer plans shall be prepared in accordance with the design standards contained herein by a professional engineer registered in the State of Alabama and shall be approved by the City Engineer. For criteria not covered herein the Recommended Standards for Sewage Works, Great Lakes - Upper Mississippi River Board of State Sanitary Engineers ("Ten State Standards"), latest edition, shall apply. The professional engineer shall consult with the City Engineer concerning the appropriate watershed population to design for. The Developer shall provide a design adequate for his development. The City may elect to participate in the cost of upsizing necessary to serve off-site watershed.

3.) Installation of sanitary sewer facilities to be maintained by the City of Huntsville shall be constructed within dedicated rights-of-way and utility and drainage easements shown on the subdivision plat as approved by the City Engineer.

4.) A properly licensed contractor shall be employed by the developer to install the sanitary sewer facilities as shown on the approved plans. The work shall be accomplished in accordance with the standard specification for construction. All work shall comply with the grades, lines, and data shown on the approved plans. Stubout locations shall be staked.

502.1.3 All plans shall meet the following minimum requirements:

1.) Plans shall be prepared on a standard 24"x36" plan and profile sheet.
(K&E Plate No. 1 Plan and Profile, or equal.)

2.) Plans views shall be drawn at a scale of 1"=50 feet and profiles shall be drawn at a scale of 1"=50 feet horizontal and 1"=5 feet or 1"=10 feet vertical. In areas where existing topographic features are dense, detail sheets at a scale of 1"=20 feet with the clearance from the proposed main to existing structures clearly defined and noted may be required.

3.) A cover sheet containing a location map at an approximate scale of not less than 1"=1000 feet, the name of the project, and the names, addresses and telephone numbers of the Developer and the Engineer shall be included in all plans.

4.) All plans shall be sealed by an Alabama licensed professional engineer.

5.) All plans shall contain the following notes:

a.) "All sewer construction shall be in accordance with specifications of the City Engineer."

b.) "After completion of the sanitary sewer(s), the City Engineer will direct the televising and air testing of the lines prior to final acceptance."

c.) "The Contractor shall be responsible for locating and verifying the elevations of existing utilities prior to construction."

d.) "The Contractor shall provide the City Engineer with a complete set of record drawings on moist erasable cronaflex mylar reproductions in reverse, or the original drawing on K&E Plat 1 Herculene drafting film or equal; upon completion of construction. They shall include actual field angles between lines, all actual service lines and tee locations, the distance of the end of service lines to property corners and lines, the depth to top of the end of the service line, and shall reflect all alignment and grade changes from the design drawings made during construction. Record drawings must be completed and submitted prior to acceptance of the sewers into the public system and any connections being made thereto."

e.) "All proposed lot corners shall be field staked prior to construction of sanitary sewers."

6.) All plans shall show the locations of existing utilities including but not limited to gas lines, underground telephone conduits, power and telephone poles, water mains, sanitary sewer lines, storm sewers, etc.

7.) All sewer plans shall include a Bench Mark based on U.S.G.S. Datum. Plans which use a manhole invert elevation or an assumed elevation will not be approved.

502.1.4 Easements:

a.) Easement Requirements

Sewers - 8" through 24"
Minimum width permanent easement - 15'

Sewers - 24" through 54"
Minimum width permanent easement - 30'

Sewers - 60" and larger
Minimum width permanent easement - 50'

Developer is required to provide temporary construction easement in accordance with all safety requirements.

b.) Documents

Easements for sanitary sewer extensions may be provided in either of two ways:

(1) Easement Document (notarized), which must include legal description of the easement(s), legal owners name, Book and Page where deed is recorded, and signature of the owner.

(2) Recorded with Subdivision Plat – If this method of recording easements is chosen, a preliminary plat of the subdivision must be provided at the time of plans submittals. The plat must clearly define the easements to be recorded and be accompanied by a letter of intent from the Licensed Engineer or Licensed Surveyor who will seal the final subdivision plat, assuring that easements will be recorded as shown on the preliminary plat.

All easements in developed areas must be obtained and recorded before construction can begin. In new subdivisions the letter of intent and preliminary plat showing the easements will be sufficient to start construction; however, the Final Plat must be recorded prior to final acceptance of the new facilities.

Special easements such as Railroad Crossings, T.V.A. crossings, and State Highway crossings will be prepared by the Engineer. The Engineer will be required to submit copies of the plans showing such crossings required by the appropriate agency.

502.1.5 Plan Submittals: The plans must be submitted on Monday of the week prior to the Subdivision Committee meeting. The initial submittal should include but not be limited to the following:

- a.) Two (2) copies of the plan.
- b.) Specifications.
- c.) Engineering reports including design criteria used in sizing mains, pumping station, and/or storage facilities.
- d.) Operation requirements, where applicable.

e.) **General system layout including its conformity to Master Plan of the City and how it will effect the existing systems.**

f.) **Where two or more solutions exist for providing sewage facilities, each of which is feasible and practical, a summary of the alternate plans should be provided giving the reasons for selecting the one recommended, including financial considerations.**

502.1.6 Final Plans for Sewer Extension and/or Service Connection:

The following are guidelines for the preparation of sanitary sewer plans and should not be construed as being the total requirements. The City Engineer may at its option require additions to be made in the plans where circumstances warrant.

a.) **Show all existing and proposed utilities on the plans.**

b.) **The plan scale as previously mentioned will be: Plan 1"=50 feet-profile; 1"=5 feet or 1"=10 feet vertical.**

c.) **The limits of all easements should be shown on the plan.**

d.) **Show all topographic features such as driveways, pavement, rights-of-way, property lines, storm drainage structures, etc.**

e.) **The direction of North should be clearly shown on all plans.**

f.) **As previously stated, all sewer extension plans must be stamped by an Alabama licensed professional engineer.**

g.) **An Engineering Report should be submitted with the plan including criteria justifying the proposed sizing. It must be submitted with the plans and should include but not be limited to the following:**

(1) **Topographic map outlining the drainage area and portion thereof to be served and showing acreage of same.**

(2) Contributions to the proposed system, both present and future, from the proposed development and adjacent areas within the drainage area, including all existing residential, commercial, and industrial flows based on the design criteria in Figure One and projections of populations densities provided by the Planning Commission. The criteria should also show the projected ultimate flows based on Planning Commission projections.

(3) The peak factor used for the flow calculations should not be less than the following:

- Lateral and submains - minimum peak design flow should be not less than 400 percent of the average design flow.

"Lateral" is defined as a sewer that has no other common sewers discharging into it.

- "Branch" is defined as a sewer that receives flow from one or more lateral sewers.

- Main, trunk and interceptor sewers - minimum peak design flow should be not less than 250 percent of the average design flow.

- "Main" or "trunk" is defined as a sewer that receives flow from one or more submains.

- "Interceptor" is defined as a sewer that receives flow from a number of main or trunk sewers, force mains, etc.

(4) The minimum velocity shall be 2.0 fps and the maximum velocity shall be 10.0 fps.

h.) All property lines should be shown on the plans and should show the lot number and block number.

i.) A connection must be provided for each parcel or proposed lot. The connection will be shown as a Tee (machine made only) and a 4-inch service line extension therefrom where applicable. Handmade Tee's and "Y" connections are not acceptable unless the connection is to be made to an existing sewer and conditions are such that a machine tap and saddle cannot be used. Such a tap can only be utilized with special approval of the City Engineer. When sewers are constructed by private developers to serve proposed developments and are to be construed as public mains within the public right-of-way, the developer will

FIGURE ONE

**Table for
DESIGN BASIS FOR NEW SEWAGE WORKS**

<u>Discharge Facility</u>	<u>Design Units</u>	<u>Flow* (GPD)</u>	<u>Flow Duration (Hour)</u>
Dwellings	per person	100	24
Schools with showers and cafeteria	per person	16	8
Schools without showers and cafeteria	per person	12	8
Boarding Schools	per person	75	16
Motels at 65 gal./person (rooms only)	per person	130	16
Trailer courts at 3 persons/trailer	per trailer	225	24
Restaurants	per seat	40	16
Interstate or through highway restaurants	per seat	180	16
Interstate rest areas	per person	5	24
Service Stations	per vehicle serviced	10	16
Factories	per person per 8-hr. shift	25	Operating Period
Shopping Centers (no food)	per 1,000 SF of ultimate floor	150	12
Hospitals	per bed	300	24
Nursing Home (add 75 gals. for laundry)	per bed	120	24
Homes for the Aged	per bed	60	24
Child Care Center	per child and adult	10	Operating Period
Laundromats, 9 to 12 machines	per machine	250	16
Swimming Pools	per swimmer	10	12
Theaters, Auditorium type	per seat	5	12
Picnic Areas	per person	5	12
Resort Camps, day and night with limited plumbing	per campsite	50	24
Luxury Camps with flush toilets	per campsite	100	24
Churches (no kitchens)	per seat	3	Operating Period

*Includes normal infiltration.

Note: In all cases, use actual data from similar facilities when possible. Note variations due to factors such as age, water conservation, etc. Submit all design data used.

...provide a 4-inch sanitary Tee with a 4-inch service line extended to the right-of-way to serve all parcels of property which lie along said main extension (which can be provided gravity service by said main). When laying the mains in private property a plugged Tee shall be provided for each existing parcel. A permanent marker shall be installed in top of curb at the service line location. If no curb exists, then an orange stake shall be installed at the end of the service.

provide a 4-inch sanitary Tee with a 4-inch service line extended to the right-of-way to serve all parcels of property which lie along said main extension (which can be provided gravity service by said main). When laying the mains in private property a plugged Tee shall be provided for each existing parcel. A permanent marker shall be installed in top of curb at the service line location. If no curb exists, then an orange stake shall be installed at the end of the service.

The type of pipe to specify on the plan will be as follows:

The type of pipe to specify on the plan will be as follows:

(1) Grades less than 0.60%, specify either ductile iron class 50 pipe, or PVC SDR 35, for 8-inch size.

(1) Grades less than 0.60%, specify either ductile iron class 50 pipe, or PVC SDR 35, for 8-inch size.

(2) Grades from 0.60% to 12.00%, either ductile iron class 50 pipe, PVC SDR 35, or reinforced concrete pipe may be used. PVC SDR 35 can be used for sizes 8 inches, 10 inches and 12 inches, for normal cut.

(2) Grades from 0.60% to 12.00%, either ductile iron class 50 pipe, PVC SDR 35, or reinforced concrete pipe may be used. PVC SDR 35 can be used for sizes 8 inches, 10 inches and 12 inches, for normal cut.

(3) Grades 12.0% to 20.0%, specify ductile iron class 50 pipe, with no anchors required.

(3) Grades 12.0% to 20.0%, specify ductile iron class 50 pipe, with no anchors required.

(4) Grades 20.00% to 34.0%, provide ductile iron class 50 pipe, with concrete anchors required each 36' C.C. For grades over 34.0%, provide concrete anchors at each bell. The surface area is to be stabilized for grades in excess of 12% (sod, etc.).

(4) Grades 20.00% to 34.0%, provide ductile iron class 50 pipe, with concrete anchors required each 36' C.C. For grades over 34.0%, provide concrete anchors at each bell. The surface area is to be stabilized for grades in excess of 12% (sod, etc.).

(5) In areas which have been filled and the proposed pipe will be within the fill, ductile iron Class 50 must be specified. If the pipe ditch through the filled area is to be undercut to natural ground, and if the trench is refilled to pipe grade with properly compacted crushed stone, then PVC or concrete pipe may be approved by the City Engineer.

(5) In areas which have been filled and the proposed pipe will be within the fill, ductile iron Class 50 must be specified. If the pipe ditch through the filled area is to be undercut to natural ground, and if the trench is refilled to pipe grade with properly compacted crushed stone, then PVC or concrete pipe may be approved by the City Engineer.

(6) Due to maintenance considerations, it will be policy to require that all sewers proposed at depths greater than 15 feet be constructed of ductile iron pipe or reinforced concrete pipe (subject to approval) and any service line risers from this depth also be ductile iron pipe. This condition should be avoided whenever possible and first consideration given to other routes.

(6) Due to maintenance considerations, it will be policy to require that all sewers proposed at depths greater than 15 feet be constructed of ductile iron pipe or reinforced concrete pipe (subject to approval) and any service line risers from this depth also be ductile iron pipe. This condition should be avoided whenever possible and first consideration given to other routes.

(7) All sanitary sewers shall have a minimum of 30 inches cover in non-traffic and 36 inches in paved areas subject to vehicular traffic. The minimum manhole depth from manhole ring to manhole shelf shall be 36-inches. Across ditches and areas where cover is less than 2.5 feet, ductile iron pipe or concrete encasement will be required.

k.) A minimum of 10 feet of horizontal clearance between sanitary sewers and water mains should be maintained whenever possible; when the 10 feet of separation is not possible a minimum vertical separation of 24 inches should be maintained. Where the vertical separation cannot be maintained, the sewer must be built to water main specifications and be pressure tested.

l.) Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 24 inches below the bottom of the water main.

m.) Manholes shall be installed at the upper end of each line, at all changes in grades, size, or alignment, at all sewer intersections, and at distances not greater than 350 feet for sewers 15 inches in diameter or less, 400 feet for sewers 18 inches through 21 inches in diameter, and 500 feet for sewers over 24 inches in diameter. Greater spacing may be permitted in larger sewers and those carrying a plant effluent.

n.) When sewers are proposed along drains and lie within a potential flood plain or lie adjacent to a drainage ditch or drainage structure in which there is a potential problem of storm water entering the sanitary sewer, the City Engineer will require approved watertight frames and covers be installed on the manholes.

o.) When trunk sewers are proposed, an approved type vent stack assembly will be required on manholes at 1000-foot intervals and on the end manhole, a detail of the proposed vent assembly should be shown on the plan.

p.) A layout drawing, which has the Planning Commission's stamp of approval, must accompany the initial plans submittal and with all proposed subdivision section or phase lines clearly defined.

q.) Anytime sewer lines are proposed to serve property where the "Serviceability" of a lot or residence is questionable, the service elevation for each lot or residence where this condition exists must be clearly indicated on the plan and profile. All proposed service lines and connections must be shown.

r.) The profiles of all storm drains and ditches adjacent to and crossing proposed sewers must be shown on the sewer plan profile. Concrete encasement must be provided on sanitary sewers crossing drainage ditches where there will be less than 2.5 feet of cover.

s.) The following checklist may be helpful in determining if the plans have all information required by the City Engineer and also contains a list of some of the documents and/or agency approvals and etc. which may be necessary prior to final approval by this Department.

PLANS REVIEW CHECKLIST

PROJECT NAME _____
PROJECT NO. _____

DATE _____
YES NO N/A

1. Engineer's Stamp _____
2. Available Capacity _____
3. Easements Obtained _____
4. Sufficient Topography _____
5. Existing Utilities Shown _____
6. Drainage Problems _____
7. Proper Pipe Sizing and Type _____
8. Adequate Cover _____
9. Accurate Grades _____
10. Tee Locations Shown _____
11. Plan Notes Correct _____
12. Bench Marks Shown _____
13. Location of Fire Hyds., Valves, Etc. _____
14. Future Extension Considered _____
15. Corps of Engineers Permit for Waterway X-ings _____
16. Alabama Highway Department _____
17. County Engineer (construction outside City limits)

18. Alabama Department of Environmental Management

19. Public Works Street Cut Permit _____
20. Railroad Crossing Permit _____
21. T.V.A. Crossing _____
22. Applications for Permit to Discharge Industrial or
Commercial Wastewater to the Publicly-owned Treatment
Works _____
23. Others _____

502.2 Mountainside Development Zoning District Design Criteria

- a. Natural slopes in excess of 35% shall not be graded except as needed to provide for utility service to developable areas of less than 35% slope and/or other officially adopted public facilities except that in no case shall any building or structure be allowed.
- b. Grading on natural slopes of 25% or greater shall only be permitted for the construction and installation of roads, utilities, and other limited foundation grading, which can be shown to be sensitive to the existing terrain.
- c. The construction of utilities will be allowed on 25% or greater slopes provided all said areas of cut are restored to natural grade and revegetated to conform to the character of the surrounding natural terrain. In order to reduce grading disturbance during utility installation, all utilities shall be incorporated in common trenches, where practical, utilizing duct banks designed and constructed to current standards of Huntsville Utilities as the same may from time to time be amended.

502.3 Design Criteria for Pumping Stations and Force Mains

It is the policy of the City of Huntsville to serve the properties in this City with gravity flow sewers whenever possible, in lieu of pumping stations and force mains which pump from one natural drainage area into another. The gravity sewers within drainage areas are designed to serve only the drainage areas wherein they lie and the pumping from other areas is detrimental to the integrity of these systems.

Whenever wastewater stations are proposed, complete design criteria for the proposed pumping station must be submitted, including but not limited to the following:

- 1.) Topographic map with the drainage area clearly defined and the acreage shown.
- 2.) Complete information concerning the proposed area of service including the number and type of proposed units.
- 3.) Complete anticipated flow data based on design criteria in Table One utilizing a peak factor for sizing of 2.5.

- 4.) Complete details of possible alternate gravity sewers to serve the same area, including cost estimates of both type systems.

If the proposed pumping station proposal is accepted by the City Engineer, the station and force main shall be designed in accordance with the following criteria.

a. Design Data

- 1.) For calculation of average daily flow, contributions should be taken from Figure One, page 44.
- 2.) The minimum peaking factor employed for design purposes shall be 2.5 times the average daily flow.

b. Site Requirements

- 1.) The lift station site shall be protected by a chain link fence six (6) feet in height with 3-strand barbed wire above. One three (3) feet walk-through gate and one twelve (12) feet, 2-united drive-through gate shall be provided. The drive-through gate should be aligned with the building door if possible. Fencing shall be class 2 zinc coating (2.0 oz. of zinc per sq. ft. of uncoated wire surface). The fencing fabric shall be woven in 2" mesh from no. 9 gage wire. If desired, a vertical board wooded fence of the same height is acceptable using treated lumber or redwood.
- 2.) Access to the station shall be via a dedicated "all weather" road of 10 feet minimum width. In cases where a steep grade creates conditions of erosion of the surface or insufficient traction for city maintenance vehicles, the requirement for a concrete or paved surface shall be imposed. In unusual cases, curb and gutter may be required. In no case shall the grade exceed 12 percent as required by the City of Huntsville for acceptance of streets.
- 3.) All grounds are to be landscaped and seeded for grass. Slopes requiring mowing shall not exceed 20 percent. All projects require review of location, character and extent by the Planning Commission and may require screening.
- 4.) The lift station shall be designed to remain fully operational and accessible during the one hundred (100) year flood event.
- 5.) The lift station shall be located within dedicated easements.

c. Lift Station Building

- 1.) The building shall have a minimum eight (8) foot ceiling with one 3'-0" x 6'-8" metal door with key lock, one 24"x24" ventilation louver and no windows.
- 2.) Key lock sets to City's existing master key system. Perform all keying at lock factory. Deliver four (4) master keys to the City only.
- 3.) A minimum of 4'-0" of unobstructed floor space shall be provided in all directions around the pumping equipment.
- 4.) A ventilator shall be provided using forced air as opposed to exhaust. Ventilation requirements are 12 air changes/hour for continuous duty or 30 air changes/hour for intermittent duty.
- 5.) No manholes shall be located inside the lift station building.
- 6.) Water service shall be provided by one (1) 3/4" hose bib and one (1) reduced pressure back flow preventer shall be located inside the building. Backflow preventer shall be ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks; Model 909 manufactured by Watts Regulator Company; Mueller, Lawler/ITT or equal. Provide manufacturer's test kit.
- 7.) Sufficient electric heat shall be provided so as to prevent freezing inside the building at -10°F ambient temperature.
- 8.) One outside entry light (Kenall Model No. 3737) shall be provided near the entrance door. Interior lighting shall be a minimum of two 4-foot, 40 watt, 4 bulb fluorescent fixtures per 100 square feet.
- 9.) A minimum of two 220 volt interior wall receptacles and four 110 volt interior wall receptacles (one on each wall) shall be provided with ground fault protection and waterproof covers.
- 10.) Should equipment removal considerations require such, the inclusion of a loading dock, roll-up door, lifting eyes and/or overhead beam and hoist shall be required so as to facilitate maintenance and repair of pumping equipment.

11.) Provisions shall be made for protection of the building walls during washdown of the floor. For wood frame buildings, this can be accomplished by setting the building on a concrete block foundation and allowing 6 to 8 inches of freeboard from top of block to finished floor.

12.) In general, the building type and architecture should match and complement adjacent buildings and properties. The building shall receive suitable interior and exterior paint. Masonry buildings shall receive water proofing and block filler prior to painting.

13.) In general, the building type and architecture should match and complement adjacent buildings and properties. The building shall receive suitable interior and exterior paint. Masonry buildings shall receive waterproofing and block filler prior to painting.

d. Wet Well

1.) All penetrations through the slab to the wet well shall be sealed to prevent sewer gas leakage.

2.) The bottom of the wet well shall be sloped 1:1 toward the flanged inlet so as to minimize solids settling.

3.) Unless otherwise provided, the wet well detention time shall be two hours at peak hourly flow.

4.) The wet well shall have a 4-inch vent pipe with a 180° turn-down outside of the building.

5.) A ladder or manhole rungs of corrosion resistant materials shall be provided to provide access to the bottom of the wet well.

6.) For stations serving a hotel or motel, a strainer basket to remove rags shall be required. The mesh shall be 1"x2" and the basket mounted on guide tracks and removable without entering the wet well. The basket shall be constructed of welded aluminum and anchored with stainless steel nuts and bolts.

7.) For any design flow, a minimum of two alternating fixed speed pumps shall be provided; each capable of pumping the peak hourly flow.

8.) The wet well volume shall be of sufficient capacity to assure that the time between pump run cycles is within the requirements of the electric motor manufacturer. At a minimum, six (6) minutes shall be provided at peak hourly flow.

9.) All access hatches and grating will be of aluminum construction.

e. Pumps and Associated Controls

1.) Suction lift pumps shall be as manufactured by Gorman Rupp or equal. Check valves shall be spring assisted. All valves, pump air vents and pump piping shall be as furnished by Gorman Rupp. Pumps shall be self-priming.

2.) Submersible pumps shall be as manufactured by Flygt or equal equipped with stainless steel guide rails, hoist and lifting cable or chain. Pumps shall be readily removable without dewatering the wet well or disconnecting any piping in the wet well.

3.) Pump controls shall be as manufactured by Consolidated Electric or equal and effect control via a pressure transducer located in the wet well. Pump controller shall be equipped with high wet well level alarm capability.

4.) All pumps shall be equipped with fixed speed motors and be of non-clog design capable of passing a 3-inch or larger sphere.

5.) An ultrasonic flow meter as manufactured by Polysonics or equal shall be provided equipped with rate of flow indicator, flow totalization and a compatible chart recorder.

f. Electrical

1.) Electrical service shall be 3-phase, 480 volt.

2.) Phase conversion equipment shall not be acceptable.

3.) Control voltage shall be 110 volt.

4.) Electrical components shall be as manufactured by General Electric or Square D, or equal.

5.) An Intrac-2000 radio alarm system shall be provided as manufactured by Motorola and installed. The system shall be delivered with 8 alarm points labeled and wired as follows:

- (1) Power Failure
- (2) High Wet Well
- (3) Low Wet Well
- (4) Pump High Temperature Shutdown
- (5) Illegal Entry
- (6) Maintenance
- (7) Low Battery

It should be noted that the FCC license cost will be borne by the developer and that a six-month delivery time for the alarm system should be assumed.

- 6.) All equipment shall be wired for automatic restart capability after restoration of power.
- 7.) Hour meters shall be provided for each pump on the motor control panel.
- 8.) Power surge and lightning protection equipment shall be provided on all electrical instrumentation and radio equipment.
- 9.) All exposed conduit shall be rigid steel galvanized.
- 10.) A Crouse-Hinds #AR-2041-522-M80 plug and install safety interlock and switching system for stand-by power.

g. Force Main

- 1.) Force main material of construction shall be ductile iron pipe.
- 2.) Depth of cover shall be a minimum of 3'-0".
- 3.) A cutoff gate valve shall be installed on the force main.
- 4.) Force main line velocities should range between 3.5 to 5.5 FPS.

h. Submittals

At the time of application, the following shall be submitted to City Engineer:

- 1.) A completed application form.
- 2.) All calculations and assumptions taken for head, flow quantification, wet well volume, pump duty cycle at average and peak daily flow, force main line velocity, as well as any other design calculations.
- 3.) Site plan showing subject lift station relative to area under development and the existing sewer system.
- 4.) Building blueprints for the lift station.
- 5.) All pump curves.

6.)

Three (3) copies of the manufacturers O/M manuals for all mechanical and electrical equipment.

7.)

Recommended spare parts list from the original equipment manufacturer.

i. Start-up

1.)

Start-up and equipment check operations shall be performed by an authorized service technician from the original equipment manufacturer.

2.)

The City Water Pollution Control (WPC) Office shall be notified forty-eight (48) hours prior to start-up and a City WPC representative shall be present during the period of start-up.

3.)

A copy of the technicians report showing all field data control, set points and equipment condition shall be furnished to City WPC.

4.)

Sufficient water to start-up and equipment check shall be the responsibility of the developer.

SUMMARY OF DESIGN CRITERIA

DESIGN PARAMETER	DESIGN VALUE
1. <u>Flow Development</u>	
a. Single family dwellings, GPD/capita	100
b. Others	Figure One
2. <u>Minimum Peak Hourly Flow Factor</u>	2.5
3. <u>Site</u>	
a. Fence	Chain link or wood.
b. Roadway	All weather, single lane, not to exceed 12% grade.
c. Maximum landscaped slope, %	20
d. Flood protection, flood event.	100-Year
4. <u>Building</u>	
a. Minimum height, feet.	8
b. Unobstructed floor space, feet.	4
c. Ventilation requirements, air changes/hour:	
(1) continuous duty	12
(2) intermittent	30
d. Water service line, inches.	3/4
e. Interior lighting, 4-foot, 4-bulb, 40 watt fixtures/100 SF	2
f. Interior electrical receptacles:	
(1) 110 volt	4
(2) 220 volt	2
5. <u>Wet Well</u>	
a. Minimum wet well slope	1:1
b. Detention time at peak flow, hours.	2
c. Detention time between pump run cycles, minute.	15
6. <u>Pumps</u>	
a. Maximum pumping rate	>peak
b. Minimum number of lift pumps	2
c. Pump type	Suction lift or submersible, non-clog, 3-inch sphere, fixed speed.
7. <u>Electrical</u>	
a. Incoming service, volt/phase.	460/220, 3-phase
b. Control voltage, volts.	110
8. <u>Force Main</u>	
a. Pipe material of construction.	Ductile iron
b. Depth of cover, feet.	3
c. Line Velocities, FPS.	3.5 to 5.5

**CITY OF HUNTSVILLE
APPLICATION FORM FOR WASTEWATER
LIFT STATION ACCEPTANCE**

A. General Information

1. **Name of Project Served** _____
2. **Total Area Served, Acres** _____
3. **Estimated Start of Construction** _____
4. **Estimated Completion Date** _____

B. Applicant

I, the undersigned, am fully aware that the statements made in this application for approval of a wastewater lift station are true, correct and complete to the best of my knowledge.

Mailing Address

Signature of Applicant

Telephone Number

Name and Title

Date

Representing

C. Engineer

This is to certify that this application has been prepared under my direction and the plans and specifications for this wastewater lift station have been designed by me and are in conformance with sound engineering practices.

Mailing Address

Signature of Engineer

Company Name

Name

Telephone Number

Alabama Registration No.

Date

AFFIX SEAL

D. Critical Elevations

1. 100-Year Flood _____
2. Top of Lift Station Structure _____
3. Influent Line in Wet Well _____
4. Pump On _____
5. Pump Off _____

E. Quantification of Design Flow

	UNITS		GAL/UNIT	GPD
1. Single Family Dwellings	_____ @		_____	_____
2. Condominiums, Apartments	_____ @		_____	_____
3. Swimming Pools	_____ @		_____	_____
4. Motels	_____ @		_____	_____
5. School	_____ @		_____	_____
6. Commercial	_____ @		_____	_____
7. Industrial	_____ @		_____	_____
8. Other	_____ @		_____	_____
Average Daily Flow				_____ GPD
Minimum Daily Flow				_____ GPD
Peak Hourly Flow				_____ GPD
Peaking Factor				_____ GPD

F. Design Information

1. Head
 - a. Static Head, Feet _____
 - b. Total dynamic head, feet. _____
2. Wet Well
 - a. Volume, CF _____
 - b. Detention time at peak hourly flow, min. _____
 - c. Time between pump starts. _____
 - d. Ventilation present. _____
 - e. Strainer basket present. _____
3. Pumps
 - a. Pump Manufacturer/Model No. _____
 - b. Number of pumps. _____
 - c. Type of pumps. _____
 - d. Pump capacity:
 - No. 1 _____ GPM @ _____ TDH; _____ HP
 - No. 2 _____ GPM @ _____ TDH; _____ HP
 - e. Pump Controller Manufacturer/Model No. _____
 - f. Flow totalizing capability present. _____

- g. **Equipment weight:**
 - (1) Pump, lbs. _____
 - (2) Motor, lbs. _____
- 4. **Force Main**
 - a. Pipe material of construction. _____
 - b. Pipe diameter, inches. _____
 - c. Line Velocity _____
 - d. Depth of cover, feet. _____
- 5. **Electrical**
 - a. Electrical service manufacturer. _____
 - b. 220 volt, 3-phase _____
 - c. Automatic restart capability. _____
 - d. Alarm Manufacturer/Model No. _____
- 6. **Building**
 - a. Interior 3/4" hose bibb present. _____
 - b. Minimum unobstructed distance round pump equipment, feet. _____
 - c. Loading dock present. _____
 - d. Overhead support beam present. _____
 - e. Ventilator present. _____
 - f. Number of electrical receptacles:
 - (1) 110 volt _____
 - (2) 220 volt _____
 - g. Freeboard of curb, inches. _____
 - h. Area of building, SF. _____
- 7. **Submittals attached with this application:**
 - a. Calculations _____
 - b. Pump Curves _____
 - c. Site Plan _____
 - d. Building Blueprints _____
 - e. O/M Manuals _____

502.4 Design Criteria for Grinder Pump Stations

It is the policy of this Department to serve properties in this City with gravity flow sewers whenever possible. However, in areas that contain properties that cannot be served by the gravity sewer system, the City Engineer may approve grinder pump stations. The station and piping shall be designed in accordance with the following criteria.

a. General

The manufacturer shall furnish and deliver to the developer the components necessary to install the completely operational grinder pump stations for the subdivision. The developer shall be required, at no cost to the City of Huntsville, to provide an inventory of replacement parts equal to ten percent of the total number of grinder pump stations to be installed. The list of replacement parts shall be provided by the Public Works Department. The pumps, control panels and inlet flanges shall be warehoused by the City of Huntsville and issued at the written request of the developer. All units required for the subdivision shall be of the same manufacturer and identical in all respects. All grinder pump stations shall be contractor installed and inspected by the City of Huntsville. Each completed grinder pump station shall include the street valve box, basin, pump, control panel, piping and wiring.

b. Street Valve Box

- 1.) The valve box construction shall be of a non-corrosive material.
- 2.) The minimum dimensions of the box shall be 12" wide, 15" long, and 18" deep.
- 3.) Shutoff and Check Valve
 - a.) The valves shall be constructed of PVC and be of the true union ball type with a self-lubricating TFE seat and Viton O-rings.
 - b.) The minimum size of the valves shall be 1-1/4".

4.) Test Tee

- a.) The size and construction of the tee is to be 1-1/4" PVC with a reducer to receive the threaded extension nipple.
- b.) The construction of the extension nipple is to be 1" threaded galvanized steel.
- c.) The extension nipple is to be provided with a 1" galvanized pipe cap to be sealed with teflon tape.

5.) Installation is to be as per standard drawing.

c. Basin

- 1.) The locations of the basin is to be either side or in front of the building served.
- 2.) The construction is to be of molded reinforced fiberglass with polyester resin.
- 3.) The size of the basin is to be a minimum of 24" in diameter and 60" in depth.
- 4.) The interior of surface is to be smooth and resin rich.

5.) Cover

- a.) The construction of the cover is to be 3/16" steel coated with a high temperature, baked on epoxy paint.
- b.) The cover is to be attached to the basin with stainless steel cap screws.
- c.) Cadmium plated nuts are to be embedded in the basin to receive the cover screws.
- d.) A 1" wide by 1/4" thick neoprene foam gasket is to be cemented to the cover to form a waterproof seal when the cover is attached to the basin.

6.) Shutoff Valve

- a.) The valve is to be constructed of PVC and be of the true union ball type with teflon seat with extension handle provided for services.
- b.) The valve is to be installed in the discharge line as shown in the standard drawings.

7.) Check Valve

- a.) The valve shall have a cast iron body and be part of the pump lift-out assembly.
- b.) The flapper is to be a Buna N type constructed of heavy duty rubber with an internally molded stainless steel spring.
- c.) All fasteners are to be of the stainless steel type.

8.) Inlet Flange

- a.) A 4" cast iron, hub type, basin inlet flange with an elastomeric hub gasket to receive the 4" PVC building service line shall be provided.
- b.) The flange is to be field mounted.
- c.) A gasket is to be installed between the flange and the basin to provide a watertight seal.

9.) Piping

- a.) All piping within the basin shall be Schedule 80 PVC.
- b.) Piping is to be terminated at a 1-1/4" NPT discharge flange.

10.) Rail Assembly

- a.) Lift-out guide rail assembly shall be provided for easy removal and installation of pump and lower check valve.
- b.) Guide rails shall be constructed of 1" galvanized steel pipe with an upper rail support casting.
- c.) Lower discharge nozzle shall be self-guiding into the lower casting and be provided with dual O-ring seals.
- d.) A top removable brace shall be provided to hold pump into the discharge casting.
- e.) The discharge casting shall be bolted to basin floor.
- f.) A lifting chain shall be provided for easy removal of the pump from the basin.

d. Pump

- 1.) The manufacturer and model number shall be Meyers WGL-20 or an approved equal.

2.) Motor

- a.) The voltage rating shall be 230 volts, AC, single phase, 60 Hertz.
- b.) The maximum RPM of the motor shall be 3450.

c.) Seal chamber:

- (1) Two rotary shaft seals are to be mounted in tandem.
- (2) The chamber will be oil-filled between seals.
- (3) All metal parts and springs shall be constructed of stainless steel.
- (4) The sensing probe shall be situated between the seals to detect water leakage.

3.) Impeller:

- a.) Construction is to be of the bronze recessed type.
- b.) Vanes are to be at the rear of the impeller.
- c.) Mounting is to be onto a threaded stainless steel shaft.

4.) Grinder Assembly

- a.) The assembly shall be of the rotating radial type.
- b.) The shredding ring shall be of the stationary type.
- c.) The assembly shall be secured on a stainless steel shaft with a washer and screw.
- d.) The removal to the assembly shall be from the outside without the need to dismantle the pump.
- e.) The construction of the assembly is to be of type 440 stainless steel.

5.) Pump and Motor Castings

- a.) Components are to be constructed of high tensile cast iron and pretreated with chromic rinse and painted with a high quality enamel paint.
- b.) All other components shall be galvanized or coated with baked-on epoxy paint.
- c.) All fasteners are to be constructed of stainless steel.

e.) Control Panel

- 1.) The panel shall be a NEMA 3R, fully gasketed with hinged door.
- 2.) The top of the cabinet is to be mounted at 36" minimum and 60" maximum above finished grade.
- 3.) The enclosure shall be constructed of treated steel and coated with grey enamel paint.
- 4.) Top and bottom cabinet mounting tabs shall be provided.
- 5.) The enclosure shall have a combination closing latch with locking hasp.

6.) Alarm Light

- a.) The basin high level alarm shall be indicated by a flashing red light visible from the street.
- b.) The high level alarm light shall be mounted externally on top of the enclosure.
- c.) The alarm light globe shall be red and 3" high by 3-1/2" in diameter, coated with a neoprene gasket.
- d.) The interior alarm light is to be installed at a location in the building where it will be readily visible during alarm conditions.

7.) Indicator Lights

- a.) The indicator lights shall be internally mounted in the control panel.
- b.) The red light shall indicate a pump seal failure.
- c.) The amber light shall indicate the pump is in the run mode.

8.) Electrical Components

- a.) The panel shall include a 2-pole, 20 amp, main disconnect breaker; pump hand-off-auto switch, fused motor overload, terminal block, contactor switch, holding relay, grounding bar, seal failure light and pump run light.
- b.) Pump run, off and high level alarm modes are to be controlled by individual mercury type float switches.
- c.) The support cords for the float switches shall be of the 16-2 SOJW type (neoprene type).
- d.) A weight shall be attached to the suspended cord above the float switch.

9.) Electrical Junction Box

- a.) The junction box is to be mounted within the grinder pump basin.
- b.) The box is to be rated as NEMA 6 and be constructed of a non-metallic, non-corrosive material.
- c.) The box is to have a removable cover which is fully gasketed and watertight for submerged condition.
- d.) All conduit and cord connections to the box are to be watertight.
- e.) All wiring and conduit between control panel, isolation switch and electrical junction box are to be installed in accordance with the standard drawing.

10.) A raintight 20 volt amp, 120 volt AC, 60 Hertz, ground fault circuit interrupter receptacle shall be installed directly below the control cabinet.

11.) An anti-syphon cold water hose bibb is to be installed under the control panel.

f. Piping

1.) Electrical conduit shall be Schedule 40 PVC with a minimum trade size of 3/4" and installed in accordance with the National Electric Code and the standard drawing.

2.) Plumbing

a.) The building service shall be Schedule 40 DWV PVC with a minimum trade size of 4".

b.) The discharge pressure service line shall be Schedule 40 Class 200 PVC capable of withstanding pressures to 160 PSIG. The minimum earth cover is to be 24" except at street valve box.

g. Wiring

1.) All field wiring shall be of #12 THHN stranded copper installed in accordance with the National Electric Code and the standard drawing.

2.) Wire markers are to be numerical and permanently attached.

3.) Wiring connections to the terminal strip shall be with fork type terminal lugs.

502.5 Design Criteria for Package Wastewater Facilities

It is the policy of the City of Huntsville to serve properties in this City with gravity flow sewers whenever possible. However, in areas that contain properties that cannot be served by gravity sewers or cannot be served cost effectively by the use of a pumping station and force main, the City Engineer may approve the construction of a package wastewater facility assuming the applicant provides a NPDES permit. The facility should be designed in accordance with the following criteria.

a. General

The purpose of these guidelines is to establish technical and design specifications for developers and their engineers for the design of package wastewater facilities for projects within the planning jurisdiction of the City of Huntsville, Alabama. The criteria are intended to assure uniformity and quality of construction for the facilities constructed hereunder. Any deviation from the criteria contained herein shall be at the approval of the City Engineer. All treatment facilities shall employ the aerobic digestion process for sludge stabilization. Plans and specifications shall be prepared and certified by a professional engineer registered in the State of Alabama.

So as to assure maintainability and minimize parts inventory costs, manufacturers of certain pieces of equipment are noted herein. The facility shall be fabricated and furnished by a reputable manufacturer engaged in the full-time business of and having a minimum of five years experience in package wastewater facilities. The plant, as well as all appurtenant equipment and materials shall be new and unused.

b. Design Data

- 1.) All facilities receiving domestic wastewater shall be designed for an average BOD₅ influent concentration of 200 mg/L and an average TSS influent concentration of 200 mg/L.

- 2.) For calculation of average daily flow from single family dwellings 100 GPD/Capita and 2.8 persons per dwelling shall be used. Contributions from other sources should be taken from Figure One.
- 3.) The minimum peaking factor employed for design purposes shall be 2.5 times the average daily flow.

c. Plant Site and Building

- 1.) The treatment plant structures and equipment shall be protected from physical damage that could be caused by the 100-year flood event.
- 2.) The facility and lift stations shall be designed to remain fully operational and accessible during the 100-year flood event.
- 3.) A minimum distance of 300 feet is required between uncovered plant processes and the boundary of developed or developable areas.
- 4.) All plant lift station and process equipment shall be enclosed within permanent structures. Such structures shall provide sufficient room to access equipment subject to repair or removal and shall have a minimum height of eight (8) feet. In general, the building type and architecture should match and complement adjacent buildings and properties. The building shall receive suitable interior and exterior paint. Masonry buildings shall receive water proofing and block filler to painting. Key lock sets to City's existing master key system. Perform all keying at lock factory. Deliver (4) master keys to the City only.
- 5.) The lift station site shall be protected by a chain link fence six (6) feet in height with 3-strand barbed wire above. One three (3) feet walk-through gate and one twelve (12) feet, 2-united drive-through gate shall be provided. The drive-through gate should be aligned with the building door if possible. Fencing shall be class 2 zinc coating (2.0 oz. of zinc per sq. ft. of uncoated wire surface). The fencing fabric shall be woven in 2" mesh from No. 9 gage wire. If desired, a vertical board wooded fence of the same height is acceptable using treated lumber or redwood.
- 6.) Sufficient interior and exterior lighting is required around all structures and maintained equipment.
- 7.) Water service shall be provided by one (1) 3/4" hose bibb and one (1) reduced pressure backflow preventer shall be located inside the building. Backflow preventer shall be ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel

springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer and four test cocks; Model 909 manufactured by Watts Regulator Company; Mueller, Lawler/ITT or equal. Provide manufacturer's test kit.

8.) All grounds are to be landscaped and seeded for grass. Slopes requiring mowing shall not exceed 20 percent. All projects require review of location, character and extent by the Planning Commission and may require screening.

9.) Access to the plant shall be via a 10'-0" all-weather road. In the event that the road grade slopes to a degree which causes limited vehicle traction, the requirement for a paved or concrete surface shall be imposed. In no case shall the grade exceed 12 percent as required by the City of Huntsville for acceptance of streets.

10.) The plant discharge pipe at the receiving stream shall be provided with a flap valve and concrete bulkhead with pad.

11.) In general, the building type and architecture should match and complement adjacent buildings and properties. The building shall receive suitable interior and exterior paint. Masonry buildings shall receive waterproofing and block filler prior to painting.

d. Materials of Construction

1.) All structural steel walls shall be A-36 1/4-inch steel plate minimum. All structural elements shall be able to withstand all hydrostatic pressures at maximum side water depths. All bulkheads separating isolated compartments and outer wells shall be designed to withstand hydrostatic pressures imposed with either side dewatered completely.

2.) All handrails shall be aluminum.

3.) All baffles and weirs at or above the water surface elevation shall be aluminum.

4.) All access hatches and grating will be of aluminum construction.

5.) All air piping shall be hot dipped galvanized steel. All above ground process piping 4" or greater shall be steel flanged pipe.

6.) All grating shall be aluminum or hot-dipped galvanized steel.

7.) All aeration diffusers shall be stainless steel or ABS plastic.

8.) Manhole rungs shall be reinforced plastic or aluminum.

e. Process Design Criteria

1.) **Lift Station**

a.) For any design flow, a minimum of two fixed speed pumps shall be provided; each capable of pumping in excess of the hourly flow. Such maximum pumping rate shall be equal to or less than the maximum hydraulic capacity of the package wastewater facility.

b.) The wet well volume shall be of sufficient capacity to insure that the time between pump run cycles is within the requirements of the electric motor manufacturer. At a minimum six (6) minutes shall be provided at peak hourly flow.

c.) The floor of the wet well shall have a minimum slope of one to one so as to minimize the deposition of solids.

d.) Manhole rungs shall be provided to access the bottom of the wet well.

e.) A ventilator shall be provided using forced air as opposed to exhaust. Ventilation requirements are 12 air changes/hour for continuous duty or 30 air changes/hour for intermittent duty.

2.) **Flow Equalization Chamber**

a.) A flow equalization chamber shall be required for all package wastewater facilities.

b.) The chamber shall have sufficient capacity to reduce the expected peak hourly flow to the design average daily flow.

c.) Minimum detention time shall be two (2) hours.

d.) Aeration shall be provided to maintain adequate mixing and a minimum of 1.0 mg/L of dissolved oxygen. Minimum air supply rates shall be 1.25 CFM per 1000 gals. of basin volume.

3.) Aeration Tank

- a.) Aeration tanks shall have an adequate air supply for mixing and aeration of the wastewater.
- b.) For suspended growth extended aeration systems BOD loading shall be 12.5 Lbs./day/1000 CF with a detention time of 24 hours at average daily flow.
- c.) For fixed growth activated sludge systems BOD loading shall be 45 lbs./day/1000 CF with a detention time of six (6) hours at average daily flow.
- d.) Domestic waste treatment design shall be on the basis of at least 0.17 Lb.-BOD/Capita/day and 0.20 Lb.-TSS/Capita/day. If garbage grinders are used, the design basis is to be increased to 0.22 LB-BOD/Capita/day and 0.25 LB-TSS/Capita/day.
- e.) All top-side valves and final clarifier weirs shall be accessible by grating and hand rail.

4.) Final Clarifiers

- a.) Surface settling rates for final clarifiers shall not exceed 400 GPD/SF at average daily flow and 1000 GPD/SF at peak hourly flow.
- b.) Peak solids loading rates for final clarifiers shall not exceed 35 lbs./day/SF.
- c.) Weir overflow rate for final clarifiers shall not exceed 10,000 GPD/LF at peak hourly flow.
- d.) Minimum side water depth for final clarifiers shall be 10 feet.
- e.) The final clarifier shall be equipped with adjustable weirs, sludge removal and scum collection equipment.
- f.) Activated sludge return rate shall be 0-100% of average daily flow.

5.) Chlorination

- a.) Minimum detention time shall be 15 minutes at peak hourly flow.

b.) Chlorination tank shall be equipped with a minimum of two (2) baffles and an adjustable weir.

c.) Method of chlorination shall be as shown below:

Under 20,000 GPD - tablet or hypochlorinator
20,000 to 100,000 GPD - hypochlorinator,
over 100,000 GPD - hypochlorinator or gas

d.) The method of chlorination shall be at the approval of the City Engineer.

6.) Aerobic Digester

a.) A minimum of three (3) cubic feet of aerobic digester volume per capita shall be provided for sludge stabilization.

b.) A minimum of 30 CFM/1000 CF of air shall be provided.

c.) An adjustable air lift or multiple ports shall be provided for transfer of supernatant to the head of the aeration tank.

d.) Solids retention time in the digester shall be a minimum of 15 days.

7.) Corrosion Protection

a.) Surface Preparation - After welding, all steel surfaces shall be blasted to SSPC-SP-6. All weld spatter and surface roughness shall be removed by grinding followed by chemical cleaning of weld seams.

b.) Primer - All primers shall be epoxy resin based and applied to a dry film thickness of 6 mils.

c.) Paint - All top coat paints shall be epoxy resin based and applied to a dry film thickness of 2 mils.

d.) For package treatment facilities installed in the ground cathodic protection shall be required and equipped with a monitoring system showing the electrical charge and an indicator of when anodes require replacement.

8.) Sludge Drying Beds

a.) Area requirements shall be 2.0 SF/Capita for open beds and 1.4 SF/Capita for covered beds.

f. **Equipment**

1.) **Lift Pumps and Controls**

- a.) All pumps shall be capable of passing a 3-inch or larger sphere and be of non-clog design.
- b.) The use of grinder and submersible pumps shall be at the approval of the City Engineer.
- c.) Pump controls shall be manufactured by Consolidated Electric or equal and effect control via a pressure transducer located in the wet well. Pump controller shall be equipped with high wet well level alarm capability.

2.) **Air Distribution System**

- a.) Butterfly valves and unions shall be provided at each diffuser assembly.
- b.) Diffusers shall be of non-clog, corrosion resistant design and have a minimum of 10 percent efficiency.
- c.) Diffusers shall be removable and replaceable from above with the aeration tank in service.

3.) **Blowers**

- a.) There shall be provided a minimum of two (2) blowers, each capable of delivering the total required air flow.
- b.) Blowers shall be manufactured by Sutorbilt or approved equal.
- c.) Blower units shall be equipped as follows:
 - (1) Weighted Air Relief Valves
 - (2) Air Check Valves
 - (3) Air Intake Filter and Silencer
 - (4) Discharge Silencer
 - (5) Magnetic Starter
 - (6) Manual-off-automatic selector switch and 60 minute adjustable timer with capability for alternation of unit.
 - (7) Air flow meter and pressure gauge.
 - (8) Sight glass.
 - (9) Expansion joints on both suction and discharge sides.

4.) Electrical

- a.) All exterior electrical controls, motor starters and switches shall be installed in a NEMA Type 4X enclosure.
- b.) Plant service shall be 3-phase, 480V with 110 volt control voltage. Phase conversion equipment shall not be acceptable.
- c.) Provide for automatic restart of electric motors after interruption of power.
- d.) Power surge and lightning protection equipment shall be provided on all electrical instrumentation and radio equipment.
- e.) All electrical equipment shall be manufactured by General Electric or Square D.
- f.) Hour meters shall be provided and installed for each pump and blower motor.
- g.) All exposed conduit shall be rigid steel galvanized.
- h.) A Crouse-Hinds #AR-2041-522-M80 plug and install safety interlock and switching system for standby power.

5.) Flow Meter

- a.) Influent or effluent flow measurement shall be provided.
- b.) Instrument shall be provided with a rate of flow indicator and totalizing capability.
- c.) Flow meters shall be manufactured by Polysonics or approved equal.

6.) Alarm System

- a.) An Intrac 2000 radio alarm system as manufactured by Motorola shall be provided and installed.
- b.) Alarm points are as follows:
 - (1) High wet well.
 - (2) Power failure.
 - (3) Illegal entry (if applicable).
 - (4) High dry well (if applicable).

- (5) Blower failure.
- (6) Low battery.
- (7) Maintenance man.
- (8) Chlorination equipment.

7.) Flow Meter

- a.) An ultrasonic flow meter as manufactured by Polysonics or equal shall be provided equipped with rate of flow indicator, flow totalization and a compatible chart recorder.

g. Sludge Disposal

- 1.) Approved measures shall be taken for disposal of the wastewater sludge.
- 2.) If transportation via tanker truck to a City of Huntsville wastewater facility is considered, prior approval from the City Engineer must be granted before the start of construction. If approved, the proper hose fittings and cutoff valves shall be installed on the aerobic digester.

h. Submittals

Unless otherwise noted, one (1) copy each of the following is required at the time of application:

- 1.) NPDES permit.
- 2.) Overall site plan showing the package wastewater facility, with respect to the rest of the development.
- 3.) Manufacturers plans and specifications for the lift station, package wastewater facility, and chlorination area.
- 4.) Catalog cut sheets of all mechanical equipment.
- 5.) All pump and blower performance curves.
- 6.) Complete mechanical and electrical details.
- 7.) Operation and maintenance manuals (3 sets).
- 8.) Completed City of Huntsville application forms.

SUMMARY OF DESIGN CRITERIA

DESIGN PARAMETER

DESIGN VALUE

1.	Influent Concentration mg/L	
a.	BOD ₅	200
b.	TSS	200
2.	Flow Contribution	
a.	Single Family Dwelling, GPD/Dwelling	350
b.	Others	Text or Manuals
3.	Peak Hourly Flow Rate	2.5
4.	Buffer Zone, etc.	300
5.	Flood Protection, Flood Event	
a.	Structures	100-Year
b.	Facility Operation	25-Year
6.	Lift Station	
a.	Maximum Pumping Rate	>Peak
b.	Wet Well Detention Time, Min.	15
c.	Ventilation Requirements, Air Change/Hr.	
	(1) Continuous Duty	12
	(2) Intermittent	30
d.	Minimum number of lift pumps	2
7.	Flow Equalization	
a.	Detention Time, Min.	120
b.	Dissolved Oxygen, mg/L	1.0
c.	Air Requirements, CFM/1000 Gal.	1.25
8.	Aeration Design, LB/Capita/Day	
a.	Without Garbage Grinders	
	(1) BOD ₅	0.17
	(2) TSS	0.20
b.	With Garbage Grinder	
	(1) BOD ₅	0.22
	(2) TSS	0.25
c.	Minimum number of blowers	2
9.	Extended Aeration Process	
a.	BOD Loading, Lbs./day/1000 CF	12.5
b.	Detention Time, Hrs.	24

10.	Fixed Growth Activated Sludge Process	
a.	BOD Loading, Lbs./day/1000 CF	45
b.	Detention Time, Hrs.	6
11.	Clarifiers	
a.	Detention Time, Hrs.	4
b.	Surface Settling Rate, GPD/SF	
(1)	At ADF	400
(2)	At Peak	1000
c.	Peak Solids Loading Rate, Lbs./day/SF	35
d.	Weir Overflow Rate, GPD/LF	10,000
e.	Side Water Depth, Ft.	10
f.	Return Rate, % of ADF	0 - 100
12.	Chlorination Contact Time, Min.	
a.	At ADF	Not Specified
b.	At Peak	15
13.	Aerobic Digester	
a.	Volume, CF/Capita	3
b.	Air Requirements, CFM/1000 CF	30
c.	Solids Retention Time	15
14.	Drying Bed Area, SF/Capita	
a.	Open	2.0
b.	Covered	1.4

SPECIFIED EQUIPMENT MANUFACTURERS

1. Pump Controls - Consolidated Electric
2. Blowers - Sutorbit
3. Electrical Equipment - General Electric
4. Flow Meter - Polysonics

CITY OF HUNTSVILLE
APPLICATION FORM FOR PACKAGE WASTEWATER FACILITY
ACCEPTANCE

A. General Information

1. Name of Project Served _____
2. Total Area Served, Acres _____
3. Estimated Start of Construction _____
4. Estimated Completion Date _____
5. Minimum distance from developable land, ft. _____

B. Applicant

I, the undersigned, am fully aware that the statements made in this application for approval of a wastewater facility are true, correct and complete to the best of my knowledge.

Mailing Address

Signature of Applicant

Telephone Number

Name and Title

Date

Representing

C. Engineer

This is to certify that this application has been prepared under my direction and the plans and specifications for this package wastewater facility have been designed by me and are in conformance with sound engineering practices.

Mailing Address

Signature of Engineer

Company Name

Name

Telephone Number

Alabama Registration No.

Date

AFFIX SEAL

D. Critical Elevations

1. 100-Year Flood _____
2. 25-Year Flood _____
3. Top of Lift Station Structure _____
4. Top of Package Wastewater Structure _____
5. Top of Chlorination Structure _____

E. Quantification of Design Flow

	Units	Gal./Unit	GPD
1. Single Family Dwelling	_____	@ _____	_____
2. Condominiums, Apartments	_____	@ _____	_____
3. Swimming Pools	_____	@ _____	_____
4. Motels	_____	@ _____	_____
5. Schools	_____	@ _____	_____
6. Commercial	_____	@ _____	_____
7. Industrial	_____	@ _____	_____
8. Other	_____	@ _____	_____

Average Daily Flow _____ GPD
 Minimum Daily Flow _____ GPD
 Peak Hourly Flow _____ GPD
 Peaking Factor _____

F. Design Influent Conditions

1. Influent BOD _____ mg/L _____ Lbs./Day
2. Influent TSS _____ mg/L _____ Lbs./Day

G. Permit Conditions

1. Permit Number _____
2. Name of Receiving Stream _____
3. Effective Date: From _____ To _____
4. Effluent BOD _____ mg/L _____ Lbs./Day _____ % Removal
5. Effluent TSS _____ mg/L _____ Lbs./Day _____ % Removal
6. Effluent pH Range: From _____ To _____
7. Effluent Dissolved Oxygen _____ mg/L
8. Effluent Residual Chlorine _____ mg/L
9. Other Permit Conditions: _____

H. Grinding Equipment

1. Manufacturer/Model Number _____
2. Number of Units _____
3. Maximum Hydraulic Throughput, GPD _____
4. Bypass Channel Present _____

I. Lift Station

1. Pump Manufacturer/Model No. _____
2. Number of Pumps _____
3. Type of Pumps _____
4. Fixed or Variable Speed _____
5. Pump Capacity

Pump No. 1	GPM @ _____	TDH; _____	HP _____
Pump No. 2	GPM @ _____	TDH; _____	HP _____
Pump No. 3	GPM @ _____	TDH; _____	HP _____
6. Method of Pump Control _____
7. Wet Well
 - a. Volume between low and high water levels, gal. _____
 - b. Detention time at average daily flow, min. _____
 - c. Detention time at peak hourly flow, min. _____
8. Ventilation Present _____

J. Flow Equalization Chamber

1. Volume of Chamber, Gal. _____
2. Detention Time, at peak hourly flow, min. _____
3. Aeration Present _____

K. Primary Clarifier (if applicable)

1. Number of Units _____
2. Volume of Clarifier, Gal. _____
3. Side Water Depth, Ft. _____
4. Surface Settling Rate, GPD/SF
 - a. At average daily flow _____
 - b. At peak hourly flow _____
5. Detention Time, Min.
 - a. At average daily flow _____
 - b. At peak hourly flow _____
6. Weir Overflow Rate, GPD/LF
 - a. Weir Length, LF _____
 - b. At average daily flow _____
 - c. At peak hourly flow _____
7. Scum Collection Present _____

L. Aeration Chamber

1. Volume of Chamber, Gal. _____
2. Number of Chambers _____
3. Side Water Depth, Ft. _____
4. Detention Time, Min.
 - a. At average daily flow _____
 - b. At peak hourly flow _____

5. Suspended or Fixed Growth Process _____
6. BOD₅ Loading, Lbs./1000 CF
 - a. At average daily flow _____
 - b. At peak hourly flow _____
7. Activated Sludge Return Rate, GPD _____
8. Spray Water System Present _____
9. Blower Manufacturer/Model No. _____
10. Number of Blowers _____
11. Type of Blowers _____
12. Fixed or Variable Speed _____
13. Blower Air Delivery

Blower No. 1	_____ CFM @	_____ PSI;	_____ HP
Blower No. 2	_____ CFM @	_____ PSI;	_____ HP
Blower No. 3	_____ CFM @	_____ PSI;	_____ HP
Blower No. 4	_____ CFM @	_____ PSI;	_____ HP
14. Blower Silencers Present _____
15. Air Supply Materials of Construction
 - a. Header _____
 - b. Drop Piping _____
 - c. Air Diffusers _____
16. Air Diffusers
 - a. Diffuser Manufacturer _____
 - b. Number per drop pipe _____
 - c. Transfer efficiency _____

M. Final Clarifier

1. Number of Units _____
2. Volume of Clarifier, Gal. _____
3. Side Water Depth, Ft. _____
4. Surface Settling Rate, GPD/SF
 - a. At average daily flow _____
 - b. At peak hourly flow _____
5. Detention Time, Hrs.
 - a. At average daily flow _____
 - b. At peak hourly flow _____
6. Weir Overflow Rate, GPD/LF
 - a. Weir Length, LF _____
 - b. At average daily flow _____
 - c. At peak hourly flow _____
7. Scum Collection Present _____

N. Aerobic Digester

1. Number of Units _____
2. Volume of Tank, Gal. _____
3. Design Holding Requirements, CF/Capita _____
4. Solids Retention Time, Days _____

5. **Aeration Present** _____

Chlorine Contact Tank

1. **Number of Units** _____
2. **Volume of Tank, Gal.** _____
3. **Detention Time, Min.** _____
 - a. **At average daily flow** _____
 - b. **At peak hourly flow** _____
4. **Method of Chlorination** _____
5. **Chlorinator Manufacturer/Model No.** _____
6. **Tank Material of Construction** _____

P. **Sludge Disposal**

1. **Method of Disposal** _____
2. **Drying Beds (if applicable)**
 - a. **Number of Beds** _____
 - b. **Surface Area per Bed, SF** _____
 - c. **Design basis, SF/Capita** _____

Q. **Corrosion Protection**

1. **Cathodic Protection** _____
2. **Describe measures taken for surface preparation, priming, and painting, including materials used.** _____

R. **Electrical**

1. **Electrical Service, phase/voltage** _____
 - a. **Equipment** _____
 - b. **Controls** _____
2. **Electrical Service Manufacturer** _____
3. **Pump Control Manufacturer** _____
4. **Flow Meter Manufacturer** _____
5. **Alarm System Manufacturer** _____
6. **Surge Protection Provided** _____

502.6 Design Criteria for Wastewater Metering Stations

By Ordinance, the policy of the City of Huntsville is to charge regional users of the city wastewater system a monthly sewer bill based on metered flows received.

The metering station shall be designed in accordance with the following criteria:

a. Design Data

- 1.) The primary flow measuring device shall be capable of accurately measuring flows equal to the maximum capacity of the incoming sewer line.
- 2.) The metering station shall be designed to remain fully operational and accessible during the one hundred (100) year flood event.

b. Metering Station Building and Site

- 1.) The building shall have a minimum eight (8) foot ceiling with one 3'-0" x 6'-8" metal door with key lock, one 24"x24" ventilation louver and no windows.
- 2.) A ventilator shall be provided using forced air as opposed to exhaust. Ventilation requirements are 12 air changes/hour for continuous duty or 30 air changes/hour for intermittent duty. Ventilation shall be thermostatically controlled and shall be capable of maintaining ambient temperatures during summer months.
- 3.) Building heat shall be provided so as to maintain 70°F during winter months.
- 4.) One outside entry light (Kenall Model No. 3737) shall be provided near the entrance door. Interior lighting shall be a minimum of two (2) 4-foot, 40 watt, 4 bulb fluorescent fixtures per 100 square feet.
- 5.) A minimum of four 110 volt interior wall receptacles (one on each wall) shall be provided with ground fault protection and waterproof covers.
- 6.) The station shall be provided with a 100 amp electric panel located inside the building.
- 7.) All flow instrumentation (flow meter and chart recorder) shall be protected from lightning by surge arrestors.

- 8.) Provisions shall be made for protection of the building walls during washdown of the floor. For wood frame buildings, this can be accomplished by setting the building on a concrete block foundation and allowing 6 to 8 inches of freeboard from top of block to finished floor.
- 9.) Water service shall be provided by one (1) 3/4" hose bibb and one (1) reduced pressure backflow preventer shall be located inside the building. Backflow preventer shall be ANSI/ASSE 1013; bronze body with bronze and plastic internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve which opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks; Model 909 manufactured by Watts Regulator Company; Mueller, Lawler/ITT or equal. Provide manufacturer's test kit.
- 10.) The metering station site shall be protected by a chain link fence six (6) feet in height with 3-strand barbed wire above. One three (3) feet walk-through gate shall be provided. Fencing shall be class 2 zinc coating (2.0 oz. of zinc per sq. ft. of uncoated wire surface). The fencing fabric shall be woven in 2" mesh from No. 9 gage wire. If desired, a vertical board wooded fence of the same height is acceptable using treated lumber or redwood. The building shall enclose the flow metering vault and all electronic instrumentation.
- 11.) Access to the metering station shall be via a dedicated "all weather" road 10'-0" in width. In cases where a steep grade creates conditions of erosion of the surface or insufficient traction for City maintenance vehicles, the requirement for a concrete or paved surface shall be imposed. In unusual cases, curb and gutter may be required. In no case shall the grade exceed 12 percent as required by the City of Huntsville for acceptance of streets.
- 12.) All grounds are to be landscaped and seeded for grass. Slopes requiring mowing shall not exceed 20 percent.
- 13.) The metering station shall be located within fee simple property dedicated to the City of Huntsville.

c. Open Channel Flow Stations

- 1.) The primary measuring device for measuring flows in gravity sanitary sewer lines shall be an appropriately sized Parshall Flume.

- 2.) The flume shall be sized so as to accurately measure both low or initial flows as well as peak or maximum pipe capacity flows. In the event initial flows cannot be accurately measured, a low-flow insert shall be provided and installed.
- 3.) The design engineer shall establish the flume crest elevation such that no more than 60 percent submergence can occur at a flow rate equal to the maximum pipe capacity. Sufficient hydraulic break shall be provided so as to account for flume head losses and to avoid submergence effects. Calculations shall be submitted to support and document the design crest elevation.
- 4.) The flume shall be provided with a factory installed scale on the side of the unit incremented in tenths of a foot.
- 5.) The flume vault shall be provided with manhole rungs or ladder fabricated from corrosion resistant materials. The vault shall be covered by grating of aluminum or heavy-duty galvanized steel construction.
- 6.) The transducer mount and related hardware shall be adjustable and fabricated from corrosion resistant materials.
- 7.) The open-channel flow meter shall be a Polysonics Model #ERS-91 or equal. A compatible 30-day strip chart recorder shall also be provided and installed. The flow meter and recorder shall be field calibrated and the installation approved by a factory authorized technician. Accuracy shall be $\pm 2\%$ of full scale.

d. Closed Pipe Flow Stations

- 1.) Closed pipe flow measurement shall apply in cases where there is pumped flow to the City system. All pertinent acceptance criteria for wastewater pump stations shall apply.
- 2.) The closed pipe flow meter shall be a Polysonics Model #UFM-84 or equal. A compatible 30-day strip chart recorder shall also be provided and installed. The flow meter and recorder shall be field calibrated and the installation approved by a factory authorized representative. Accuracy shall be $\pm 2\%$ of full scale.
- 3.) The transducer shall be located the correct minimum distance from valves and pipe fittings.
- 4.) In cases where the transducer is located away from the building, it shall be enclosed in a concrete vault equipped with corrosion resistant manhole rungs or ladder and having a P-trap drain with flap valve to the wet well. Sufficient working room shall be provided within the vault.

502.7 Standard Specifications

All gravity sewer lines and manholes shall be constructed in accordance with the rules, regulations, and standards of the City of Huntsville. The following is a list of the applicable sections in the Standard Specifications:

- SECTION 623 MANHOLES FOR SANITARY SEWERS**
- SECTION 673 LOW PRESSURE AIR TESTING FOR SEWER LINES**
- SECTION 647 SANITARY SEWERS**
- SECTION 820 BRICK MATERIALS**
- SECTION 823 CONCRETE**
- SECTION 837 REINFORCING STEEL**
- SECTION 839 MANHOLE FRAMES, COVERS AND STEPS**

503. Stormwater Management

503.1 General Requirements

- a.) The Planning Commission shall not approve any plat of a subdivision which does not make adequate provision for drainage of storm or flood water in accordance with a plan approved by the City Engineer in accordance with the Stormwater Management Regulations which are published in a separate document available through the City Engineer's office.
- b.) Storm sewers and drainage facilities shall be designed as provided in the Stormwater Management Regulations and according to the City of Huntsville's specifications by a professional engineer registered in the State of Alabama. The design of the stormwater drainage system shall insure the adequate handling of stormwater runoff and the adequate control of erosion and sedimentation through the use of properly sized and positioned drainage structures and facilities.
- c.) Lakes, ponds and similar facilities may be used to retain stormwater runoff to prevent or help drainage problems provided such facilities are in compliance with the Stormwater Management Regulations promulgated by the City Engineer and provided adequate provisions are made to control siltation and pollution. Lakes, ponds and similar areas may be accepted by the local government for maintenance as determined by the City Engineer, if sufficient land is dedicated as a necessary part of the drainage control system.
- d.) Drainage improvements and installations shall be constructed within dedicated rights-of-way and utility and drainage easements shown on the subdivision plat as approved by the City Engineer.

- e.) A licensed contractor shall be employed by the developer to install the drainage systems and facilities as shown in the approved subdivision. The work shall be accomplished according to the latest edition of the construction specifications and as directed by the City Engineer.

503.2 Flood Prone Areas

All local government rules and regulations pertaining to flood prone areas shall be observed when designing subdivisions. Specifically, the following rules and regulations shall apply:

- a.) Subdivisions lying in whole or in part within recognized flood hazard areas shall be subject to the provisions of the City of Huntsville's Zoning Ordinance - Floodway Fringe Regulations, the Stormwater Management Regulations, or other applicable regulations.
- b.) The boundaries of flood districts and hazard areas shall be as defined in the above-referenced ordinances. Any interpretation necessary shall be made by the City Engineer.
- c.) Lands within a floodway shall not be subdivided or developed except that certain minimal grading and construction may be allowed to provide for public utility service and/or roadways to cross said floodway.
- d.) The Engineer shall prescribe on the plat or development plan minimum building floor elevations for structures located within flood districts where development is allowed.
- e.) In other areas determined to have poor drainage that is subject to periodic or possible flooding, the City Engineer may require the developer to fill to heights which will be above the elevation of the maximum design flood as determined by the Engineer of Record and approved by the City Engineer.

504. Utility Construction

504.1 Water Facilities

- a. Where a public water system is accessible the subdivider shall install adequate water facilities, including fire hydrants, subject to the specifications of the Huntsville Utilities Water Department.
- b. In low-density developments, if a public water system is not available, drilling individual wells must be approved by the Health Department and Huntsville Utilities Water Department manager.

504.2 Gas, Electric, Phone, and Cable Facilities

- a. All utility facilities including gas, electric power, telephone and CATV cables shall be planned and installed in accordance with the specifications of the local government and governing utility boards or authorities.
- b. All power and communication circuits within a subdivision shall be placed underground and the subdivider shall make arrangements with the utility authorities for facilities to be placed underground as a condition to the approval of the subdivision plat, provided however, that underground wiring shall not be required if any of the conditions listed in the Subdivision Regulations are determined to exist.

504.3 Special Provisions for Mountainside Development Zoning District

- a. Grading on natural slopes of twenty-five percent (25%) or greater shall only be permitted for the construction and installation of roads, utilities and other limited foundation grading, which can be shown to be sensitive to the existing terrain.

- b. **The construction of utilities shall not be allowed unless all said areas of cut are restored to natural grade and revegetated to conform to the character of the surrounding natural terrain. In order to reduce grading disturbance during utility installation, all utilities shall be incorporated in common trenches, where practical, utilizing duct banks designed and constructed to current standards of Huntsville Utilities as the same may from time to time be amended.**

600. ASSURANCE FOR COMPLETION AND MAINTENANCE OF IMPROVEMENTS

601. Improvements and Performance Bond

601.1 Completion of Improvements

Before any subdivision plat is signed by the chairman of the Planning Commission, all applicants shall be required to complete, in accordance with the Planning Commission's decision and to the specifications of the City Engineer, all the street, sanitary, and other improvements including lot improvements on the individual lots of the subdivision as required in these regulations, specified in the preliminary and final subdivision plats, and as approved by the Planning Commission.

601.2 Bonds to Insure Performance

- a. The Planning Commission in its discretion may waive the requirement that the applicant complete and dedicate all public improvements prior to the signing of the subdivision plat, and provide that, as an alternative, the applicant post a bond secured by an insurance company licensed by the State of Alabama, or a cash bond, or an irrevocable letter of credit from an approved lending institution, as approved by the Legal Department, at the time of application for final subdivision approval in an amount estimated by a registered professional engineer and approved by the City Engineer, Director of Department of Transportation, and by the local utilities as sufficient to secure to the local government the satisfactory construction, installation, and dedication of the uncompleted portion of required improvements. The bond or letter of credit shall also secure all lot improvements on the individual lots of the subdivision as required in these regulations.

- b. Such bond or letter of credit shall comply with all statutory requirements and shall be satisfactory to the local government as to form, sufficiency, and manner of execution as set forth in these regulations. A bare signature bond will not be accepted by the local government. The period

within which required improvements must be completed shall be specified by the Planning Commission in the resolution approving the final subdivision plat and shall be incorporated in the bond or letter of credit and shall not, in any event, exceed two (2) years from the date of final approval. If the improvements are not completed within the period specified by the Planning Commission in the resolution approving the final plat, then, at the option of the Planning Commission, the approval may be deemed to have expired, or, with the consent of the City Council, the bond or the letter of credit shall be forfeited or invoked, as the case may be, to complete the improvements as provided by the final subdivision plat.

601.3 Cost of Improvements

Unless otherwise specified, all required improvements shall be made by the applicant, at his expense, without reimbursement by the local government or any improvement district herein.

601.4 Acceptance of Dedication Offers

Acceptance of formal offers of dedication of streets, public areas, easements, and parks shall be in accordance with the procedure established by the local government. The approval by the Planning Commission of a subdivision plat shall not be deemed to constitute or imply the acceptance by the local government of any street, easement, or park shown on said plat. The Planning Commission may require said plat to be endorsed with appropriate notes to this effect.

602. Inspection of Improvements

602.1 General Procedure

The City Engineer shall provide for inspection of required improvements during construction and insure their satisfactory completion. If the City Engineer finds upon inspection that any of the required improvements have not been constructed in accordance with the standards and specifications as outlined in these regulations, the applicant shall be responsible for completing the improvements.

Wherever the cost of improvements is covered by a bond or letter of credit, the

applicant and the bonding company, or institution shall be severally and jointly liable for completing the improvements according to specifications.

602.2 Procedure for Obtaining Final Acceptance of Improvements by the City of Huntsville

All improvements which are constructed within a public right-of-way, and/or public easement, and improvements constructed within a subdivision development with the intention of being operated and maintained by the City of Huntsville must be formally accepted by the City of Huntsville before the City of Huntsville will perform any work or maintenance on the improvement. The procedure for obtaining final acceptance of improvements are described in this section.

602.2.1 Procedure

(1) After all improvements have been constructed and completed in accordance with all City of Huntsville requirements, the owner's engineer will notify the City Engineer and arrange a time for a Final Inspection of the improvements. The Engineer, owner's engineer and City Engineer will inspect the improvements to insure that all work has been satisfactorily completed. Any discrepancies must be corrected before the City of Huntsville will accept the improvements.

(2) Submit Acceptance Letter and "As-built" Plans

The owner and his registered professional engineer (Engineer of Record) and registered land surveyor must furnish the City Engineer and acceptance letter and "as-built" drawings. The owner's engineer shall prepare a letter stating to the City Engineer that to the best of his knowledge the improvements have been completed as required. The owner's engineer and his surveyor shall certify to the City Engineer (both in the acceptance letter and on detailed "as-built" engineering drawings of the subdivision or improvements indicating location, dimension, materials, and other information required by the Planning Commission or City Engineer) that all public improvements have been constructed in

accordance with both the approved construction plans and the City of Huntsville specifications and that the improvements have been completed; are located within the dedicated and/or platted easements and/or right-of-way, and are ready for dedication to the City of Huntsville. For subdivisions where construction occurred on lands or portions of lands which are designated as "Level K" as defined by the Zoning Ordinance of the City of Huntsville, Alabama, the following certification shall be affixed to the Letter of Acceptance and the "as-built" engineering drawings of the subdivision.

(3) Improvements and Maintenance Bond

The City of Huntsville may accept a subdivision into its maintenance program where the sidewalks have not been completed as required provided that the owner has posted a bond to cover the incomplete improvements and provided that the time limit on completion of the improvements as required by the City of Huntsville's Subdivision Regulations has not been exceeded.

Before acceptance of a subdivision improvements into the City of Huntsville, the owner will be required to post a Maintenance Bond. The maintenance bond shall be in the form of a bond secured by an insurance company licensed by the State of Alabama, or a cash bond, or an irrevocable letter of credit from an approved lending institution, as approved by the Legal Department, and in the amount of five (5) percent of the total construction cost of the subdivision. The amount of the maintenance bond will be determined by the owner's engineer and approved by the City Engineer, and shall extend for a time period of at least twelve (12) months from the date of acceptance.

- (4) The "Acceptance Letter," "As-built" drawings, Maintenance Bond, Improvements Completion Bond where applicable, and three (3) copies of the recorded plat shall be submitted to the City Engineer for his signature.**

When all items of work have been completed as required and all regulations have been met, the City Engineer will sign the "Acceptance Letter" and forward to the Mayor for his signature. The signature by the Mayor of the City of Huntsville on the Acceptance Letter shall constitute dedication of and acceptance of the improvements into the City of Huntsville Maintenance Program. The date of acceptance of the subdivision improvements will be the date of the Mayor's signature as shown on the Acceptance Letter.

ENGINEER OF RECORD

I, _____, the engineer of record, certify that the proposed development shown herein is designed in accordance with sound engineering standards and practices, and in accordance with all applicable laws and regulations, whether local, state or national. I further certify that I have caused prudent investigation, testing and inspections to be performed on all lands within the proposed development identified as "LEVEL K," as defined by the zoning ordinance of the City of Huntsville, Alabama, including geotechnical analysis and testing on all "LEVEL K" lands and on lands upslope and downslope of the proposed development. Based upon the investigation, testing and inspections performed, as defined and discussed in the geotechnical analysis and report dated _____ and submitted in connection herewith, and further based upon any remedial measures taken in connection with the hazards defined therein, I certify that the site is safe for the proposed development, and within acceptable geotechnical standards the proposed development does not diminish the stability of the slope or otherwise increase the likelihood of landslide or other slope failure.

Date

Engineer of Record

OWNER

I, _____, owner/owners of the lands embraced hereon, am fully aware of the existence of "LEVEL K" lands, as defined by the zoning ordinance of the City of Huntsville, Alabama, within the development as shown hereon. I further understand the potential and inherent danger of said lands and that landslides have originated in conditions that regularly exist on said "LEVEL K" lands. With this knowledge, I hereby certify that I have caused all prudent measures to be taken in the design of the development as shown hereon, including an analysis of all lands upslope and downslope of the "LEVEL K" lands, to assure that the site is safe for the proposed development, and within acceptable geotechnical standards the proposed development does not diminish the stability of the slope or otherwise increase the likelihood of landslide or other slope failure.

Date

Owner

Upon such approval and recommendation of the City Engineer, the City of Huntsville may thereafter accept the improvements for dedication in accordance with the established procedure.

However, the City of Huntsville may accept for dedication a subdivision in which the required sidewalks are incomplete on the condition that the construction and installation of such sidewalks are secured by a bond or letter of credit as defined in Section A.2.a and further provided that such bond or letter of credit guarantees completion of said sidewalks within two (2) years of the date of final plat approval.

602.3 Reduction of Release of Bonds.

The bond or letter of credit covering all improvements may be reduced upon acceptance of said improvements by the City of Huntsville. The City Engineer shall set the amount of the bond or letter of credit to be retained by the City for a period of at least twelve (12) months following the date of acceptance. The bond or letter of credit shall be released only upon receipt by the City Engineer of a letter from the applicant's registered professional engineer stating that any improvements required since the date of acceptance by the City of Huntsville have been constructed in accordance with the approved plans and City of Huntsville specifications and are located within the dedicated and/or platted easements and/or rights-of-way. At such time, the City Engineer shall recommend in writing to the City Clerk that the bond or letter of credit be reduced or released. The City Engineer shall recommend the amount of the bond or letter of credit to be held as deemed necessary to insure that the improvements are completed and/or repaired or replaced and made acceptable to the City of Huntsville.

A bond or letter of credit covering sidewalk improvements, if posted, shall be released upon receipt by the City Engineer of a letter from the applicant's registered professional engineer and land surveyor stating that the sidewalk improvements have been completed and have been constructed in accordance with the approved plans and City of Huntsville specifications and are located within the dedicated or platted easements and/or rights-of-way. At such time, the

City Engineer shall recommend in writing to the City Clerk that the bond or letter of credit be released if, in his opinion, the sidewalks have been satisfactorily completed.

602.4. Forfeiture of Bonds

If, during the period when the subdivision improvements are covered by a bond or letter of credit, the construction of said subdivision creates a situation that is harmful, dangerous or an unreasonable nuisance to an adjacent property owner and the applicant does not correct the situation in a timely fashion, or if the applicant responsible for constructing the subdivision improvements goes into receivership or is otherwise financially unable to complete said improvements, or if said applicant abandons or leaves his subdivision improvements uncompleted, then the City Council may, at the recommendation of the Planning Commission, invoke said bond or letter of credit and direct that such work be completed so as to eliminate any dangerous, harmful or unreasonable nuisance.

603. Deferral of Required Improvements

The construction of specific required improvements may be deferred if the Planning Commission finds that:

1. The improvement is likely to be destroyed while still in a good state of repair due to the planned upgrading or expansion of public facilities or to expected future private development adjacent to the site.
2. The improvement would be so situated that it would be likely to deteriorate before it was put into service because it could not presently be used for its intended purpose.
3. The improvement would require additional off-site easements or rights-of-way in order to be constructed to City standards.
4. The improvement, if constructed concurrently with the subdivision, could create a situation hazardous to the health and/or safety of the public because of the nature of adjoining public or private features.

5. The City Engineer, County Engineer, or Director of Department of Transportation recommends that such improvement be deferred due to a unique characteristic or situation that would have the effect of nullifying the intent and purpose of the improvement if it were constructed.

If the Planning Commission so finds, then the applicant shall pay to the local government prior to the signing of the final subdivision plat a sum of money equal to the cost of constructing the deferred improvement as estimated by a registered professional engineer and approved by the City Engineer.

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DRAINAGE DETAILS

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DR-110	DOUBLE CURB INLET
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DR-126	OPEN GRATE INLET BOX - NON-TRAFFIC TYPE
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DR-163	SWALE DITCH SECTION
DR-164	SLOPE PAVING - DITCHES UNDER 6 FEET IN DEPTH

DR-165

SLOPE PAVING - DITCHES OVER 6 FEET IN DEPTH

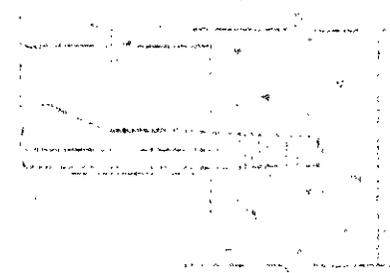
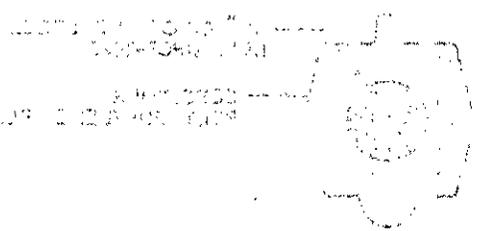
DR-166

STORM SEWER PIPE BEDDING



SECTION 1
 SLOPE PAVING - DITCHES OVER 6 FEET IN DEPTH
 STORM SEWER PIPE BEDDING

SECTION 2
 SLOPE PAVING - DITCHES OVER 6 FEET IN DEPTH
 STORM SEWER PIPE BEDDING



SECTION 3
 SLOPE PAVING - DITCHES OVER 6 FEET IN DEPTH
 STORM SEWER PIPE BEDDING

SECTION 4
 SLOPE PAVING - DITCHES OVER 6 FEET IN DEPTH
 STORM SEWER PIPE BEDDING

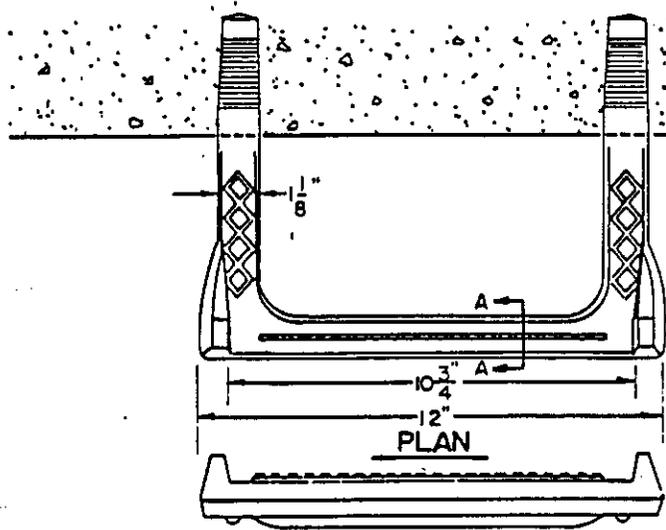
PLANNING AND DESIGN

THIS PLAN IS A PART OF THE PROJECT AND IS TO BE USED IN CONNECTION WITH THE OTHER PLANS AND SPECIFICATIONS FOR THE PROJECT.

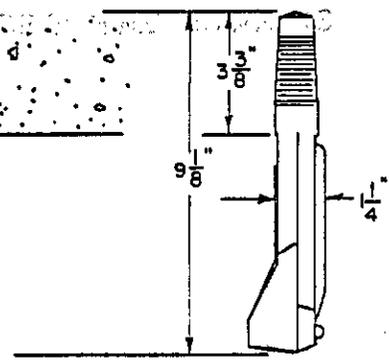
BY THE CITY ENGINEER

APPROVED FOR THE CITY ENGINEER

DATE

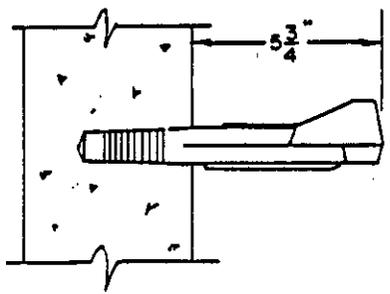


ELEVATION

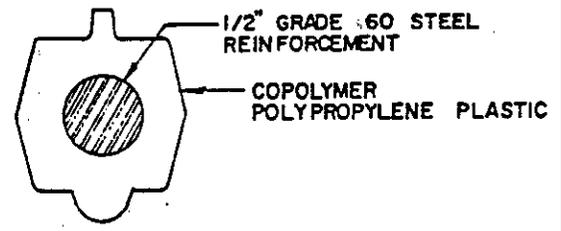


SIDE

NOTE: MANHOLE STEP TYPE (PSI - PF) AS MANUFACTURED BY M.A. INDUSTRIES, INC. OR APPROVED EQUAL.



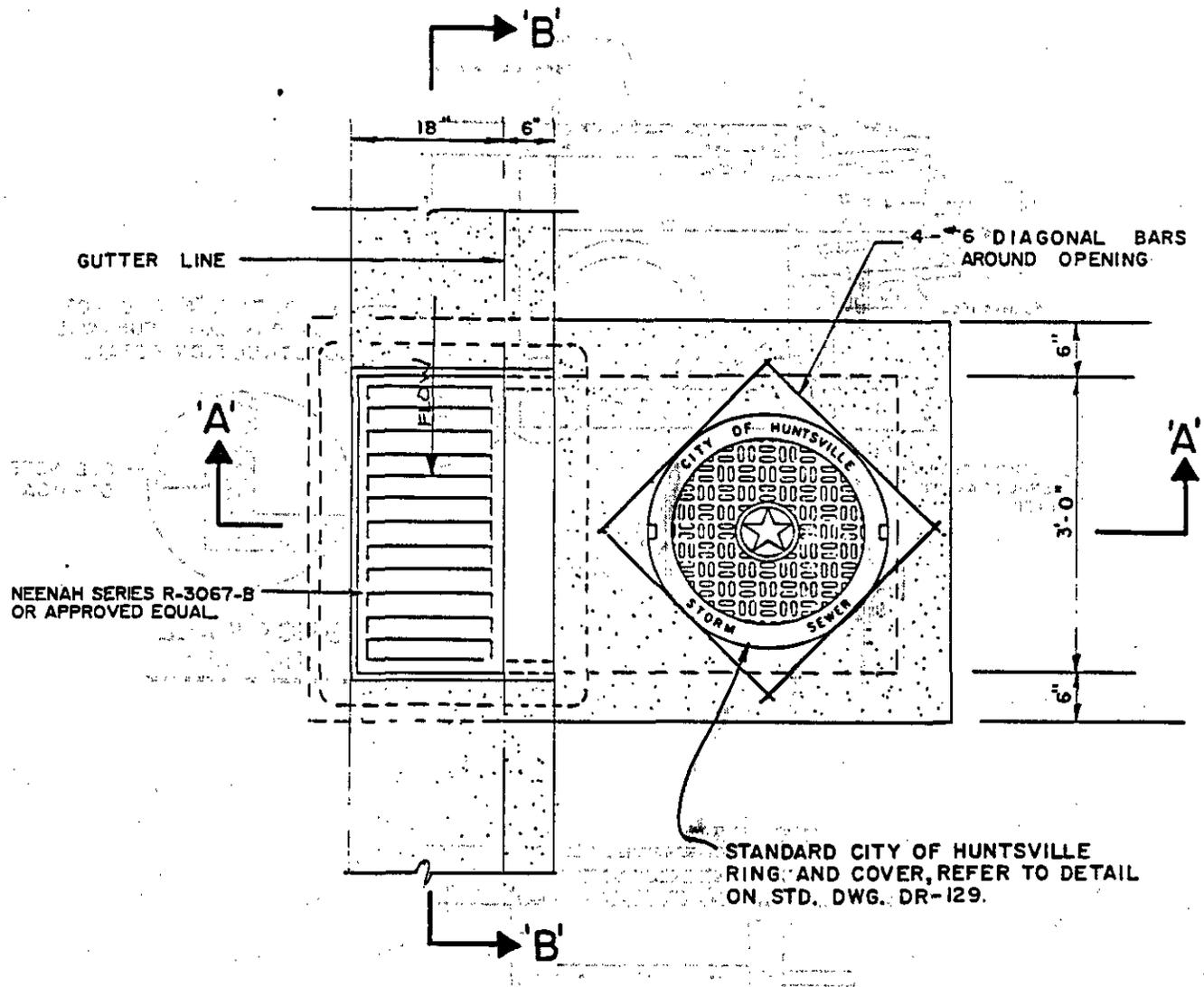
INSTALLATION



SECTION A-A

INLET STEP DETAILS

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	STANDARD LADDER BAR DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-100 DRAWING NO.

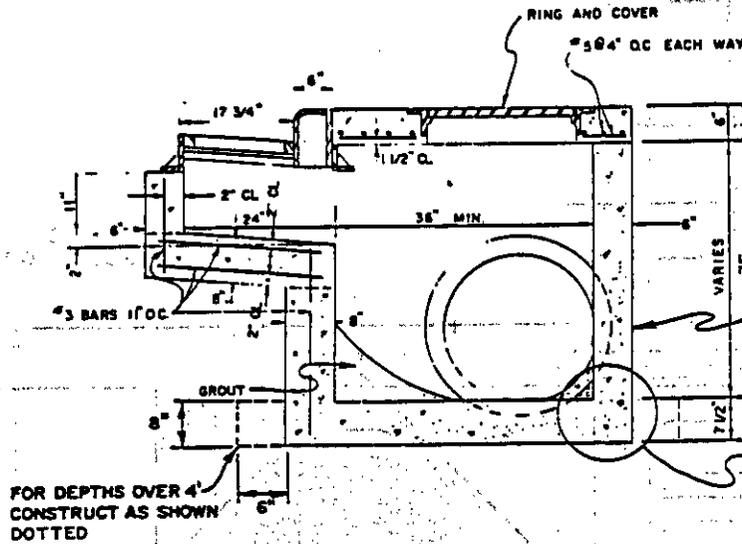


(SINGLE)
CURB INLET DETAIL

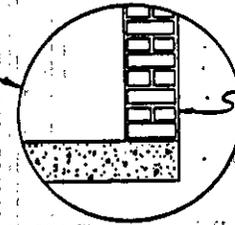
NOTES:

1. WHEN BRICK CONSTRUCTION IS USED WALLS WILL BE 8" BRICK WHEN "H" IS LESS THAN 5'-0", AND 12" BRICK WHEN "H" IS MORE THAN 5'-0". 1/2" THICK MORTAR ON BOTH SIDES.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			SINGLE CURB INLET DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-105A DRAWING NO.

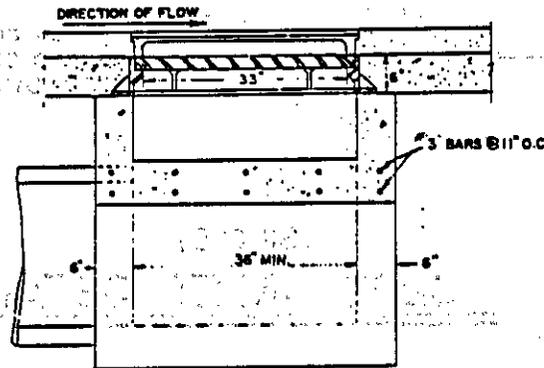


SEE DETAIL "A" AND NOTE 6 ON DR-120 C FOR WALL CONSTRUCTION DETAIL.



SEE NOTE 1 DR-110A

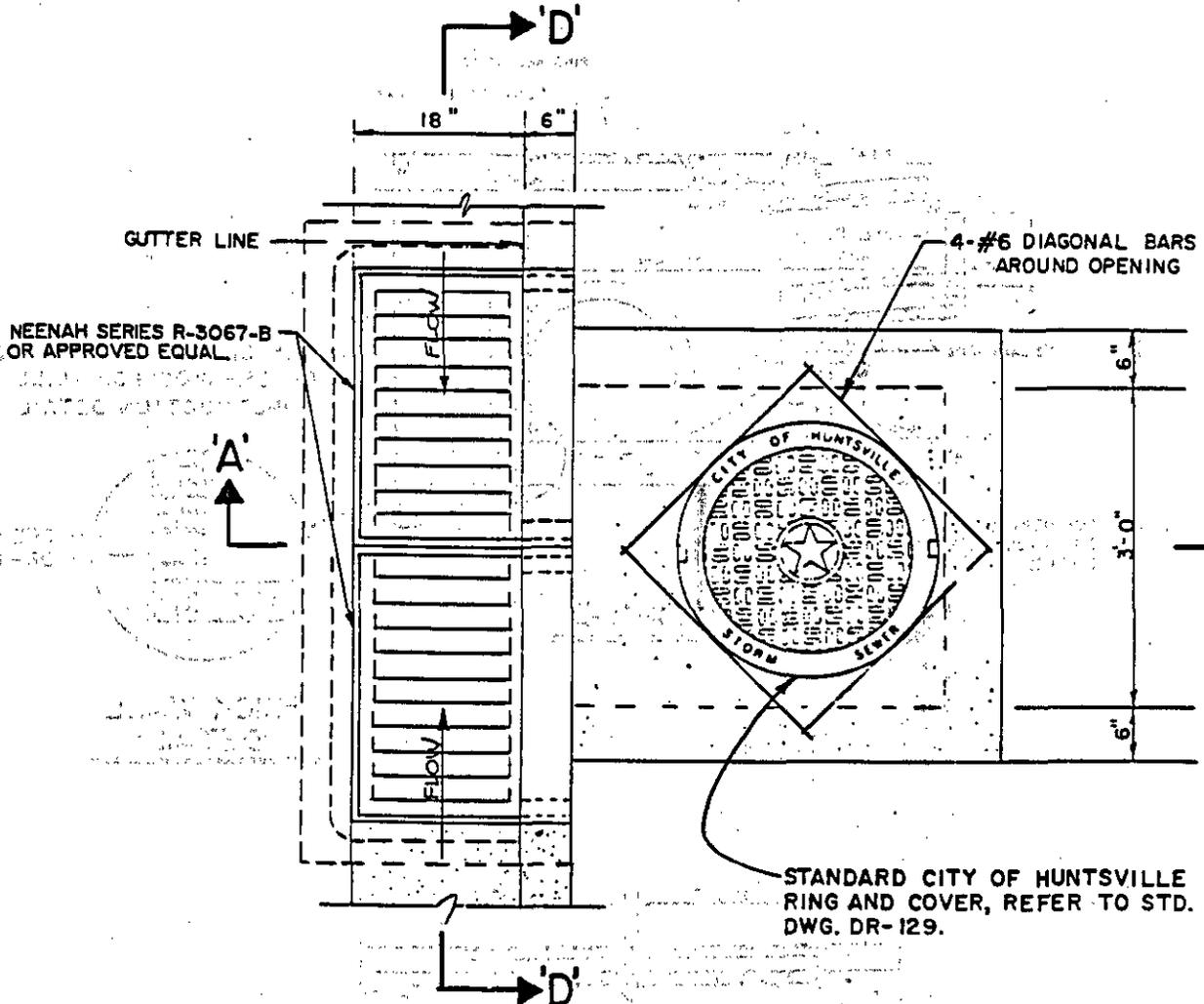
BRICK WALL DETAIL



SECTION 'B-B'

PRECAST UNITS:
 CONCRETE - 4000 P.S.I. MINIMUM
 REINFORCING STEEL - A615 GRADE 60 MINIMUM
 0.20 SO. IN./50. FT. MINIMUM

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			SINGLE CURB INLET DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-105 B DRAWING NO.



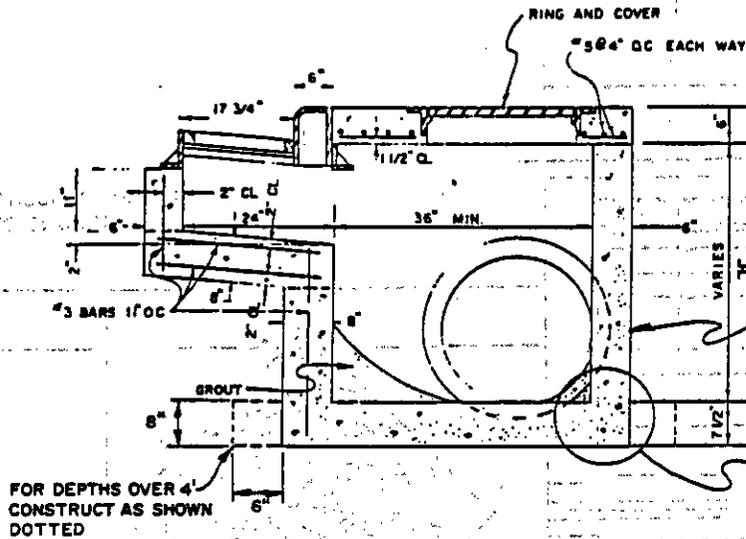
STANDARD CITY OF HUNTSVILLE RING AND COVER, REFER TO STD. DWG. DR-129.

(DOUBLE)
CURB INLET DETAIL

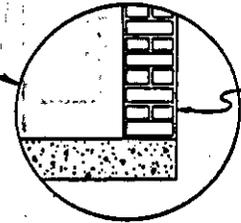
NOTES:

1. WHEN BRICK CONSTRUCTION IS USED WALLS WILL BE 8" BRICK WHEN "H" IS LESS THAN 5'-0", AND 12" BRICK WHEN "H" IS MORE THAN 5'-0". 1/2" THICK MORTAR ON BOTH SIDES.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			DOUBLE CURB INLET DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-110A DRAWING NO.

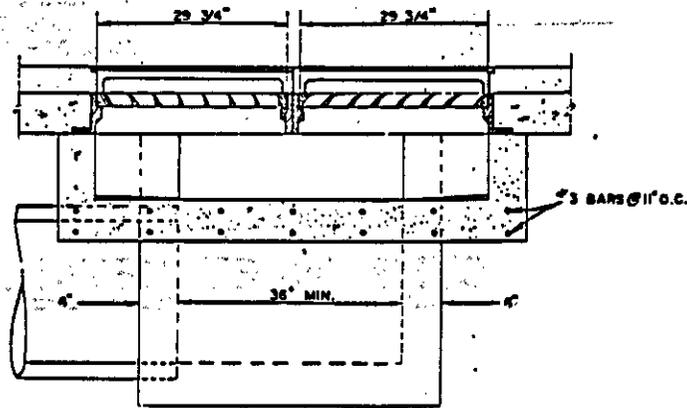


SEE DETAIL "A" AND NOTE 6 ON DR-120C FOR WALL CONSTRUCTION DETAIL.



SEE NOTE 1 DR-110A

BRICK WALL DETAIL

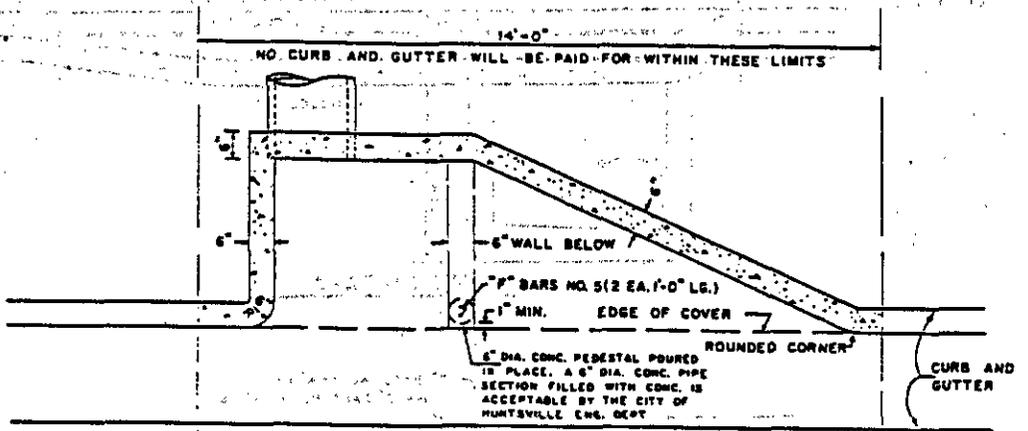
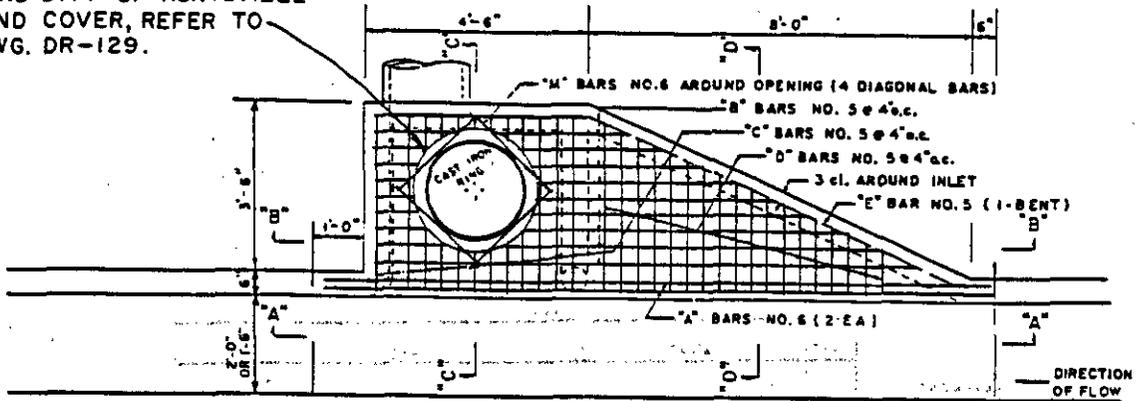


SECTION 'D-D'

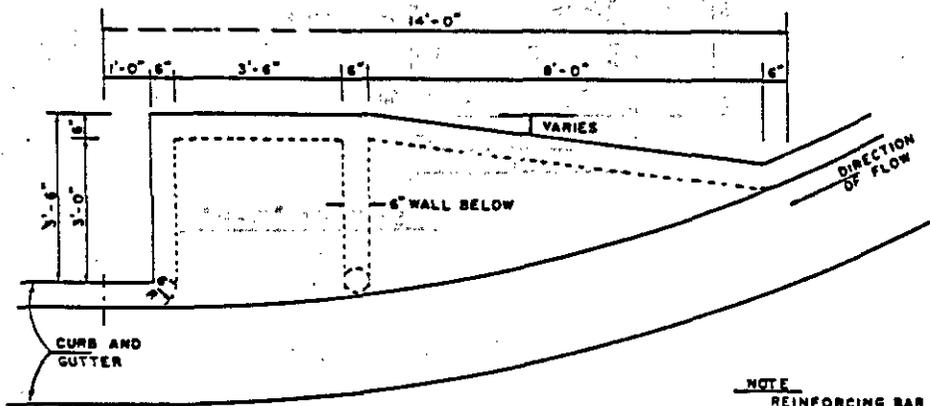
PRECAST UNITS:
 CONCRETE - 4000 P.S.I. MINIMUM
 REINFORCING STEEL - A615 GRADE 60 MINIMUM
 Q20 SO. IN./50. FT. MINIMUM

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			DOUBLE CURB INLET DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-110B DRAWING NO.

STANDARD CITY OF HUNTSVILLE
RING AND COVER, REFER TO
STD. DWG. DR-129.



PLAN VIEW
Scale: 1/2" = 1'-0"



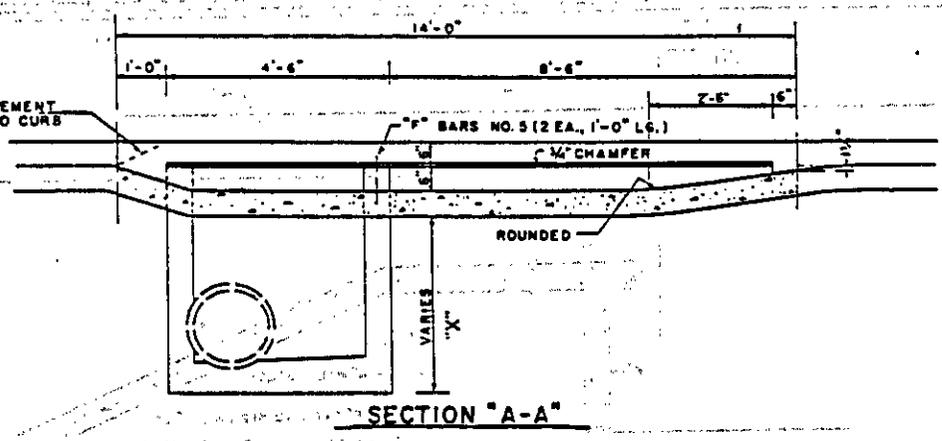
PLAN ON RADIUS
Scale: 1/2" = 1'-0"

(TO BE USED ONLY WHEN RADIUS
EXCEEDS 30') AND APPROVED
BY ENGINEER OF PUBLIC WORKS.

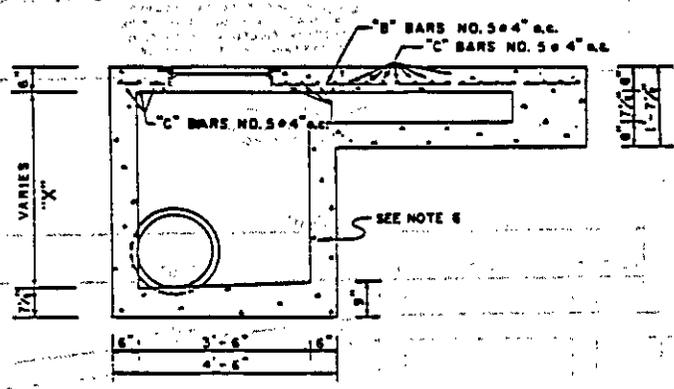
NOTE
REINFORCING BAR SIZE AND
SPACING SAME AS INLET ON
TANGENT LINE.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			"S" TYPE INLET DETAILS	
			ENGINEER OF PUBLIC WORKS	
			CITY OF HUNTSVILLE, ALABAMA	
DIRECTOR		DATE	DR-120A	DRAWING NO.

NOTE:
SLOPE TO PAVEMENT
IF THERE IS NO CURB
ON THIS SIDE

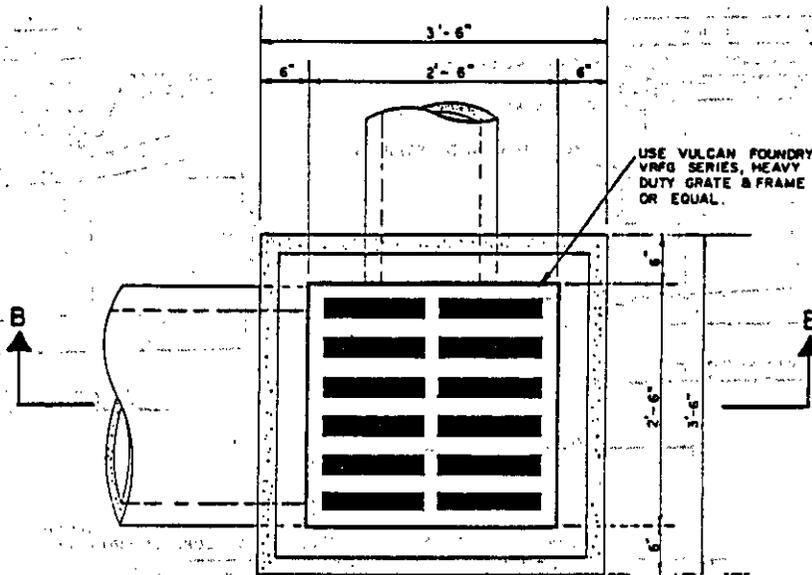


SECTION "A-A"



SECTION "B-B"

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			"S" TYPE INLET DETAILS	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-120B DRAWING NO.



PLAN

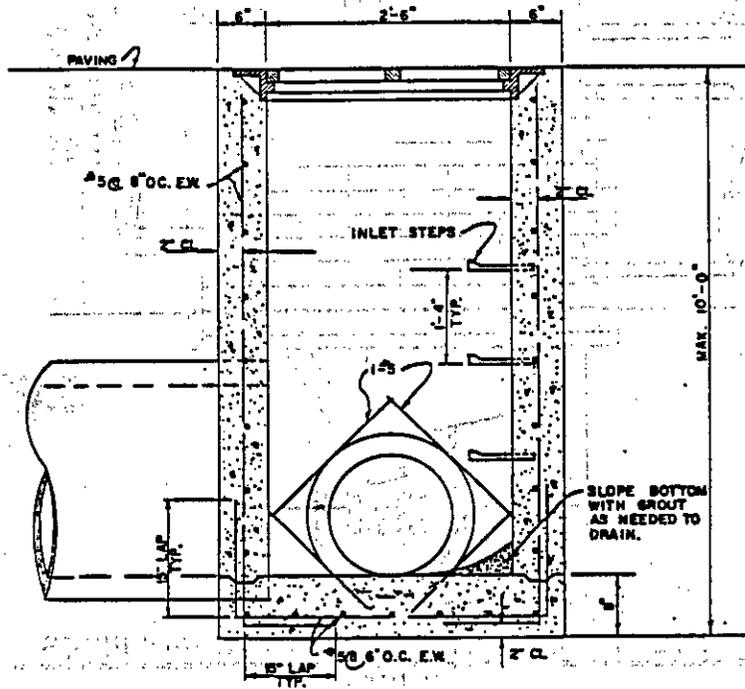
INLET BOX FOR 15" TO 24" PIPES

(TRAFFIC TYPE)

NOTES :

1. MIN. SIZE OF AN INLET BOX IS 2'-6" x 2'-6".
2. MAX. SIZE OF AN INLET BOX IS 7'-0" (W2) x 13'-6" (W1) FOR 27" TO 60" PIPES.
3. MIN. SIZE OF AN INLET BOX IS 2'-6" x 2'-6" FOR 15" TO 24" PIPES.
4. MAX. HEIGHT OF AN INLET BOX IS AS SHOWN.
5. INLET BOXES GREATER THAN 7'-0" x 13'-6" x 10'-0" SHALL BE A SPECIAL DESIGNED INLET BOX.
6. ALL CONCRETE SHALL BE CLASS 'A' AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS.
7. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
8. STEPS ARE REQUIRED ON ALL INLET BOXES WHEN DIMENSION FROM BOTTOM SLAB FLOW LINE TO TOP OF TOP SLAB IS GREATER THAN 4'-0".

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			OPEN GRATE INLET BOX DETAIL	
			TRAFFIC TYPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-125A DRAWING NO.



SECTION B-B

1. ALL CONCRETE SHALL BE PLACED AND FINISHED TO THE SURFACE OF THE CURB OR PAVEMENT. THE SURFACE SHALL BE FINISHED TO THE SURFACE OF THE CURB OR PAVEMENT. THE SURFACE SHALL BE FINISHED TO THE SURFACE OF THE CURB OR PAVEMENT.

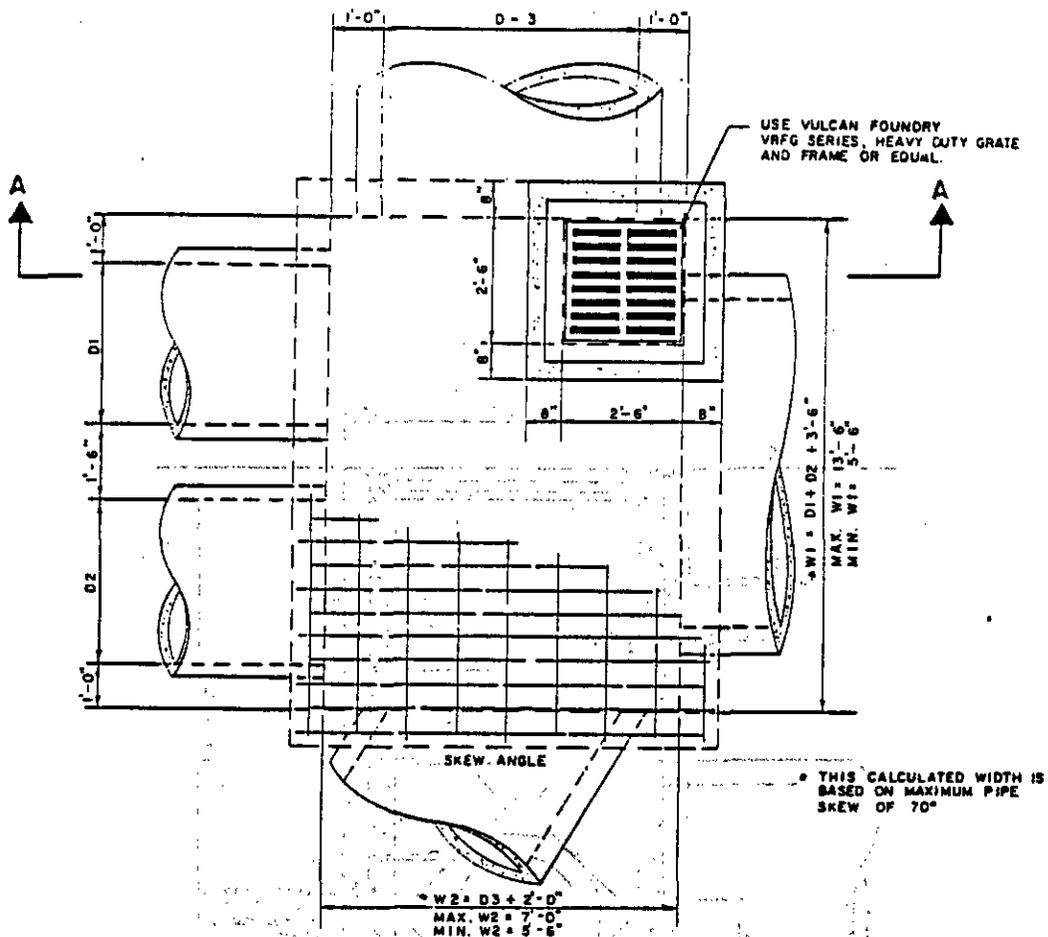
2. THE GRATE SHALL BE SET IN A CONCRETE SLAB. THE GRATE SHALL BE SET IN A CONCRETE SLAB. THE GRATE SHALL BE SET IN A CONCRETE SLAB.

3. THE BOTTOM OF THE BOX SHALL BE SLOPED TO DRAIN. THE BOTTOM OF THE BOX SHALL BE SLOPED TO DRAIN. THE BOTTOM OF THE BOX SHALL BE SLOPED TO DRAIN.

4. THE CURB SHALL BE FINISHED TO THE SURFACE OF THE PAVEMENT. THE CURB SHALL BE FINISHED TO THE SURFACE OF THE PAVEMENT. THE CURB SHALL BE FINISHED TO THE SURFACE OF THE PAVEMENT.

5. THE PAVEMENT SHALL BE FINISHED TO THE SURFACE OF THE CURB. THE PAVEMENT SHALL BE FINISHED TO THE SURFACE OF THE CURB. THE PAVEMENT SHALL BE FINISHED TO THE SURFACE OF THE CURB.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	OPEN GRATE INLET BOX DETAIL TRAFFIC TYPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-125B DRAWING NO.



PLAN

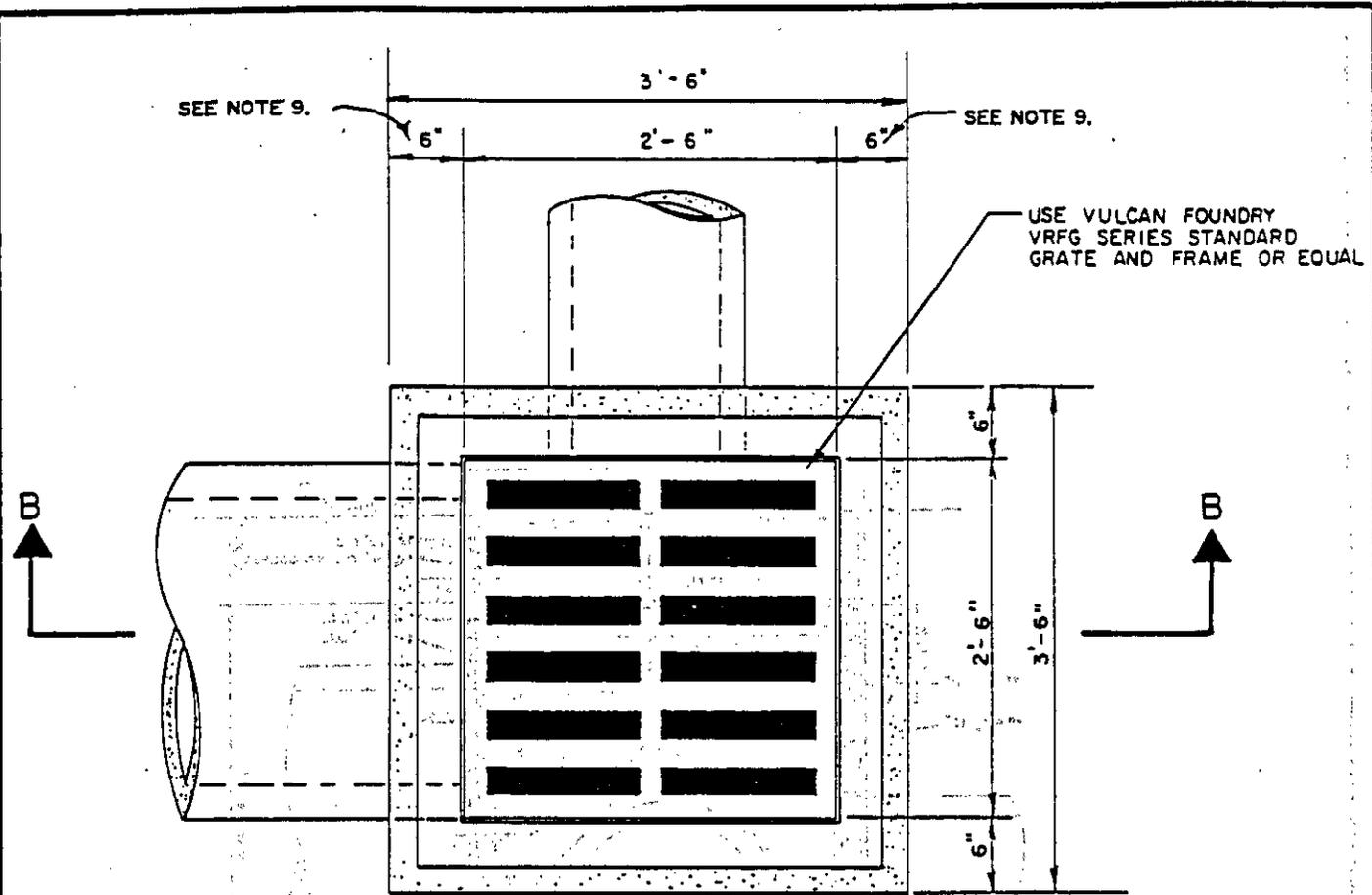
INLET BOX FOR — 27" TO 60" PIPES

(TRAFFIC TYPE)

NOTES :

1. MIN. SIZE OF AN INLET BOX IS 2'-6" x 2'-6".
2. MAX. SIZE OF AN INLET BOX IS 7'-0" (W2) x 13'-6" (W1) FOR 27" TO 60" PIPES.
3. MIN. SIZE OF AN INLET BOX IS 2'-6" x 2'-6" FOR 15" TO 24" PIPES.
4. MAX. HEIGHT OF AN INLET BOX IS AS SHOWN.
5. INLET BOXES GREATER THAN 7'-0" x 13'-6" x 10'-0" SHALL BE A SPECIAL DESIGNED INLET BOX.
6. ALL CONCRETE SHALL BE CLASS 'A' AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS.
7. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
8. STEPS ARE REQUIRED ON ALL INLET BOXES WHEN DIMENSION FROM BOTTOM SLAB FLOW LINE TO TOP OF TOP SLAB IS GREATER THAN 4'-0".

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			OPEN GRATE INLET BOX DETAIL	
			TRAFFIC TYPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-125C DRAWING NO.



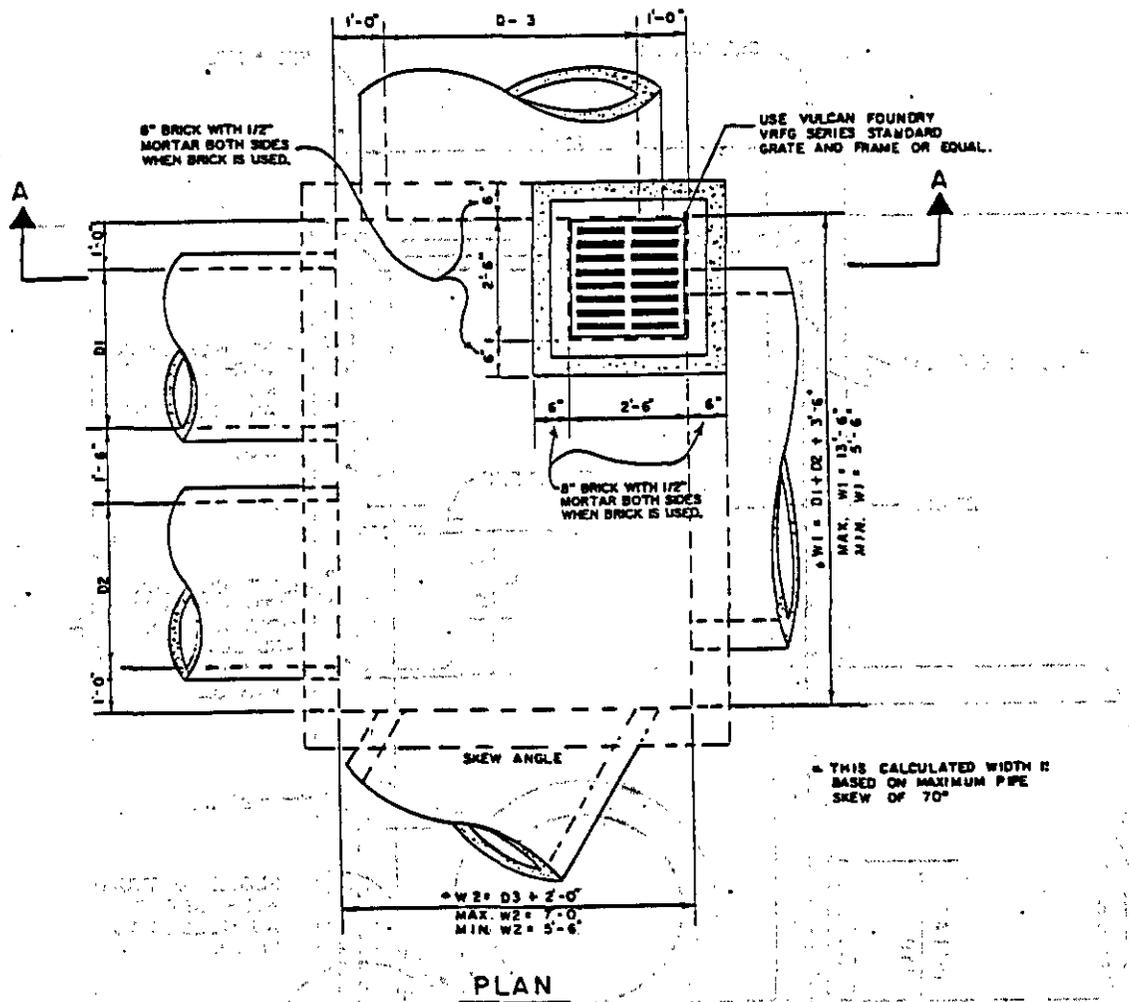
PLAN

INLET BOX FOR-15" TO 24" PIPES

NOTES :

1. MIN. INTERIOR SIZE BOX IS 2'-6" x 2'-6".
2. MAX. SIZE OF A INLET BOX IS 7'-0" (W2) x 13'-6" (W1) FOR 42" TO 60" PIPES.
3. MAX. SIZE OF A INLET BOX IS 5'-0" (W2) x 9'-6" (W1) FOR 15" TO 36" PIPES.
4. MAX. HEIGHT OF INLET BOX SHOWN IS 10'-0" SPECIAL DESIGN REQUIRED FOR GREATER DEPTH.
5. INLET BOXES GREATER THAN 7'-0" x 13'-6" x 10'-0" SHALL BE A SPECIAL DESIGNED INLET BOX.
6. ALL CONCRETE SHALL BE CLASS "A" AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS.
7. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
8. STEPS ARE REQUIRED ON ALL INLET BOXES WHEN DIMENSION FROM BOTTOM SLAB FLOW LINE TO TOP OF TOP SLAB IS GREATER THAN 4'-0".
9. BRICK CONSTRUCTION-THICKNESS WILL BE 8" BRICK WHEN H=LESS THAN 5'-0" AND 12" BRICK WHEN H=MORE THAN 5'-0". 1/2" THICK MORTAR ON BOTH SIDES.

REVISIONS			CITY OF HUNTSVILLE					
DESCRIPTION	NAME	DATE	OPEN GRATE INLET BOX DETAIL NON-TRAFFIC TYPE					
DIRECTOR		DATE			ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-126A DRAWING NO.		



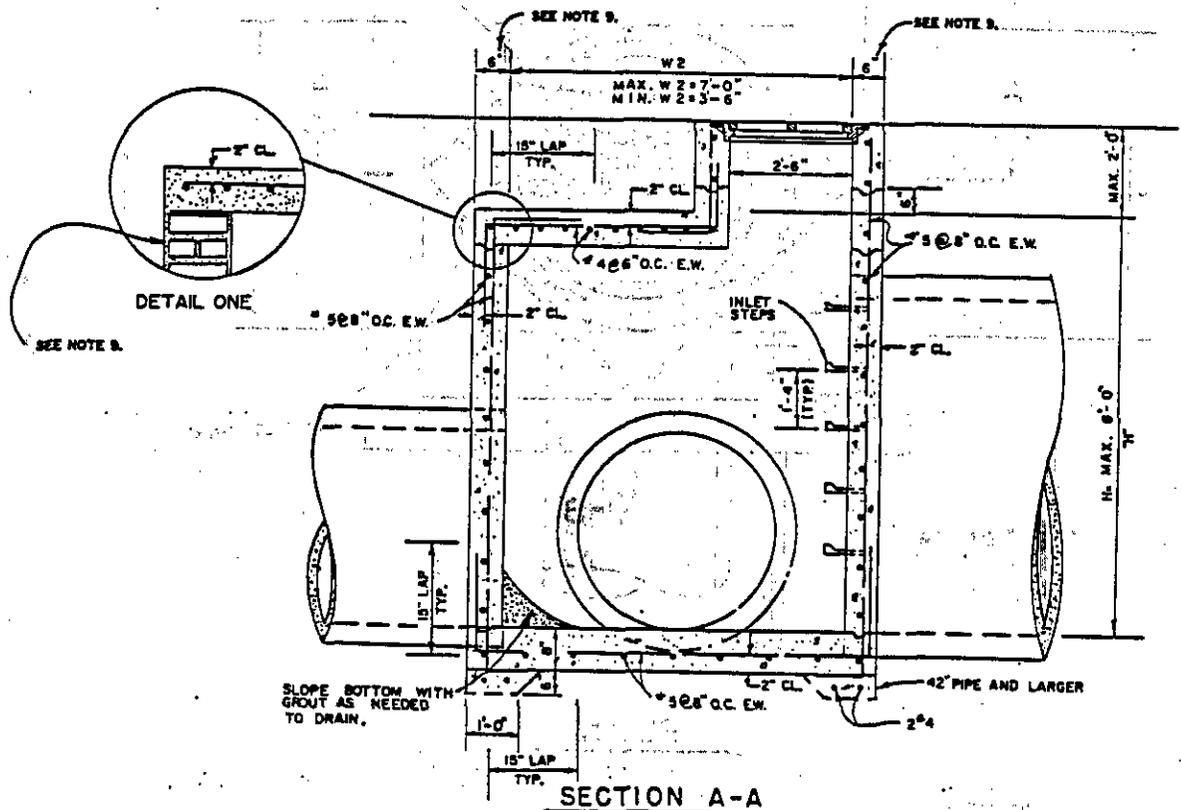
INLET BOX FOR — 27" TO 60" PIPES

NOTES :

1. MIN. INTERIOR SIZE BOX IS 2'-6" x 2'-6".
2. MAX. SIZE OF A INLET BOX IS 7'-0" (W2) x 13'-6" (W1) FOR 42" TO 60" PIPES.
3. MAX. SIZE OF A INLET BOX IS 5'-0" (W2) x 9'-6" (W1) FOR 15" TO 36" PIPES.
4. MAX. HEIGHT OF INLET BOX SHOWN IS 10'-0". SPECIAL DESIGN REQUIRED FOR GREATER DEPTH.
5. INLET BOXES GREATER THAN 7'-0" x 13'-6" x 10'-0" SHALL BE A SPECIAL DESIGNED INLET BOX.
6. ALL CONCRETE SHALL BE CLASS "A" AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS.
7. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
8. STEPS ARE REQUIRED ON ALL INLET BOXES WHEN DIMENSION FROM BOTTOM SLAB FLOW LINE TO TOP OF TOP SLAB IS GREATER THAN 4'-0".
9. BRICK CONSTRUCTION THICKNESS WILL BE 8" BRICK WHEN H-LESS THAN 5'-0" AND 12" BRICK WHEN H-MORE THAN 5'-0". 1/2" THICK MORTAR ON BOTH SIDES.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			OPEN GRATE INLET BOX DETAIL NON-TRAFFIC TYPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-126C DRAWING NO.

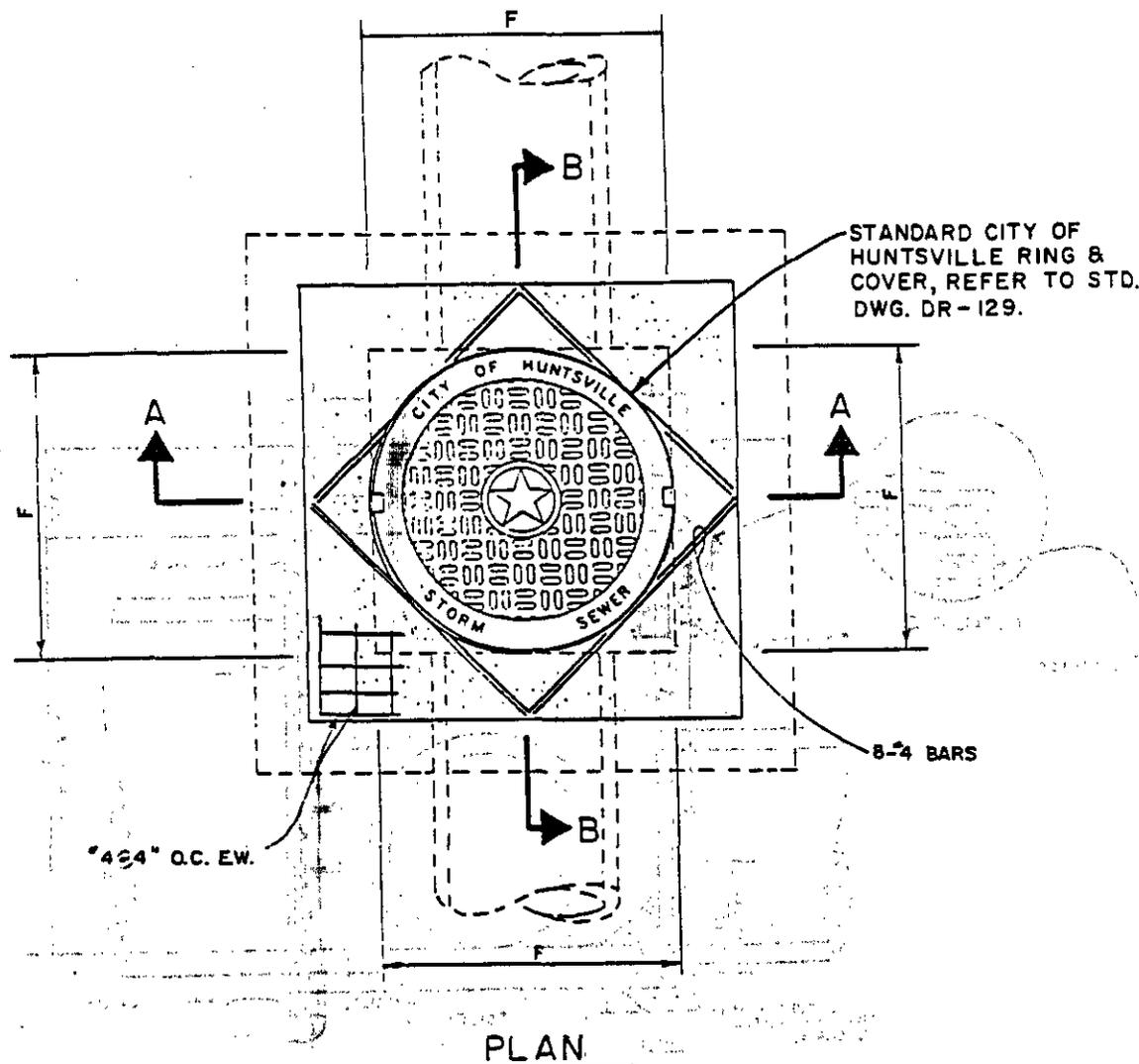
201-541-1011
 201-541-1012
 201-541-1013



SECTION A-A

THE CITY OF HUNTSVILLE, ALABAMA, HAS ADOPTED THE STANDARD SPECIFICATIONS FOR CONSTRUCTION OF PUBLIC WORKS, LATEST EDITION, AS A BASIS FOR THE DESIGN AND CONSTRUCTION OF ALL PUBLIC WORKS. THESE SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE. THE CITY ENGINEER OF PUBLIC WORKS IS AUTHORIZED TO MAKE SUCH CHANGES AS HE DEEMES NECESSARY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING THE LATEST EDITION OF THESE SPECIFICATIONS.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	OPEN GRATE INLET BOX DETAIL NON-TRAFFIC TYPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-126D DRAWING NO.

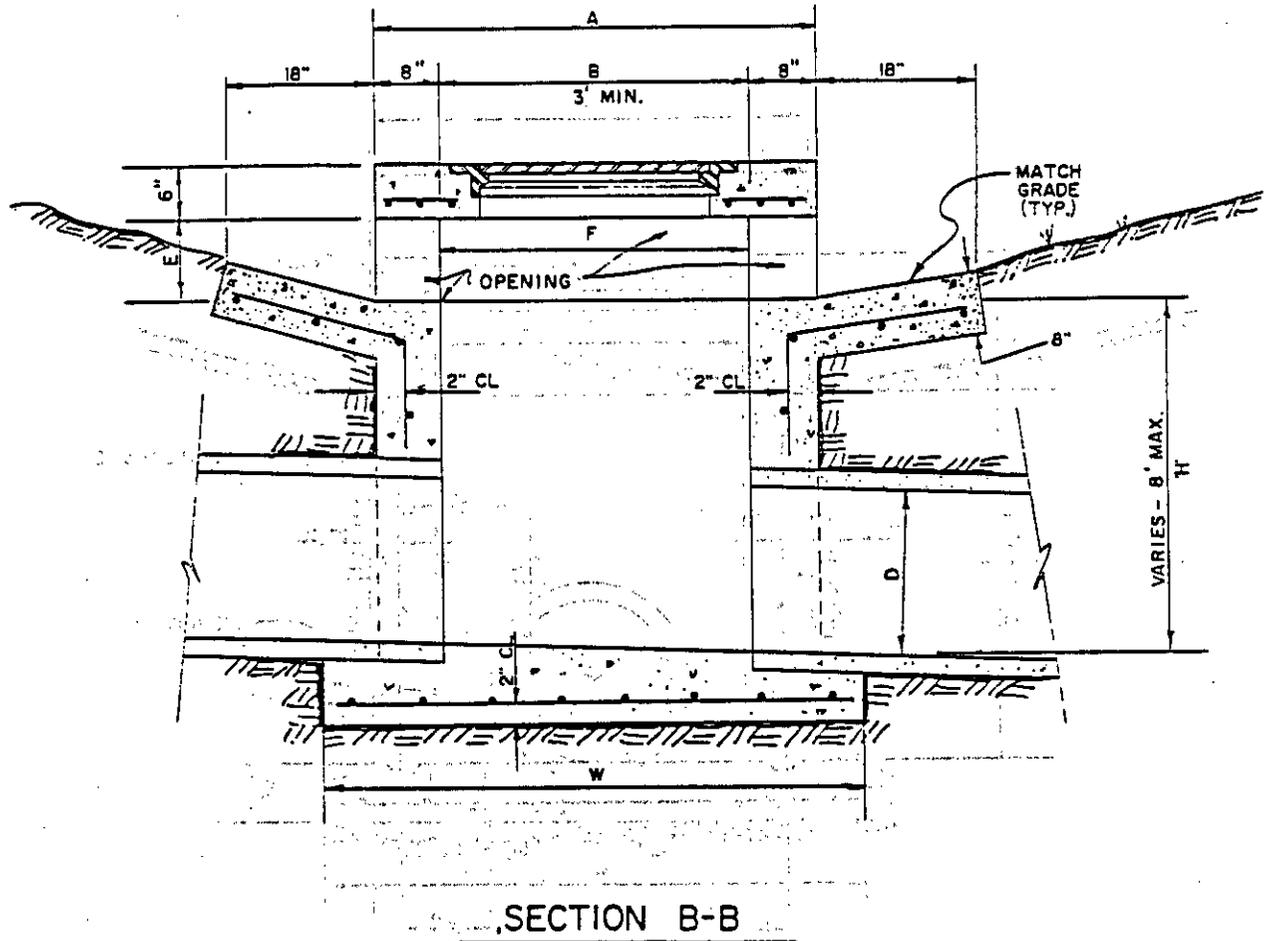


PLAN

NOTES:

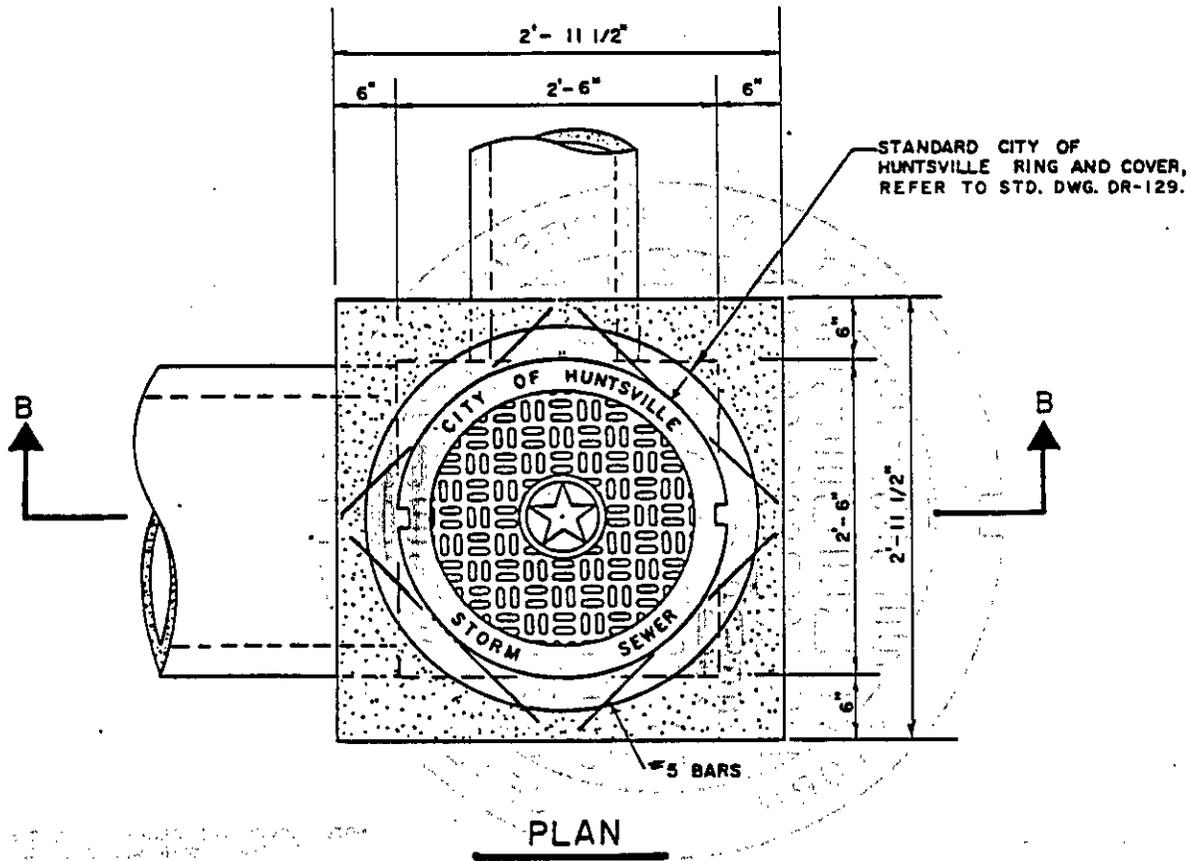
1. DIMENSION "A" IS DETERMINED BY THE LARGEST DIAMETER PIPE ENTERING THE OPEN THROAT INLET.
2. STEPS ARE REQUIRED ON ALL INLETS WHEN DIMENSION FROM BOTTOM SLAB FLOW LINE TO TOP OF TOP SLAB IS GREATER THAN 4'-0".
3. ALL CONCRETE SHALL BE CLASS "A" AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS.
4. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A - 305.
5. WHEN BRICK CONSTRUCTION IS USED, WALLS WILL BE 8" BRICK WHEN "H" IS LESS THAN 5'-0". USE 12" BRICK WHEN "H" IS MORE THAN 5'-0". 1/2" THICK MORTAR ON BOTH SIDES.
6. PROVIDE CONCRETE APRON AT THROAT OPENINGS.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-127A DRAWING NO.



INLET DIMENSIONS					
PIPE SIZE	A	B & F	D	E	W
12"	4'-4"	3'	12"	8"	5'-4"
15"	4'-4"	3'	15"	8"	5'-4"
18"	4'-4"	3'	18"	8"	5'-4"
21"	4'-6"	3'-2"	21"	8"	5'-6"
24"	4'-9"	3'-5"	24"	8"	5'-9"
30"	5'-4"	4'	30"	8"	6'-4"
36"	5'-10"	4'-6"	36"	8"	6'-10"

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			OPEN THROAT INLET DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-127C DRAWING NO.

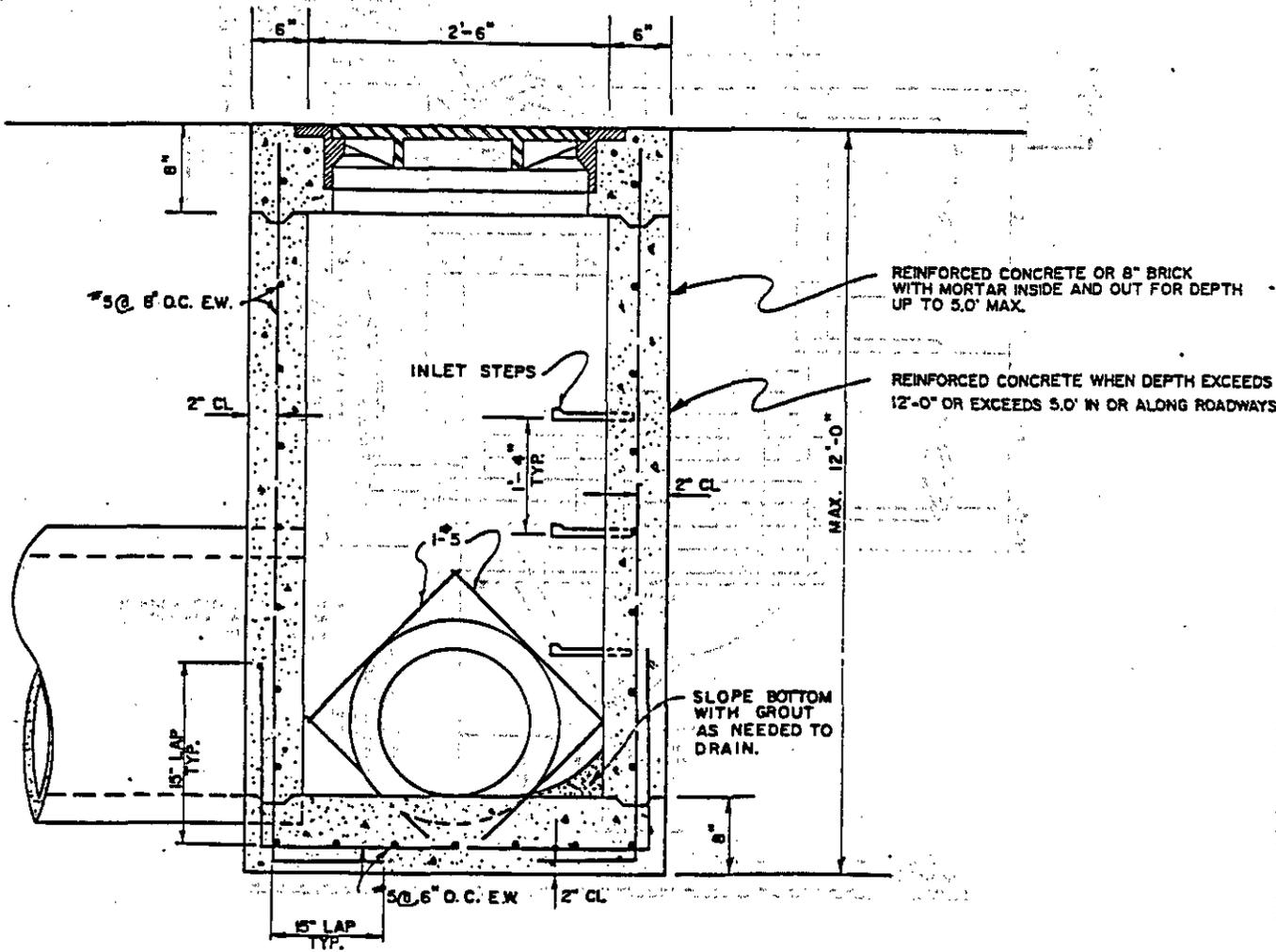


JUNCTION BOX FOR 15" TO 24" PIPES

NOTES:

1. MIN. SIZE OF JUNCTION BOX IS 2'-6" x 2'-6".
2. MAX. SIZE OF A JUNCTION BOX IS 7'-0" (W2) x 13'-6" (W1) FOR 27" TO 60" PIPES.
3. MAX. SIZE OF A JUNCTION BOX IS 2'-6" x 2'-6" FOR 15" TO 24" PIPES.
4. MAX. HEIGHT OF A JUNCTION BOX IS AS SHOWN.
5. JUNCTION BOXES GREATER THAN 7'-0" x 13'-6" x 12'-0" SHALL BE A SPECIAL DESIGNED JUNCTION BOX.
6. ALL CONCRETE SHALL BE CLASS "A" AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS.
7. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
8. STEPS ARE REQUIRED ON ALL JUNCTION BOXES WHEN DIMENSION FROM BOTTOM SLAB FLOW LINE TO TOP OF TOP SLAB IS GREATER THAN 4'-0".

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	<p style="font-size: 1.2em; margin: 0;">JUNCTION BOX FOR 15" TO 24" PIPES</p> <p style="margin: 0;">TRAFFIC TYPE</p>	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-140A DRAWING NO.



SECTION B-B

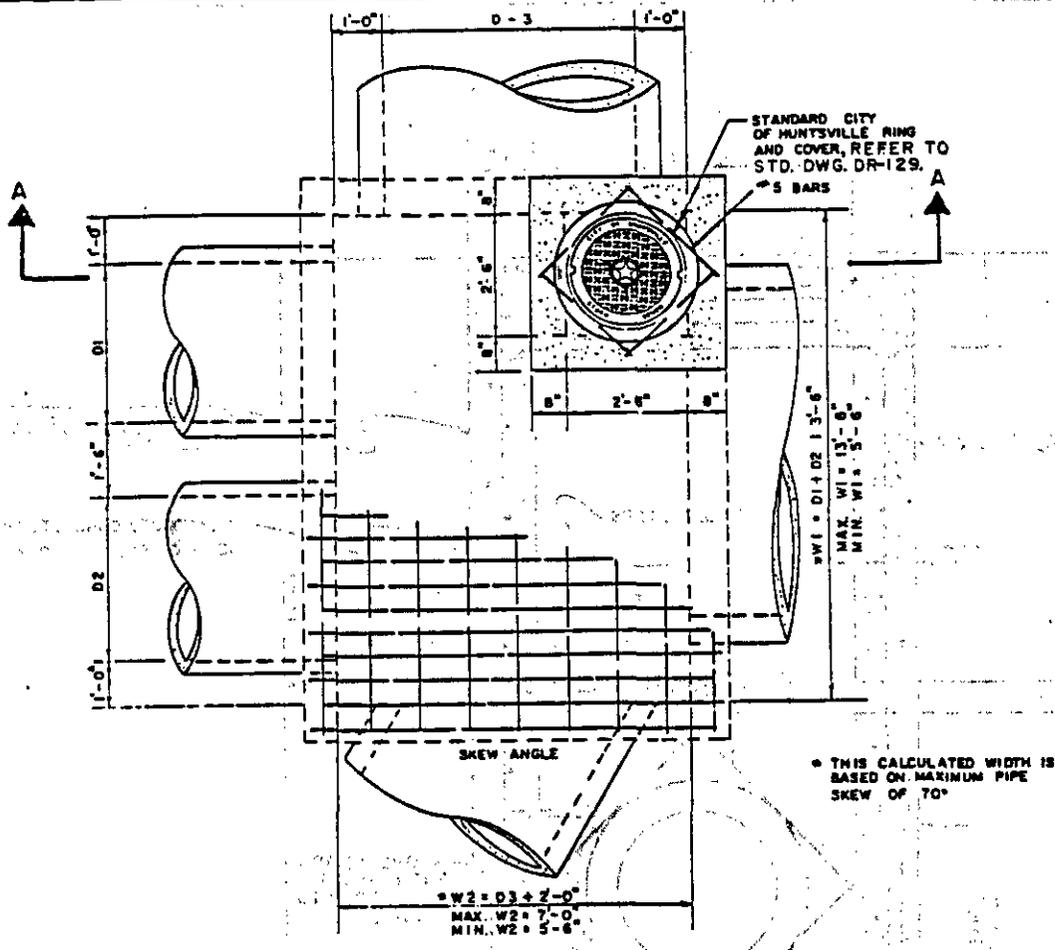
SECTION

THIS DRAWING IS THE PROPERTY OF THE CITY OF HUNTSVILLE, ALABAMA. IT IS TO BE USED ONLY FOR THE PROJECT AND LOCATION SPECIFIED HEREON. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF THE CITY ENGINEER OF PUBLIC WORKS. ANY VIOLATION OF THESE TERMS SHALL BE CONSIDERED A VIOLATION OF THE CITY OF HUNTSVILLE, ALABAMA, MUNICIPAL CODE, TITLE 10, CHAPTER 1, SECTION 1-101.

THIS DRAWING IS THE PROPERTY OF THE CITY OF HUNTSVILLE, ALABAMA. IT IS TO BE USED ONLY FOR THE PROJECT AND LOCATION SPECIFIED HEREON. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF THE CITY ENGINEER OF PUBLIC WORKS. ANY VIOLATION OF THESE TERMS SHALL BE CONSIDERED A VIOLATION OF THE CITY OF HUNTSVILLE, ALABAMA, MUNICIPAL CODE, TITLE 10, CHAPTER 1, SECTION 1-101.

REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE	
JUNCTION BOX FOR 15" TO 24" PIPES TRAFFIC TYPE	
ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-140B DRAWING NO.



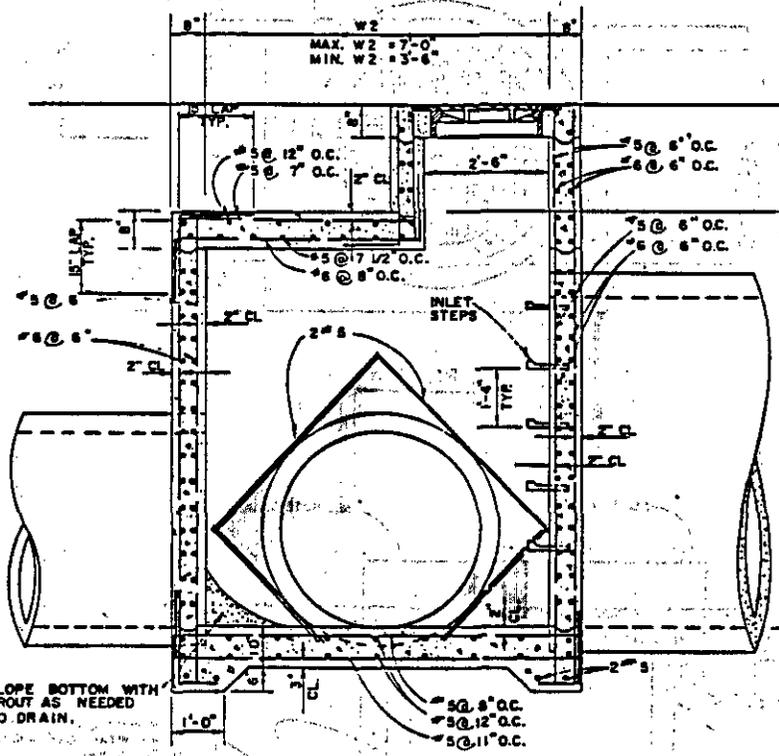
PLAN

JUNCTION BOX FOR - 27" TO 60" PIPES

NOTES :

1. MIN. SIZE OF JUNCTION BOX IS 2'-6" x 2'-6"
2. MAX. SIZE OF A JUNCTION BOX IS 7'-0" (W2) x 13'-6" (W1) FOR 27" TO 60" PIPES.
3. MAX. SIZE OF A JUNCTION BOX IS 2'-6" x 2'-6" FOR 15" TO 24" PIPES.
4. MAX. HEIGHT OF A JUNCTION BOX IS AS SHOWN.
5. JUNCTION BOXES GREATER THAN 7'-0" x 13'-6" x 12'-0" SHALL BE A SPECIAL DESIGNED JUNCTION BOX.
6. ALL CONCRETE SHALL BE CLASS "A" AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS.
7. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
8. STEPS ARE REQUIRED ON ALL JUNCTION BOXES WHEN DIMENSION FROM BOTTOM SLAB FLOW LINE TO TOP OF TOP SLAB IS GREATER THAN 4'-0".

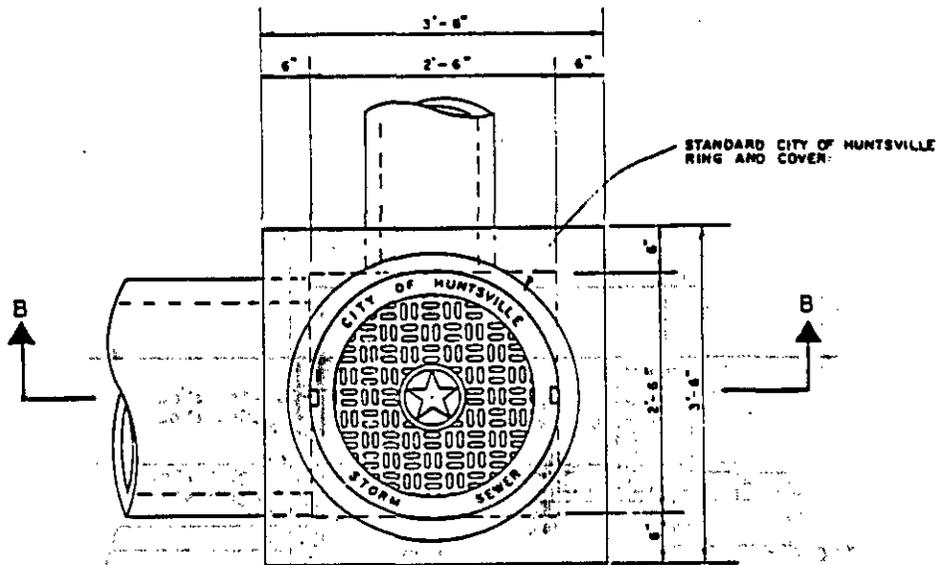
REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	JUNCTION BOX FOR-27" TO 60" PIPES TRAFFIC TYPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-141A DRAWING NO.



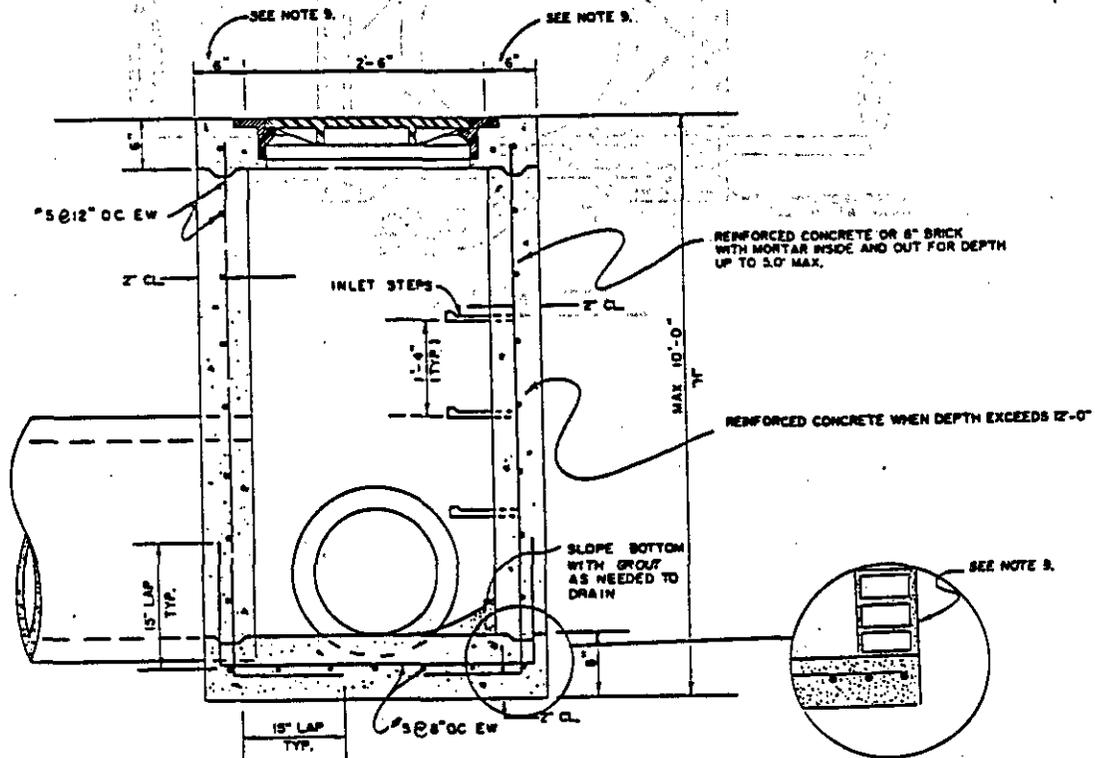
SECTION A-A

SLOPE BOTTOM WITH GROUT AS NEEDED TO DRAIN.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			JUNCTION BOX FOR 27" TO 60" PIPES TRAFFIC TYPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-141B DRAWING NO.



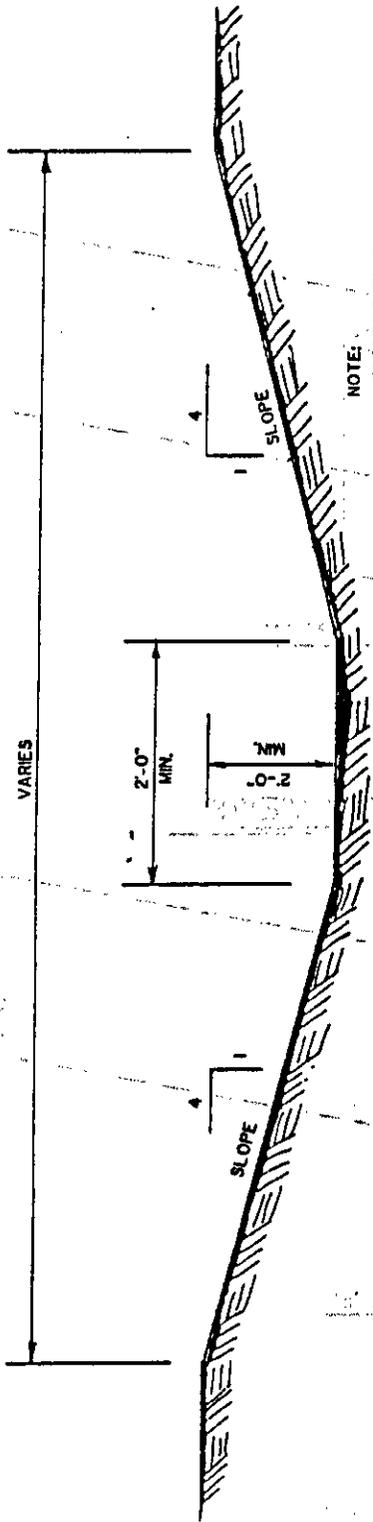
PLAN



SECTION B-B

DETAIL TWO

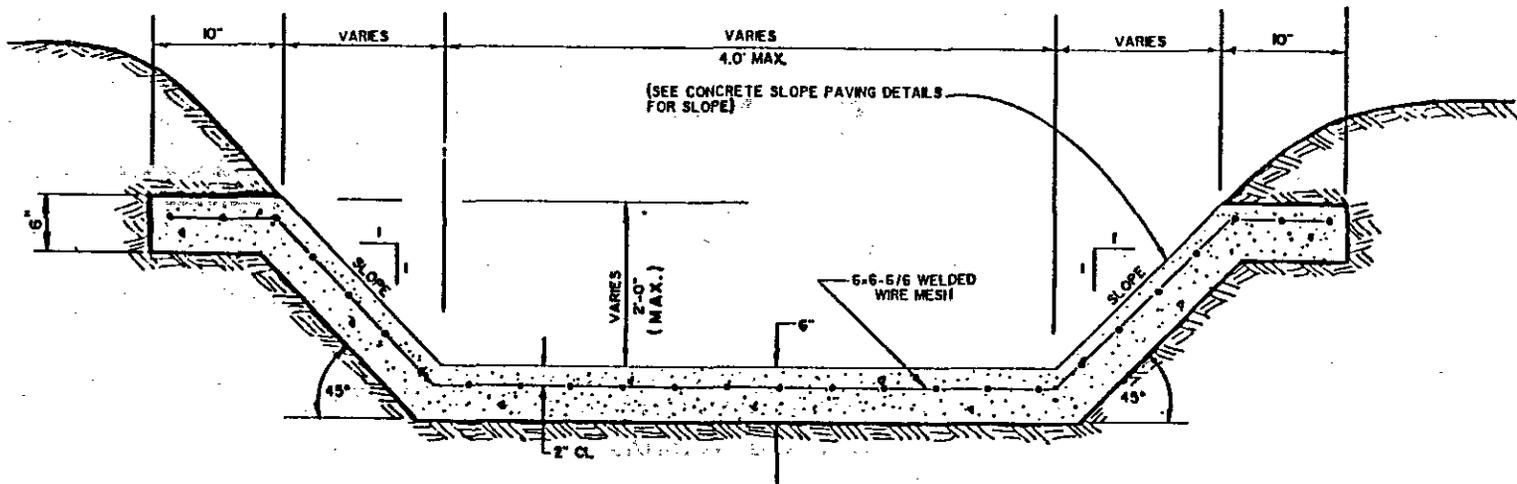
REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			JUNCTION BOX (15"-24" PIPES) DETAIL	
			NON-TRAFFIC TYPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-142A DRAWING NO.



NOTE:
TREATMENT OF SOIL SURFACE SHALL
BE IN ACCORDANCE WITH THE
REQUIREMENTS OF CHAPTER 10 OF THE
HUNTSVILLE STORMWATER MANAGE-
MENT MANUAL.

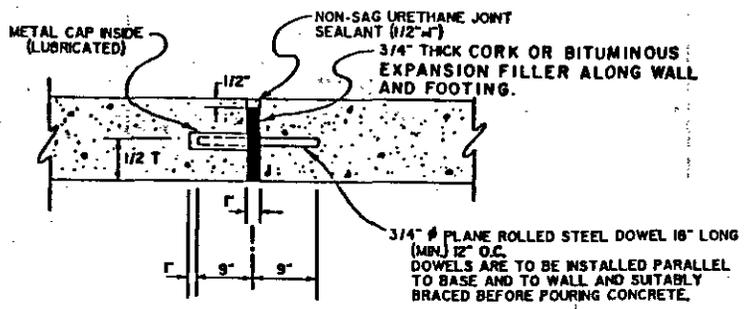
**TYPICAL EARTH
DITCH SECTION**

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL EARTH DITCH SECTION	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-160 DRAWING NO.



TYPICAL CONCRETE FLUME

NOTE:
TREATMENT OF SOIL SURFACE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF CHAPTER 10 OF THE HUNTSVILLE STORMWATER MANAGEMENT MANUAL.



TRANSVERSE EXPANSION JOINT

REVISIONS	DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

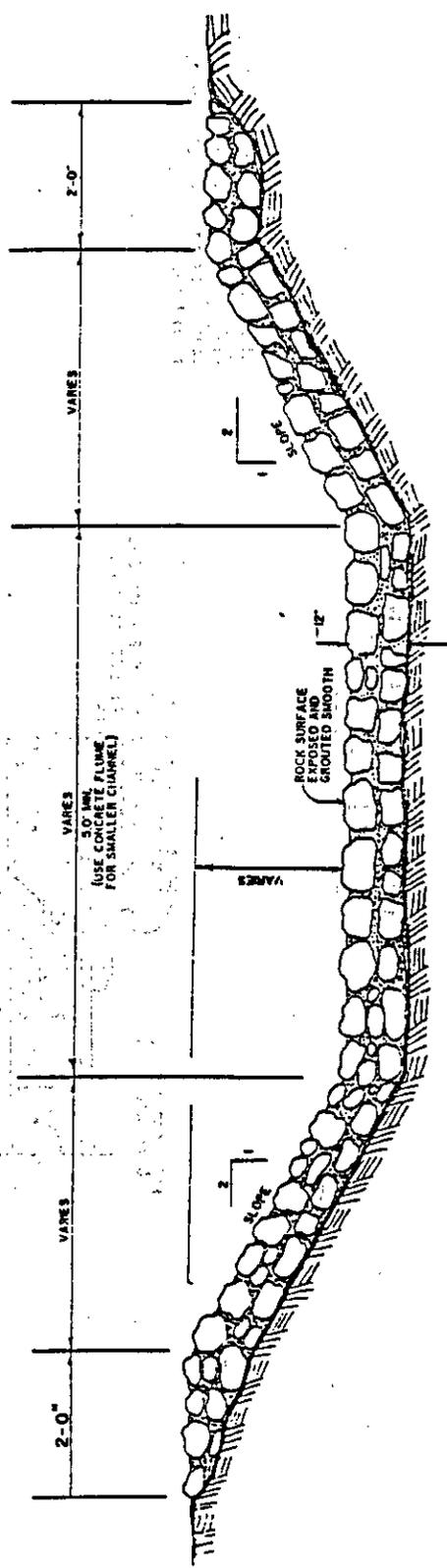
TYPICAL CONCRETE FLUME DETAIL

DIRECTOR

DATE

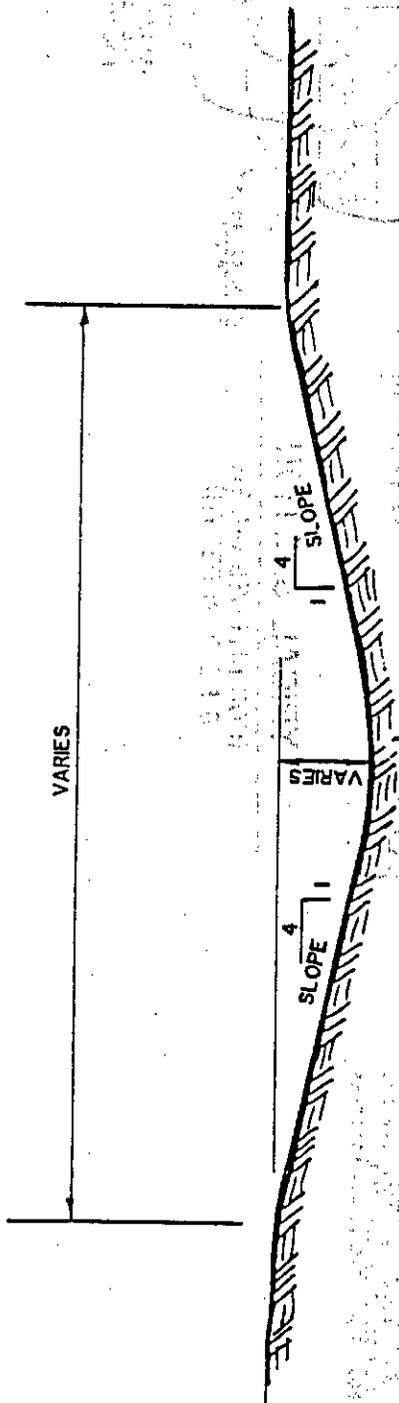
ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

DR-161
DRAWING NO.



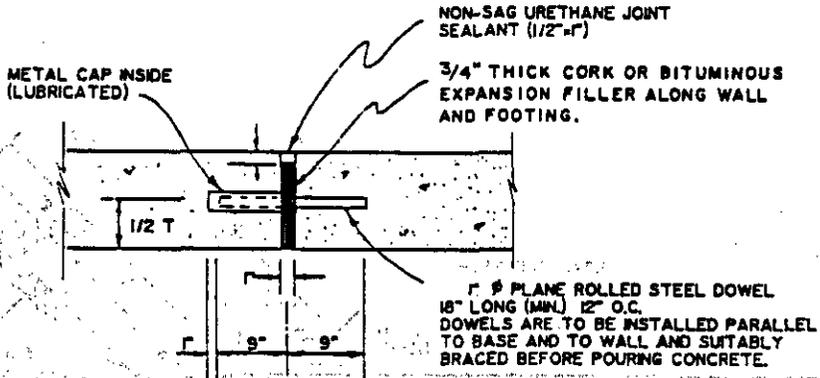
TYPICAL RIP-RAP
DITCH SECTION

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			TYPICAL RIP-RAP DITCH SECTION	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-162 DRAWING NO.



**TYPICAL SWALE
DITCH SECTION**

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL SWALE DITCH SECTION	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-163 DRAWING NO.

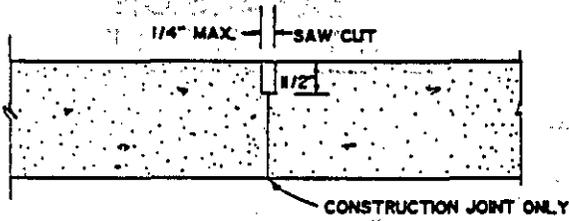


PROVIDE TRANSVERSE EXPANSION JOINTS AT 50 FT. INTERVALS. (SIDE SLOPES) THIS EXPANSION JOINT SHALL BE LOCATED IN LINE WITH CONCRETE BOTTOM EXPANSION JOINT.

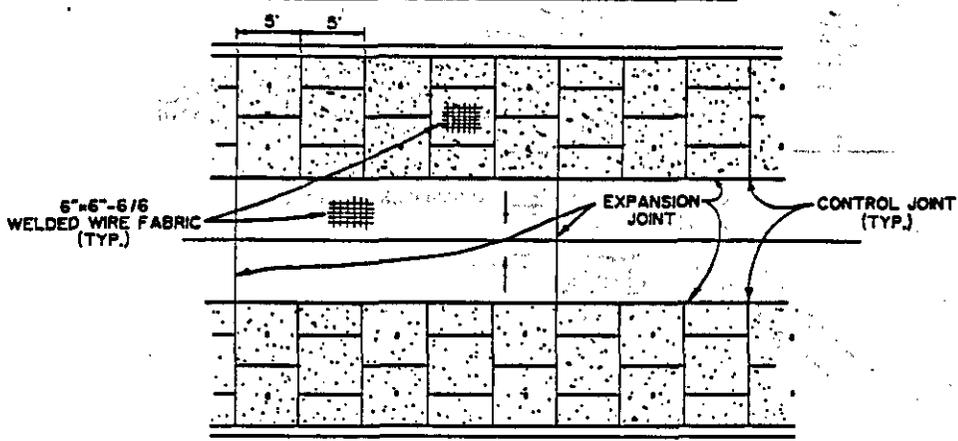
TRANSVERSE EXPANSION JOINT

LONGITUDINAL EXPANSION JOINT SIMILAR

PROVIDE TRANSVERSE CONSTRUCTION JOINTS AT 10 FT. INTERVALS ALONG SIDE SLOPES. PROVIDE TRANSVERSE CONTROL JOINTS MIDWAY BETWEEN CONSTRUCTION JOINTS. PROVIDE LONGITUDINAL CONTROL JOINTS AS SHOWN ON TYPICAL SLOPE PAVING JOINT LAYOUT.

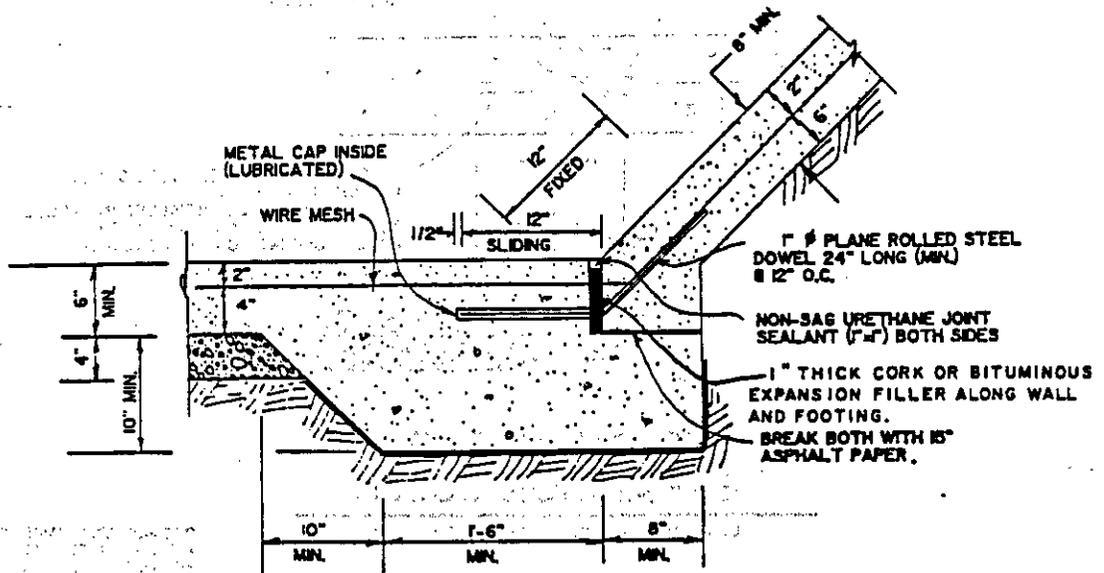


CONSTRUCTION OR CONTROL JOINT



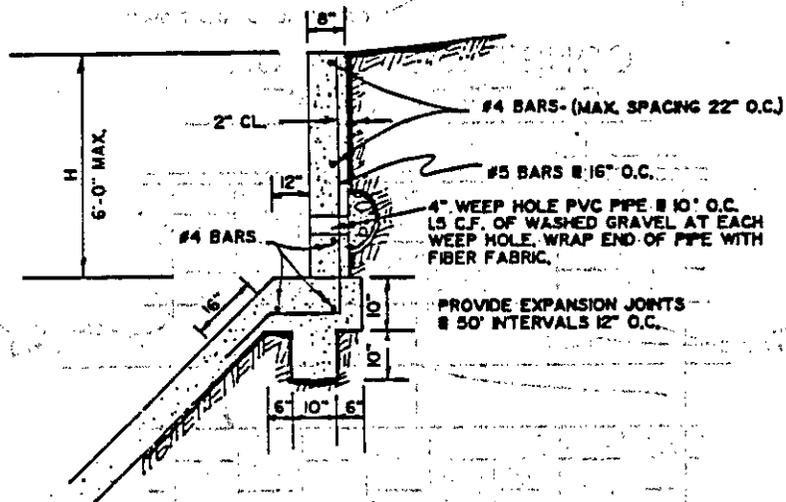
PLAN VIEW OF CONTROL JOINT LAYOUT

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL SECTION FOR SLOPE PAVING-DITCHES UNDER 6 FEET IN DEPTH	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-164B DRAWING NO.



EXPANSION JOINT DETAIL

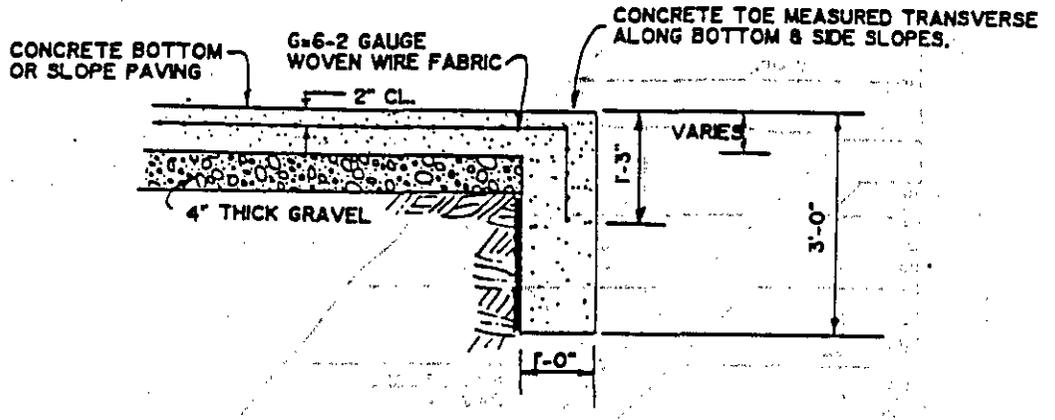
PROVIDE TRANSVERSE CONSTRUCTION JOINTS AT 10 FT. INTERVALS ALONG SIDE SLOPES. PROVIDE TRANSVERSE CONTROL JOINTS MIDWAY BETWEEN CONSTRUCTION JOINTS. PROVIDE LONGITUDINAL CONTROL JOINTS AS SHOWN ON TYPICAL SLOPE PAVING JOINT LAYOUT DETAIL.



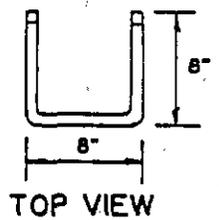
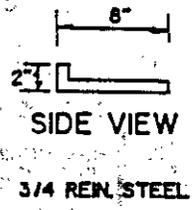
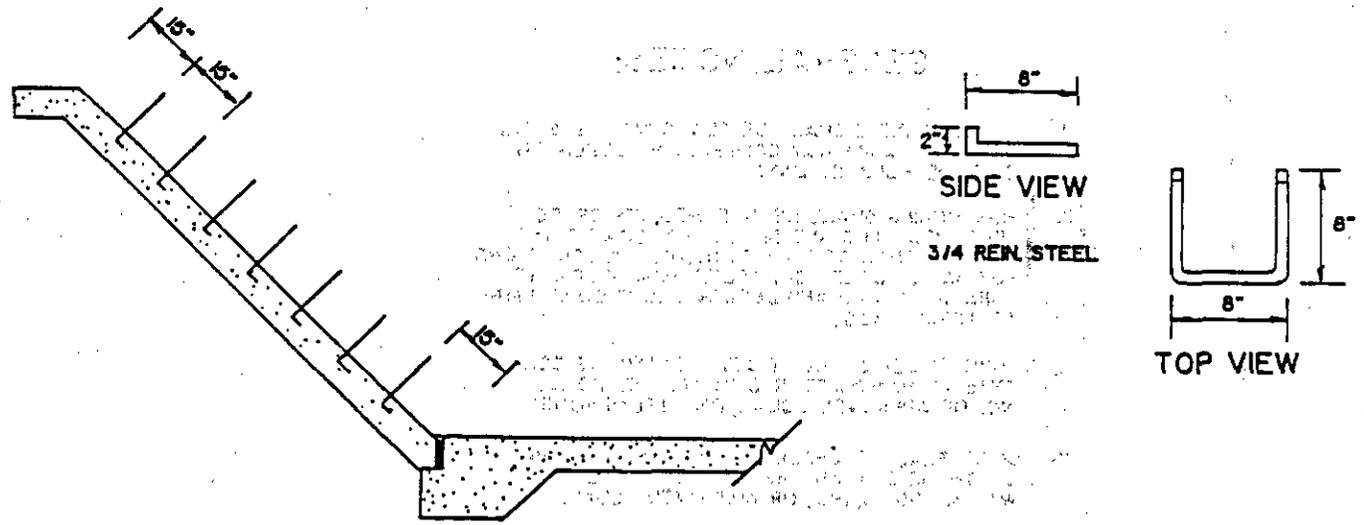
(USE ONLY WHEN H EXCEEDS 3'-0")

RETAINING WALL

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL SECTION FOR SLOPE PAVING-DITCHES UNDER 6 FEET IN DEPTH	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-164C DRAWING NC.

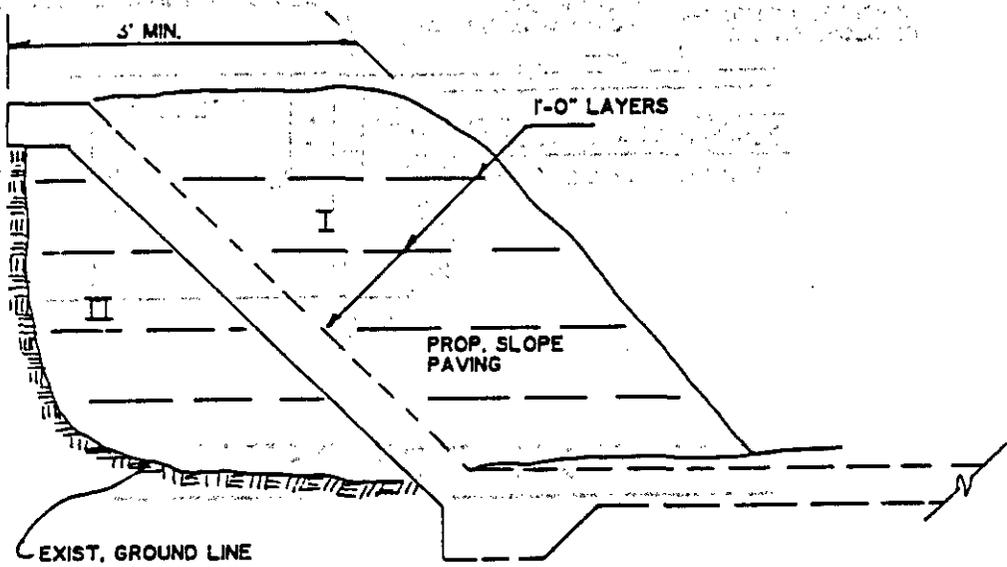


TYPICAL TOE DETAIL



LADDER RUNG DETAIL

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL SECTION FOR SLOPE PAVING-DITCHES UNDER 6 FEET IN DEPTH	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-164 D DRAWING NO.



TYP. FILL SECTION

- 1. FILL TO BE COMPACTED TO 95% IN 1-0" LFTS AREA I & II
- 2. AREA I WILL BE REMOVED AFTER COMPACTION TO PROVIDE FOR SLOPE PAVING.

GENERAL NOTES:

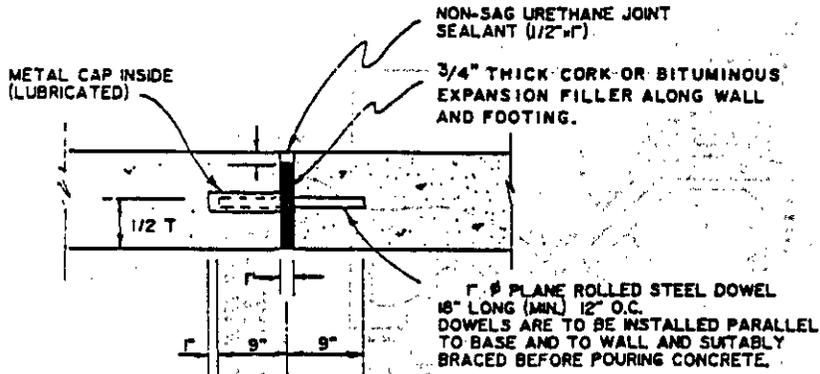
1. ALL CONCRETE SHALL BE CLASS "A" AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS.
2. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
3. JOINT FILLER SHALL BE SELF-EXPANDING CORK TYPE AS MANUFACTURED BY W.R. MEADOWS, INC., OR APPROVED EQUAL, OR BITUMINOUS.
4. JOINT SEALANT SHALL BE "DUALTHANE", NON-SAG URETHANE SEALANT AS MANUFACTURED BY W.R. MEADOWS, INC., OR APPROVED EQUAL.
5. ALL HORIZONTAL REINFORCING BARS SHALL BE CONTINUOUS. CORNER BARS SHALL BE PROVIDED WITH 24 DIAMETER SPLICES. ALL REINFORCING BARS SHALL BE PROVIDE WITH 24 DIAMETER SPLICES UNLESS OTHERWISE NOTED.

REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

**TYPICAL SECTION FOR
SLOPE PAVING-DITCHES UNDER
6 FEET IN DEPTH**

ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA.	DR-164E DRAWING NO.
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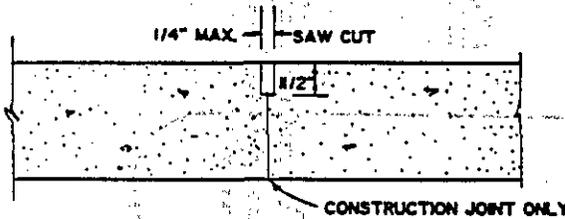


PROVIDE TRANSVERSE EXPANSION JOINTS AT 50 FT. INTERVALS. (SIDE SLOPES) THIS EXPANSION JOINT SHALL BE LOCATED IN LINE WITH CONCRETE BOTTOM EXPANSION JOINT.

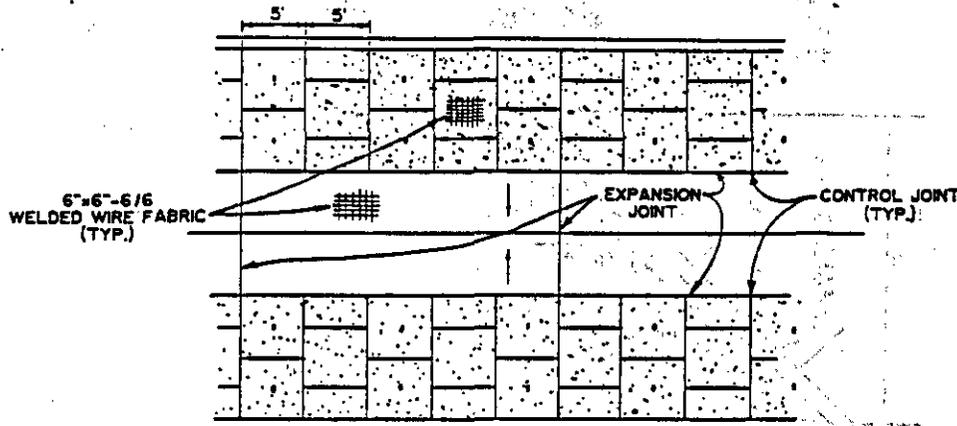
TRANSVERSE EXPANSION JOINT

LONGITUDINAL EXPANSION JOINT SIMILAR

PROVIDE TRANSVERSE CONSTRUCTION JOINTS AT 10 FT. INTERVALS ALONG SIDE SLOPES. PROVIDE TRANSVERSE CONTROL JOINTS MIDWAY BETWEEN CONSTRUCTION JOINTS. PROVIDE LONGITUDINAL CONTROL JOINTS AS SHOWN ON TYPICAL SLOPE PAVING JOINT LAYOUT DETAIL.

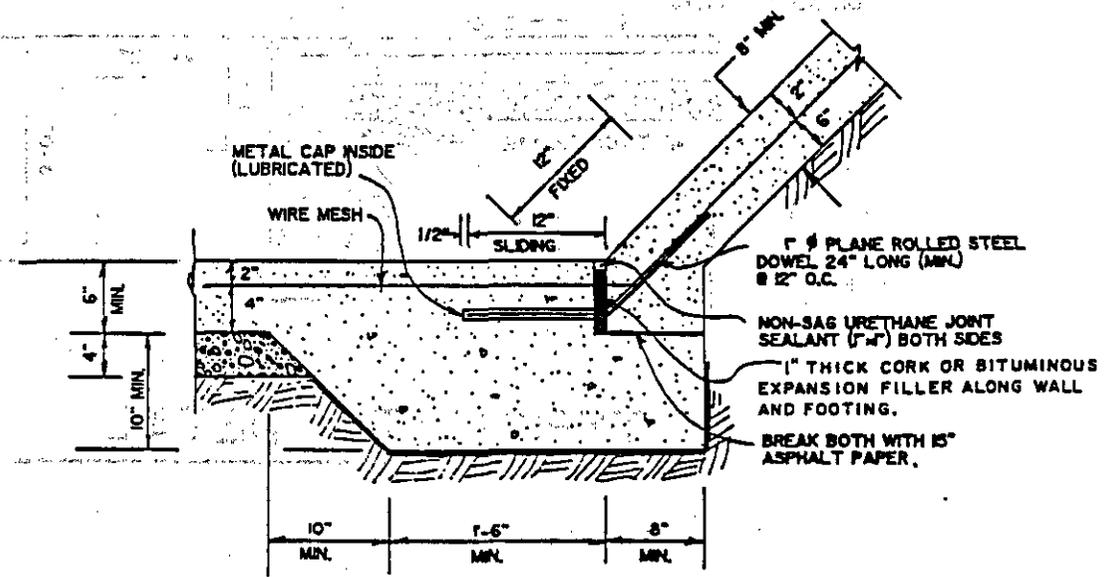


CONSTRUCTION OR CONTROL JOINT



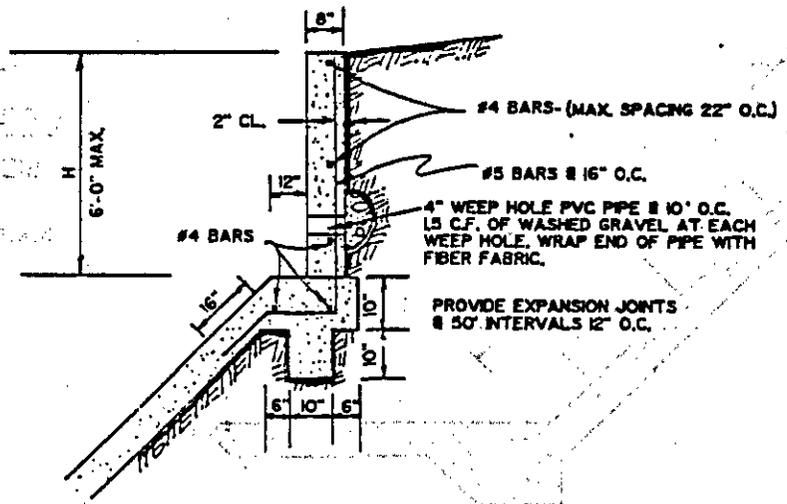
PLAN VIEW OF CONTROL JOINT LAYOUT

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL SECTION FOR SLOPE PAVING-DITCHES OVER 6 FEET IN DEPTH	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA.	DR-165B DRAWING NO.



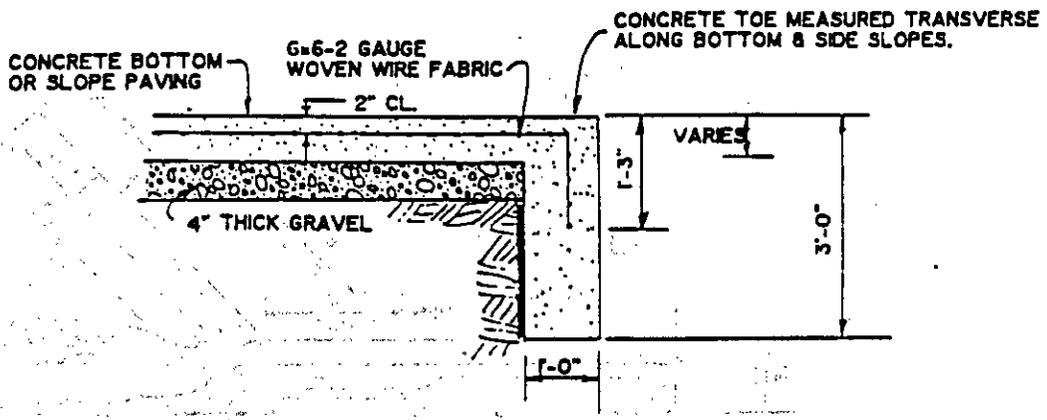
EXPANSION JOINT DETAIL

PROVIDE TRANSVERSE CONSTRUCTION JOINTS AT 10 FT. INTERVALS ALONG SIDE SLOPES. PROVIDE TRANSVERSE CONTROL JOINTS MIDWAY BETWEEN CONSTRUCTION JOINTS. PROVIDE LONGITUDINAL CONTROL JOINTS AS SHOWN ON TYPICAL SLOPE PAVING JOINT LAYOUT DETAIL.

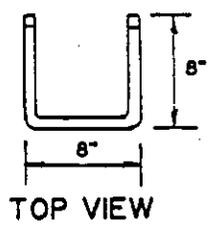
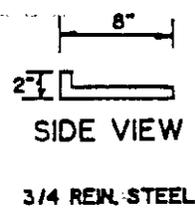
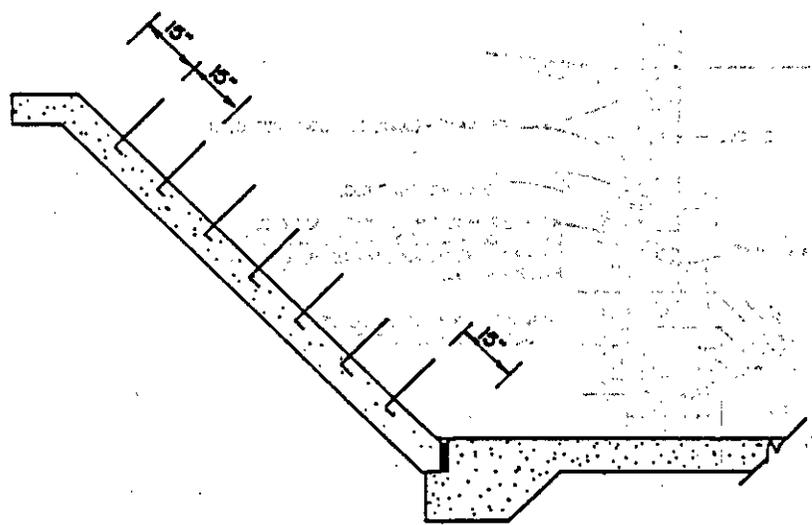


(USE ONLY WHEN H EXCEEDS 3'-0")
RETAINING WALL

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL SECTION FOR SLOPE PAVING-DITCHES OVER 6 FEET IN DEPTH	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-165C DRAWING NO.

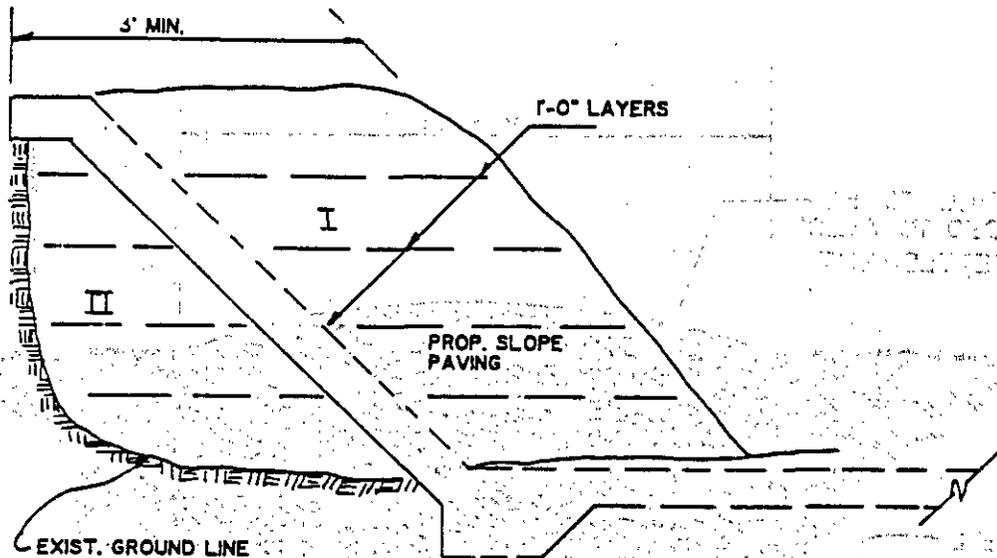


TYPICAL TOE DETAIL



LADDER RUNG DETAIL

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL SECTION FOR SLOPE PAVING-DITCHES OVER 6 FEET IN DEPTH	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-165D DRAWING NO.



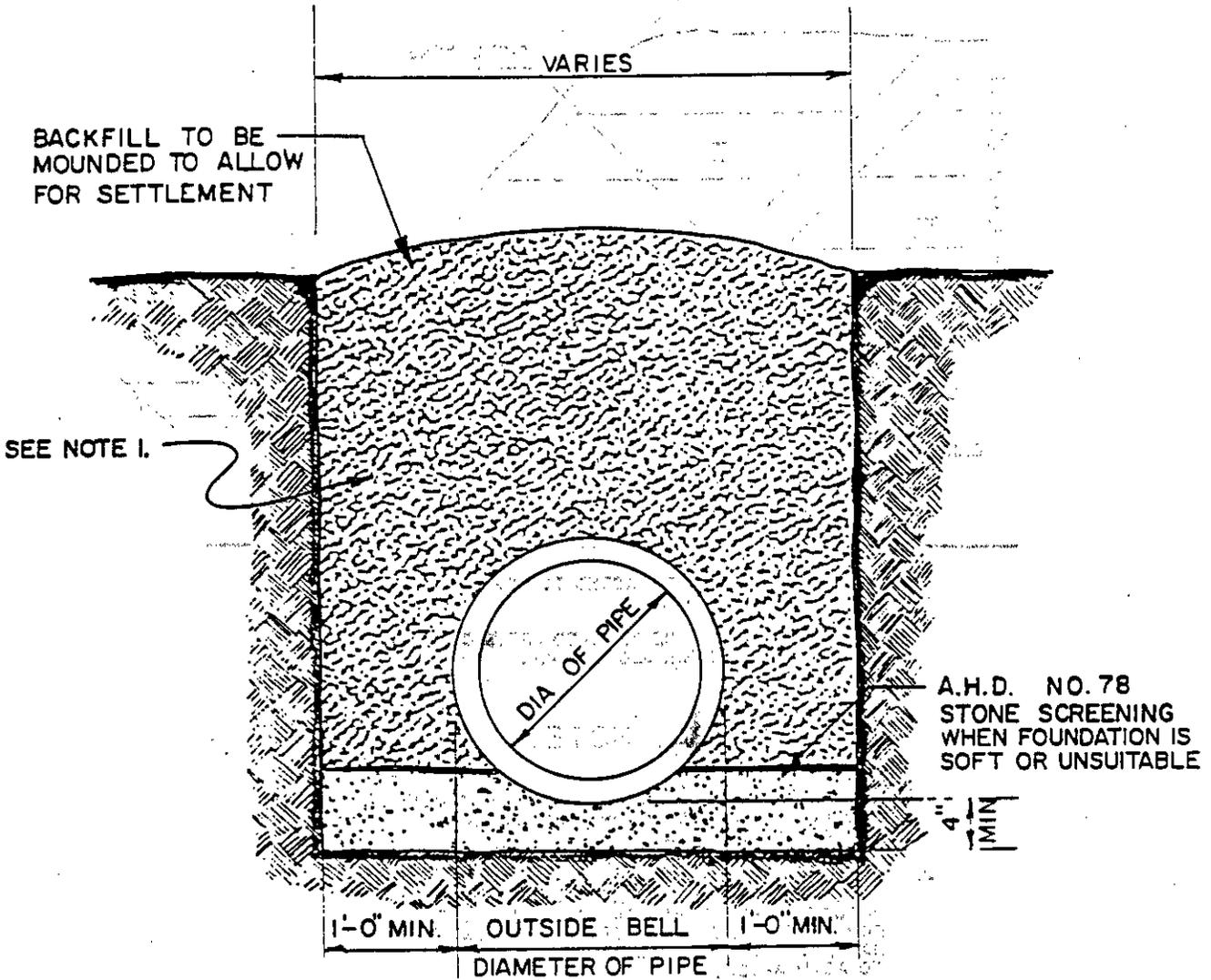
TYP. FILL SECTION

1. FILL TO BE COMPACTED TO 95% IN 7-0" LIFTS AREA I & II.
2. AREA I WILL BE REMOVED AFTER COMPACTION TO PROVIDE FOR SLOPE PAVING.

GENERAL NOTES:

1. ALL CONCRETE SHALL BE CLASS "A" AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 PSI IN 28 DAYS.
2. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
3. JOINT FILLER SHALL BE SELF-EXPANDING CORK TYPE AS MANUFACTURED BY W.R. MEADOWS, INC., OR APPROVED EQUAL, OR BITUMINOUS.
4. JOINT SEALANT SHALL BE "DUALTHANE", NON-SAG URETHANE SEALANT AS MANUFACTURED BY W.R. MEADOWS, INC., OR APPROVED EQUAL.
5. ALL HORIZONTAL REINFORCING BARS SHALL BE CONTINUOUS. CORNER BARS SHALL BE PROVIDED WITH 24 DIAMETER SPLICES. ALL REINFORCING BARS SHALL BE PROVIDED WITH 24 DIAMETER SPLICES UNLESS OTHERWISE NOTED.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL SECTION FOR SLOPE PAVING-DITCHES OVER 6 FEET IN DEPTH	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-165E DRAWING NO.



STORM SEWER PIPE BEDDING

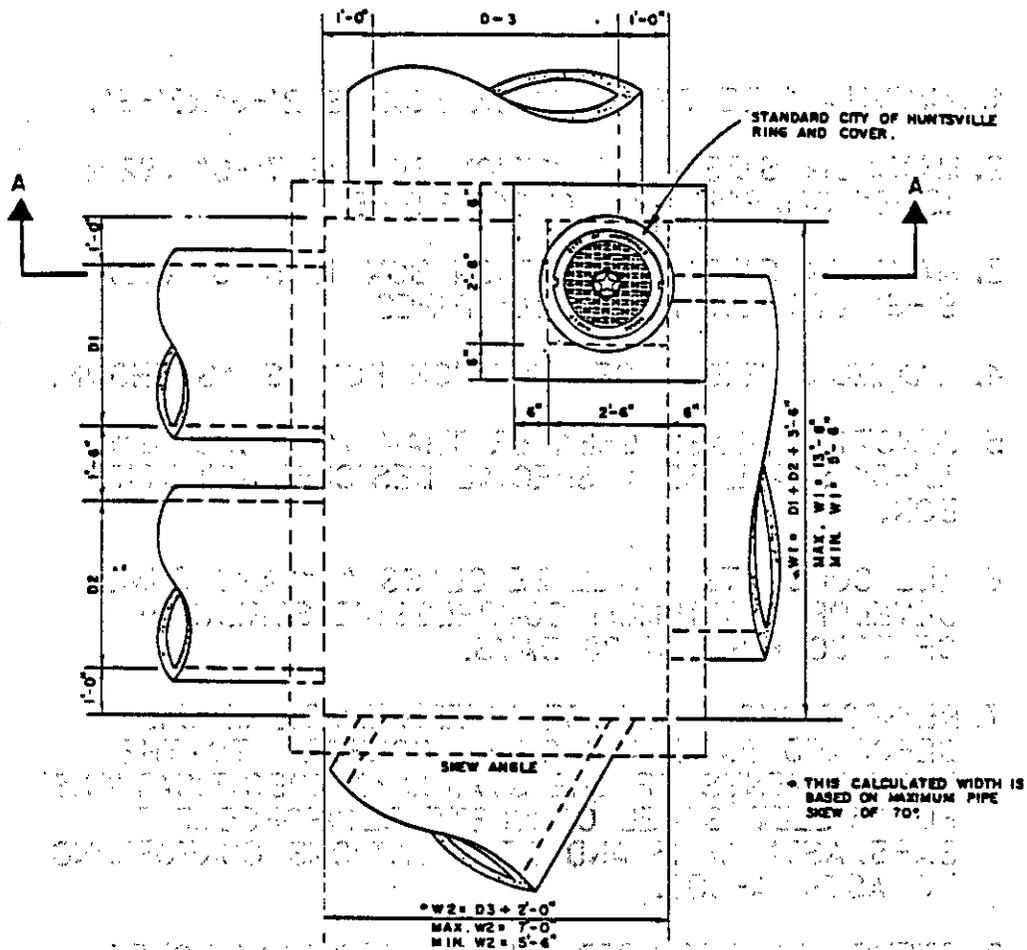
NOTE:

- I. IN TRAFFIC AREAS USE CRUSHED STONE, DENSE GRADED BASE OR APPROVED CLASS I BACKFILL COMPACTED IN 6" LAYERS TO 95% STANDARD PROCTOR DENSITY UP TO WHERE STREET SUBGRADE REQUIREMENTS DICTATE.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TYPICAL STORM SEWER PIPE BEDDING DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-166 DRAWING NO.

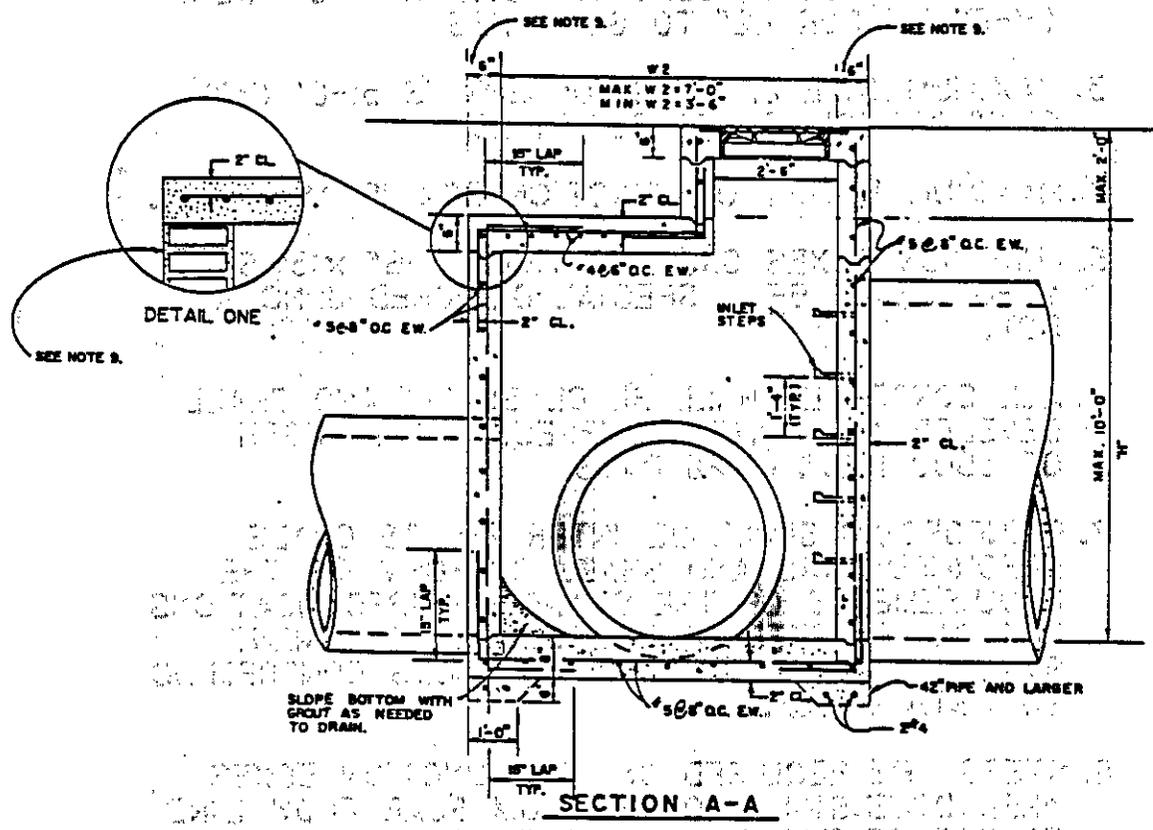
1. MINIMUM SIZE OF JUNCTION BOX IS 2'-6"x2'-6".
2. MAXIMUM SIZE OF JUNCTION BOX IS 7'-0" (W2)X 13'-6" (W1) FOR 42" TO 60" PIPES
3. MAXIMUM SIZE OF JUNCTION BOX IS 5'-0" (W2)X 9'-6" (W1) FOR 15" TO 36" PIPES
4. MAXIMUM HEIGHT OF JUNCTION BOX IS AS SHOWN.
5. JUNCTION BOXES GREATER THAN 7'-6" X13'-6" X 12'-0" SHALL BE A SPECIAL DESIGNED JUNCTION BOX.
6. ALL CONCRETE SHALL BE CLASS "A" AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3000 P.S.I. IN 28 DAYS.
7. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
8. STEPS ARE REQUIRED ON ALL JUNCTION BOXES WHEN DIMENSION FROM BOTTOM SLAB FLOW LINE TO TOP OF TOP SLAB IS GREATER THAN 4'-0".
9. BRICK CONSTRUCTION - WALL THICKNESS WILL BE 8" BRICK WHEN "H" IS LESS THAN 5'-0" AND 12" BRICK WHEN "H" IS MORE THAN 5'-0". 1/2" MORTAR ON BOTH SIDES.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	GENERAL NOTES FOR NON-TRAFFIC TYPE JUNCTION BOXES	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-142B DRAWING NO.



PLAN

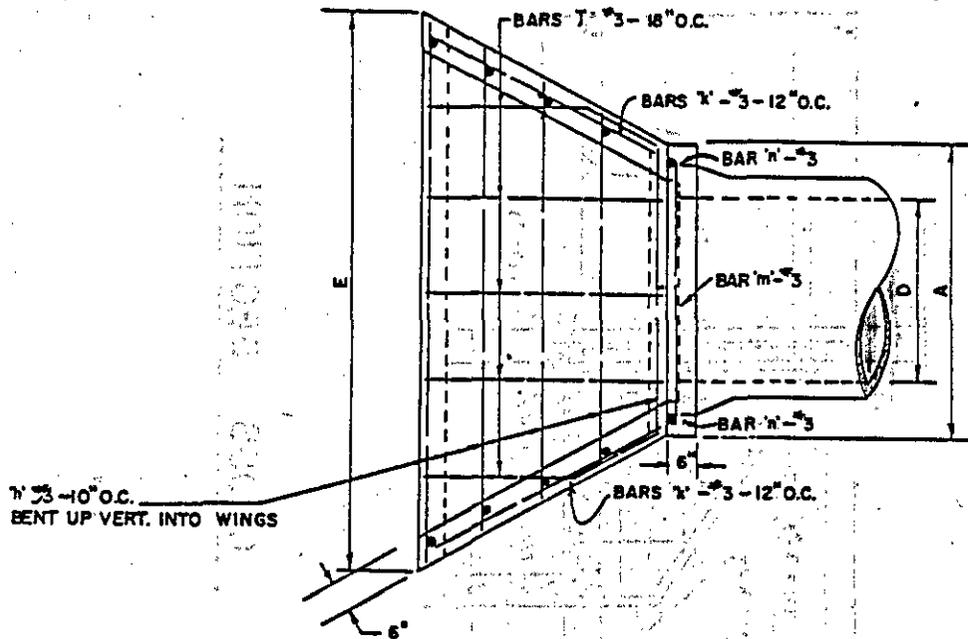
REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	JUNCTION BOX (27"-60" PIPES) DETAIL	
			NON-TRAFFIC-TYPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-143A DRAWING NO.



REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	JUNCTION BOX (27"-60" PIPES) DETAIL	
			NON-TRAFFIC TYPE	
			ENGINEER OF PUBLIC WORKS	DR-143B
			CITY OF HUNTSVILLE, ALABAMA	DRAWING NO.
DIRECTOR		DATE		

1. MINIMUM SIZE OF JUNCTION BOX IS 2'-6" X 2'-6".
2. MAXIMUM SIZE OF JUNCTION BOX IS 7'-0" (W2) X 13'-6" (W1) FOR 42" TO 60" PIPES
3. MAXIMUM SIZE OF JUNCTION BOX IS 5'-0" (W2) X 9'-6" (W1) FOR 15" TO 36" PIPES
4. MAXIMUM HEIGHT OF JUNCTION BOX IS AS SHOWN.
5. JUNCTION BOXES GREATER THAN 7'-6" X 13'-6" X 12'-0" SHALL BE A SPECIAL DESIGNED JUNCTION BOX.
6. ALL CONCRETE SHALL BE CLASS "A" AND SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 3500 P.S.I. IN 28 DAYS.
7. REINFORCING SHALL BE INTERMEDIATE GRADE DEFORMED BARS AND SHALL CONFORM TO THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR BILLET STEEL CONCRETE REINFORCEMENT BARS, ASTM A-15 AND DEFORMATIONS CONFORMING TO ASTM A-305.
8. STEPS ARE REQUIRED ON ALL JUNCTION BOXES WHEN DIMENSION FROM BOTTOM SLAB FLOW LINE TO TOP OF TOP SLAB IS GREATER THAN 4'-0".
9. BRICK CONSTRUCTION - WALL THICKNESS WILL BE 8" BRICK WHEN "H" IS LESS THAN 5'-0" AND 12" BRICK WHEN "H" IS MORE THAN 5'-0". 1/2" MORTAR ON BOTH SIDES.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	GENERAL NOTES FOR NON-TRAFFIC TYPE JUNCTION BOXES	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-143C DRAWING NO.



PLAN

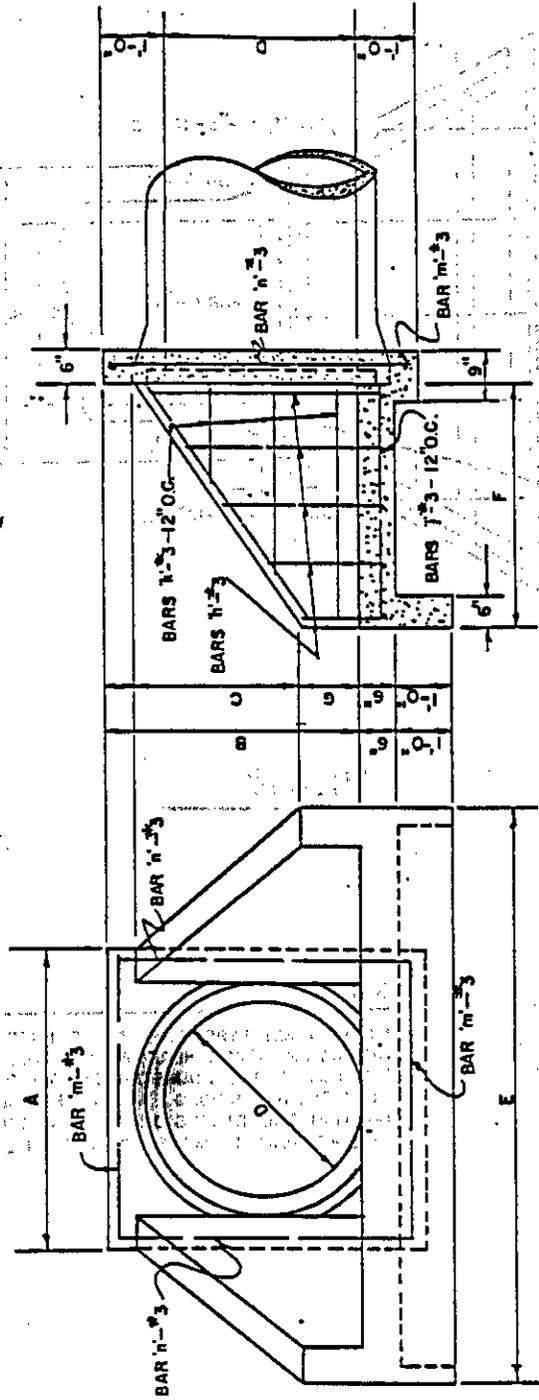
SINGLE HEADWALL DIMENSIONS						
D	A	B	C	E	F	G
15" OR 12"	2'-11"	2'-3"	1'-3"	5'-1"	1'-10 1/2"	0'-6"
18"	3'-2"	2'-6"	1'-3"	5'-4"	1'-10 1/2"	0'-9"
21"	3'-5"	2'-9"	1'-3"	5'-7"	1'-10 1/2"	1'-0"
24"	3'-8"	3'-0"	1'-6"	6'-3"	2'-3"	1'-0"
30"	4'-2"	3'-6"	2'-0"	7'-8"	3'-0"	1'-0"
36"	4'-8"	4'-0"	2'-6"	9'-0"	3'-9"	1'-0"
42"	5'-2"	4'-6"	3'-0"	10'-4"	4'-8"	1'-6"
48"	5'-8"	5'-0"	3'-6"	11'-8"	5'-5"	1'-6"

QUANTITIES PER 2 HDWL'S SINGLE LINE								
PIPE DIA.	15"	18"	21"	24"	30"	36"	42"	48"
CONC.	1.38	1.60	1.88	2.14	2.86	3.64	4.42	5.20
STEEL	44	50	56	60	90	118	147	183

NOTE:

WHERE ARCH TYPE PIPE IS SPECIFIED, HORIZONTAL DIMENSION "A" FOR HEADWALLS SHALL CONFORM TO THE HORIZONTAL DIAMETER OF THE PIPE AND VERTICAL DIMENSIONS, AND DIMENSIONS DEPENDENT ON VERTICAL DIMENSIONS, SHALL CONFORM TO THE VERTICAL DIAMETER OF THE PIPE.

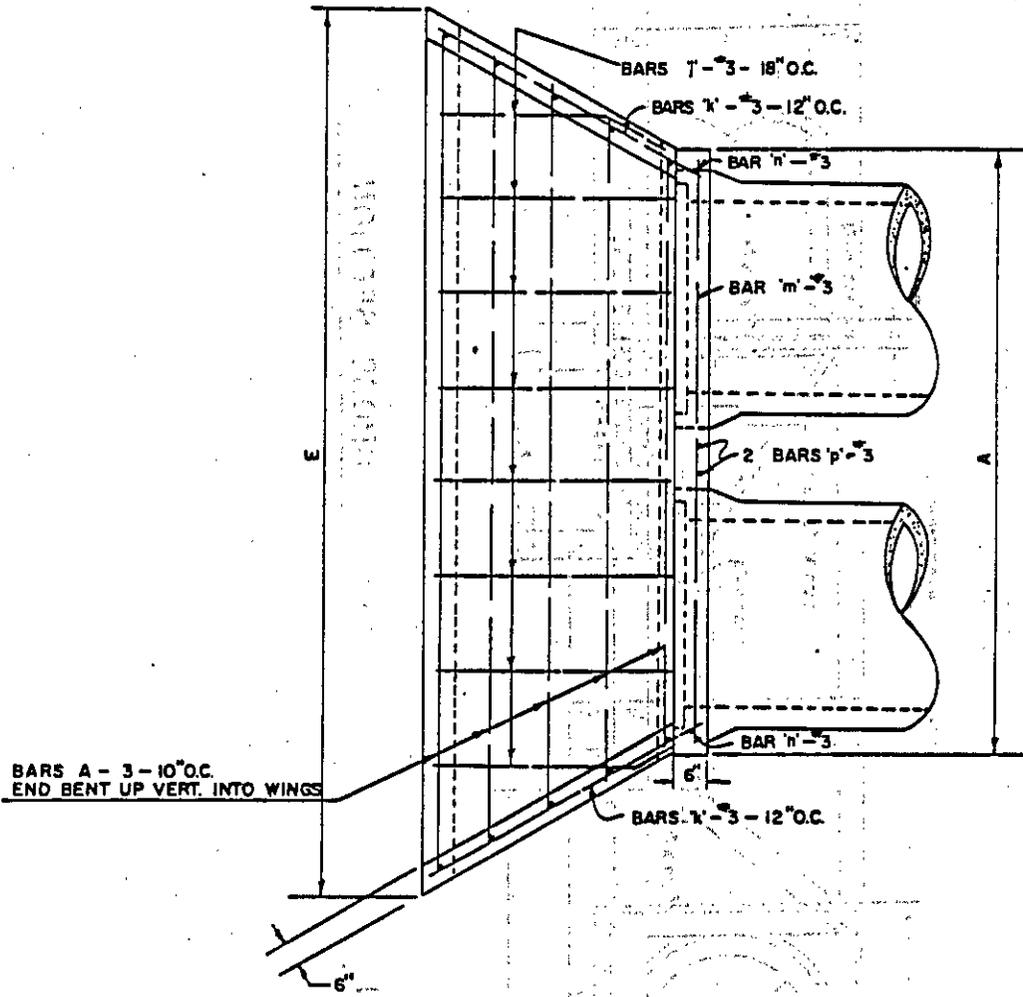
REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			CONCRETE HEADWALL DETAIL	
			SINGLE PIPE	
			ENGINEER OF PUBLIC WORKS	DR-150A
			CITY OF HUNTSVILLE, ALABAMA	DRAWING NO.



CROSS SECTION

END ELEVATION

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	CONCRETE HEADWALL DETAIL SINGLE PIPE	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-150B DRAWING NO.



PLAN

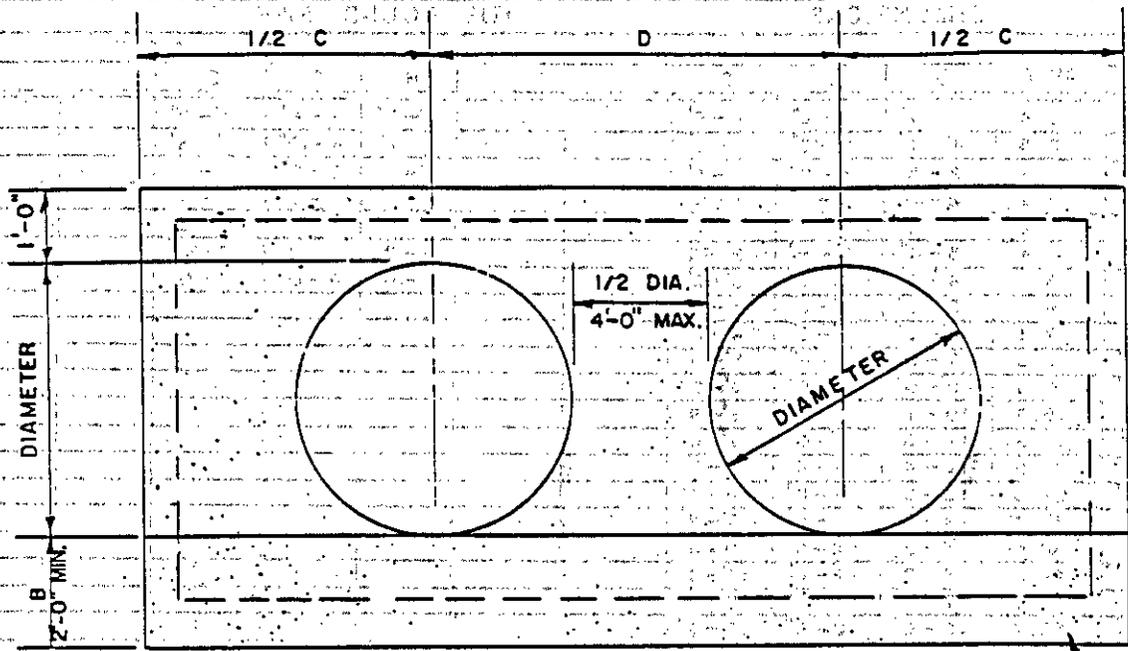
DOUBLE LINE HEADWALL DIMENSIONS						
D	A	B	C	E	F	G
15"	6'-2"	2'-3"	1'-3"	8'-4"	1'-10 1/2"	8'-6"
18"	6'-8"	2'-6"	1'-3"	8'-10"	1'-10 1/2"	0'-9"
21"	7'-2"	2'-9"	1'-3"	9'-4"	1'-10 1/2"	1'-0"
24"	7'-8"	3'-0"	1'-6"	10'-3"	2'-3"	1'-0"
30"	8'-8"	3'-6"	2'-0"	12'-2"	3'-0"	1'-0"
36"	9'-8"	4'-0"	2'-6"	14'-0"	3'-9"	1'-0"

QUANTITIES PER 2 HDWL'S, DBL. LINE						
PIPE DIA.	15"	18"	21"	24"	30"	36"
CONC.	1.68	1.87	2.05	2.43	3.28	4.23
STEEL	54	58	62	72	103	131

NOTE:

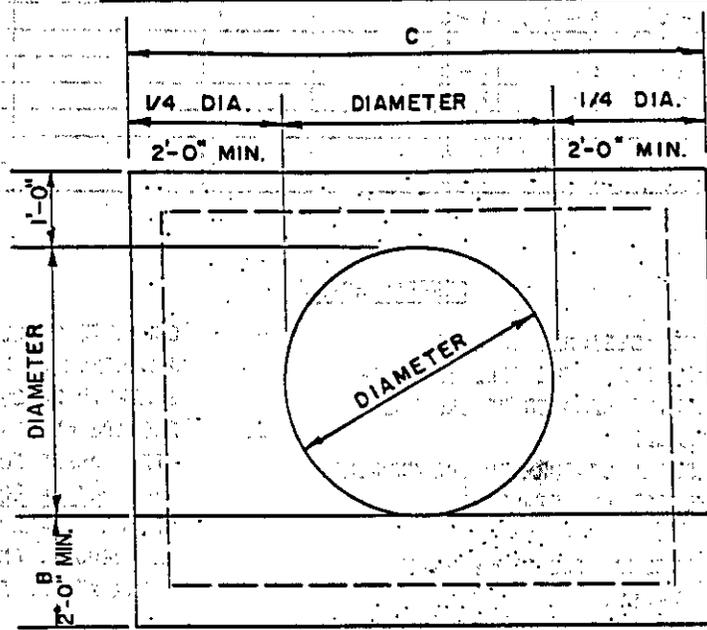
WHERE ARCH TYPE PIPE IS SPECIFIED, HORIZONTAL DIMENSION "A" FOR HEADWALLS SHALL CONFORM TO THE HORIZONTAL DIAMETER OF THE PIPE AND VERTICAL DIMENSIONS, AND DIMENSIONS DEPENDENT ON VERTICAL DIMENSIONS, SHALL CONFORM TO THE VERTICAL DIAMETER OF THE PIPE.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			CONCRETE HEADWALL DETAIL DOUBLE PIPE	
			ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	
	DIRECTOR	DATE	DR-151A DRAWING NO.	



ELEVATION OF DOUBLE BARREL
ROUND PIPE HEADWALL

CONCRETE OR
RIP-RAP



ELEVATION OF ROUND
PIPE HEADWALL

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	CONCRETE & LIMESTONE RIP-RAP SLOPE PAVED HEADWALLS-ROUND PIPE DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-152A DRAWING NO.

DIMENSIONS FOR ROUND PIPE

DIAMETER		OPEN AREA	2 TO 1 SLOPE			3 TO 1 SLOPE		
INCHES	FT. & IN.		B	C	D	B	C	D
8"	0'-8"	0.4	1'-6"	4'-8"	1'-0"	2'-2"	4'-8"	1'-0"
10"	0'-10"	0.5	1'-11"	4'-10"	1'-3"	2'-8"	4'-10"	1'-3"
12"	1'-0"	0.8	2'-5"	5'-0"	1'-6"	3'-2"	5'-0"	1'-6"
15"	1'-3"	1.2	2'-10"	5'-3"	1'-11"	4'-0"	5'-3"	1'-11"
18"	1'-6"	1.8	3'-3"	5'-6"	2'-3"	4'-9"	5'-6"	2'-3"
21"	1'-9"	2.4	3'-11"	5'-9"	2'-7 $\frac{1}{2}$ "	5'-7"	5'-9"	2'-7 $\frac{1}{2}$ "
24"	2'-0"	3.1	4'-6"	6'-0"	3'-0"	6'-4"	6'-0"	3'-0"
30"	2'-6"	4.9	5'-3"	6'-6"	3'-9"			
36"	3'-0"	7.1	6'-9"	7'-0"	4'-6"			
42"	3'-6"	9.6	7'-0"	7'-6"	5'-3"			
48"	4'-0"	12.6	9'-0"	8'-0"	6'-0"			
54"	4'-6"	15.9	10'-1"	8'-6"	6'-9"			
60"	5'-0"	19.6	11'-3"	9'-0"	7'-6"			
66"	5'-6"	23.8	12'-4"	9'-6"	8'-3"			
72"	6'-0"	28.3	13'-5"	10'-0"	9'-0"			
78"	6'-6"	33.2	14'-7"	10'-6"	9'-9"			
84"	7'-0"	38.5	15'-8"	11'-0"	10'-6"			
90"	7'-6"	44.2	16'-10"	11'-6"	11'-3"			
96"	8'-0"	50.3	17'-11"	12'-0"	12'-0"			
102"	8'-6"	56.7	19'-0"	12'-9"	12'-6"			
108"	9'-0"	63.6	20'-2"	13'-6"	13'-0"			
114"	9'-6"	70.9	21'-3"	14'-3"	13'-6"			
120"	10'-0"	78.5	22'-5"	15'-0"	14'-0"			
126"	10'-6"	86.6	23'-6"	15'-9"	14'-6"			
132"	11'-0"	95.0	24'-8"	16'-6"	15'-0"			
138"	11'-6"	103.9	25'-9"	17'-3"	15'-6"			
144"	12'-0"	113.1	26'-10"	18'-0"	16'-0"			
150"	12'-6"	122.7	28'-0"	18'-9"	16'-6"			
156"	13'-0"	132.7	29'-1"	19'-6"	17'-0"			
162"	13'-6"	143.1	30'-3"	20'-3"	17'-6"			
168"	14'-0"	153.9	31'-4"	21'-0"	18'-0"			
174"	14'-6"	165.1	32'-6"	21'-9"	18'-6"			
180"	15'-0"	176.7	33'-7"	22'-6"	19'-0"			

GENERAL NOTES

- THIS HEADWALL IS NOT DESIGNED TO OFFER ANY SUPPORT TO THE PIPE. THE FILL IS TO BE PLACED AND ALL SHORING REMOVED BEFORE THE SLOPE PAVING IS PLACED.
- ALL SLOPE PAVING SHALL CONFORM TO THE CURRENT ALABAMA HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS.
- QUANTITIES SHOWN INCLUDE TWO SLOPE PAVED WALLS AND TWO TOE WALLS.
- CONTRACTOR SHALL INSURE THROUGH MECHANICAL MEANS OR OTHER APPROVED DEVICES THAT CONNECTION BETWEEN BEVELED PIPE END AND CONCRETE WILL NOT BE DETACHED.
- CONCRETE SHALL BE CLASS A WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 p.s.f.
- PROVIDE 6"x6"-6/6 GAGE WELDED WIRE FABRIC FOR PIPES LARGER THAN 36" OR EQUIVALENT.
- RIP-RAP SHALL BE UNIFORM SIZE THROUGHOUT, AND AT LEAST 6" THICK AT THE SMALLEST DIMENSION.

REVISIONS

DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

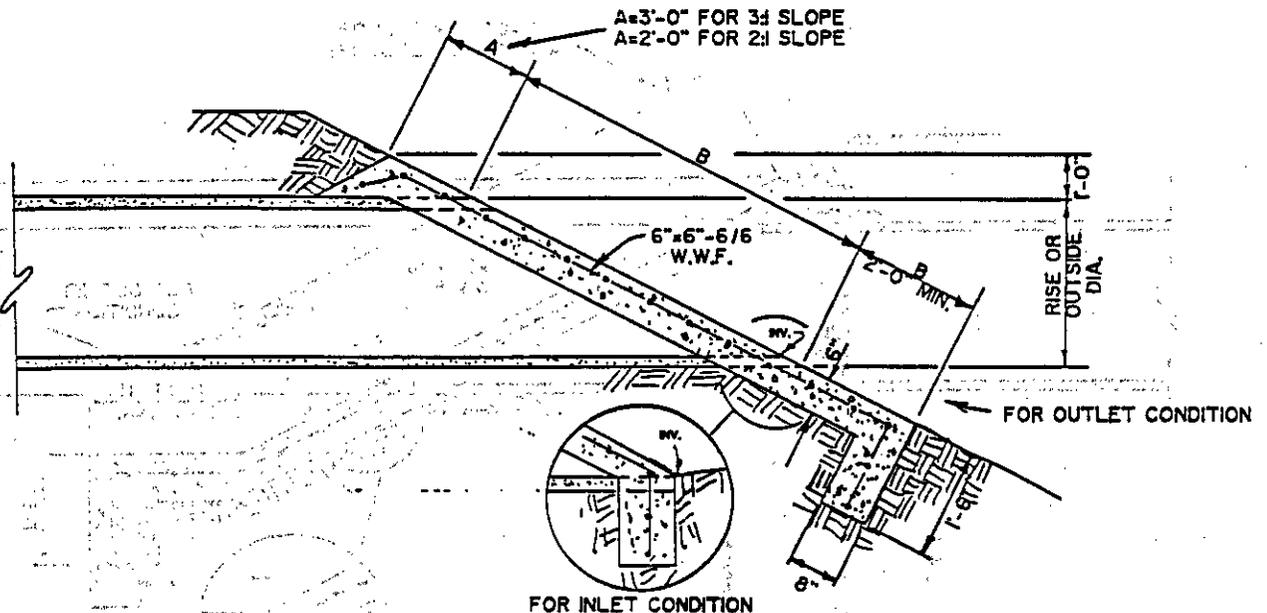
CONCRETE & LIMESTONE RIP-RAP SLOPE PAVED HEADWALLS-ROUND PIPE DETAIL

DIRECTOR

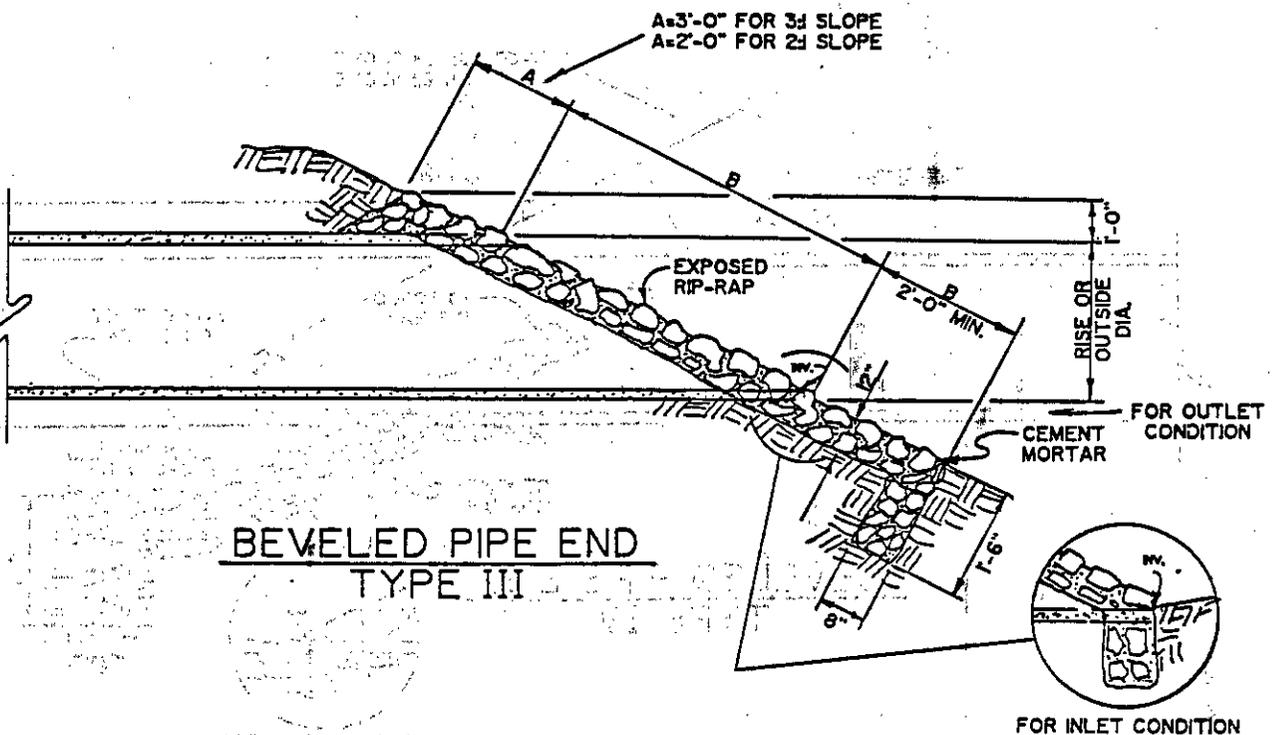
DATE

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

DR-152B
DRAWING NO.

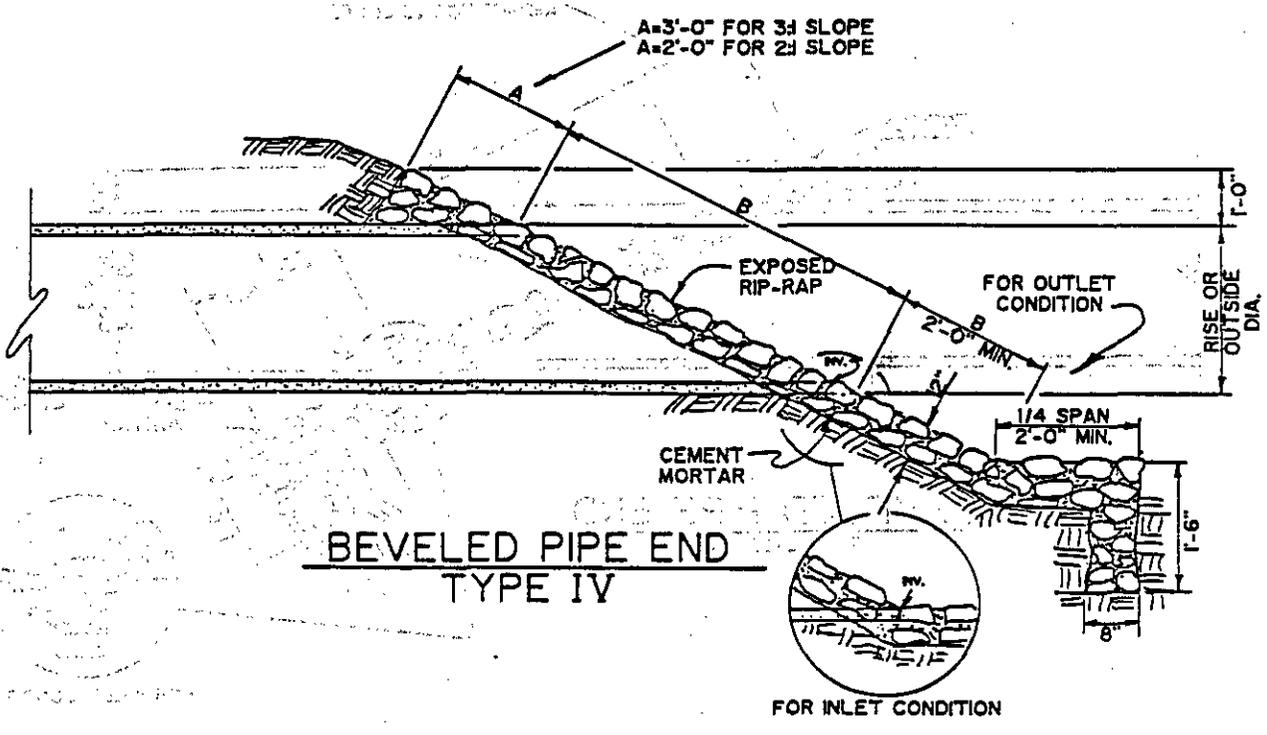
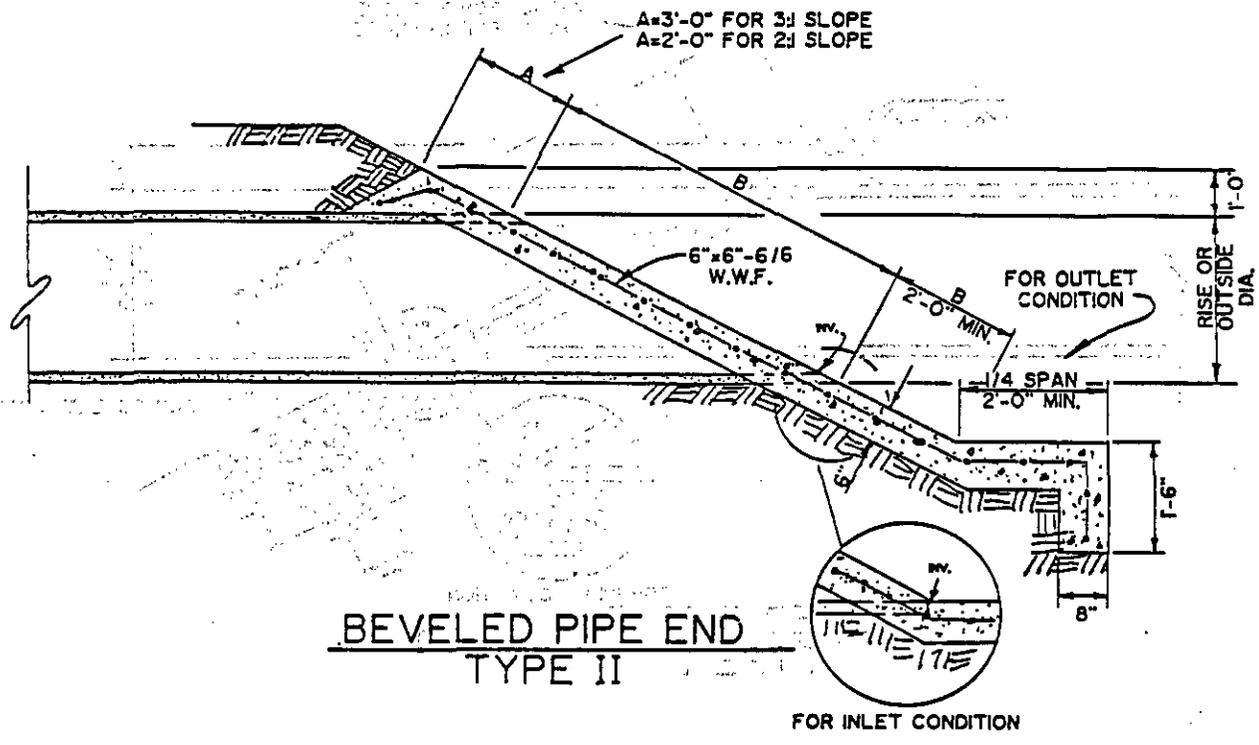


**BEVELED PIPE END
TYPE I**



**BEVELED PIPE END
TYPE III**

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	CONCRETE & LIMESTONE RIP-RAP SLOPE PAVED HEADWALLS-ROUND PIPE DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-152C DRAWING NO.



REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

CONCRETE & LIMESTONE RIP-RAP
SLOPE PAVED HEADWALLS-ROUND PIPE
DETAIL

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

DR-152 D
DRAWING NO.

DIMENSIONS FOR ARCH PIPE

SPAN	RISE	OPEN AREA	2 TO 1 SLOPE			3 TO 1 SLOPE		
			B	C	D	B	C	D
1'-6"	0'-11"	1.1	2'-1"	5'-6"	2'-3"	2'-11"	5'-6"	2'-3"
1'-10"	1'-1"	1.6	2'-6"	5'-10"	2'-9"	3'-6"	5'-10"	2'-9"
2'-1"	1'-4"	2.2	3'-0"	6'-2"	3'-3"	4'-3"	6'-2"	3'-3"
2'-5"	1'-6"	2.8	3'-5"	6'-5"	3'-7½"	4'-9"	6'-5"	3'-7½"
3'-0"	1'-10"	4.4	4'-2"	7'-0"	4'-6"			
3'-7"	2'-3"	6.2	5'-1"	7'-7"	5'-4½"			
4'-2"	2'-7"	8.3	5'-10"	8'-2"	6'-3"			
4'-10"	3'-0"	10.8	6'-9"	8'-10"	7'-3"			
5'-5"	3'-4"	13.5	7'-6"	9'-5"	8'-1½"			
6'-0"	3'-8"	16.6	8'-3"	10'-0"	9'-0"			
6'-5"	4'-9"	24.0	10'-8"	10'-3"	9'-4½"			
7'-9"	5'-4"	33.0	12'-0"	11'-9"	11'-7½"			
8'-11"	6'-0"	43.0	13'-5"	13'-5"	12'-11"			
10'-3"	6'-5"	55.0	14'-5"	15'-5"	14'-3"			
11'-10"	7'-6"	70.0	16'-10"	17'-9"	15'-10"			
13'-3"	8'-0"	85.0	17'-11"	19'-11"	17'-3"			
14'-2"	8'-8"	96.0	19'-5"	21'-3"	18'-2"			
15'-9"	9'-7"	114.0	21'-6"	23'-8"	19'-9"			

GENERAL NOTES

1. THIS HEADWALL IS NOT DESIGNED TO OFFER ANY SUPPORT TO THE PIPE. THE FILL IS TO BE PLACED AND ALL SHORING REMOVED BEFORE THE SLOPE PAVING IS PLACED.
2. ALL SLOPE PAVING SHALL CONFORM TO THE CURRENT ALABAMA HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS.
3. QUANTITIES SHOWN INCLUDE TWO SLOPE PAVED WALLS AND TWO TOE WALLS.
4. CONTRACTOR SHALL INSURE THROUGH MECHANICAL MEANS OR OTHER APPROVED DEVICES THAT CONNECTION BETWEEN BEVELED PIPE END AND CONCRETE WILL NOT BE DETACHED.
5. CONCRETE SHALL BE CLASS A WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 p.s.i.
6. PROVIDE 6"x6"-6/6 GAGE WELDED WIRE FABRIC FOR PIPES LARGER THAN 36" OR EQUIVALENT.
7. RIP-RAP SHALL BE UNIFORM SIZE THROUGHOUT, AND AT LEAST 6" THICK AT THE SMALLEST DIMENSION.

REVISIONS

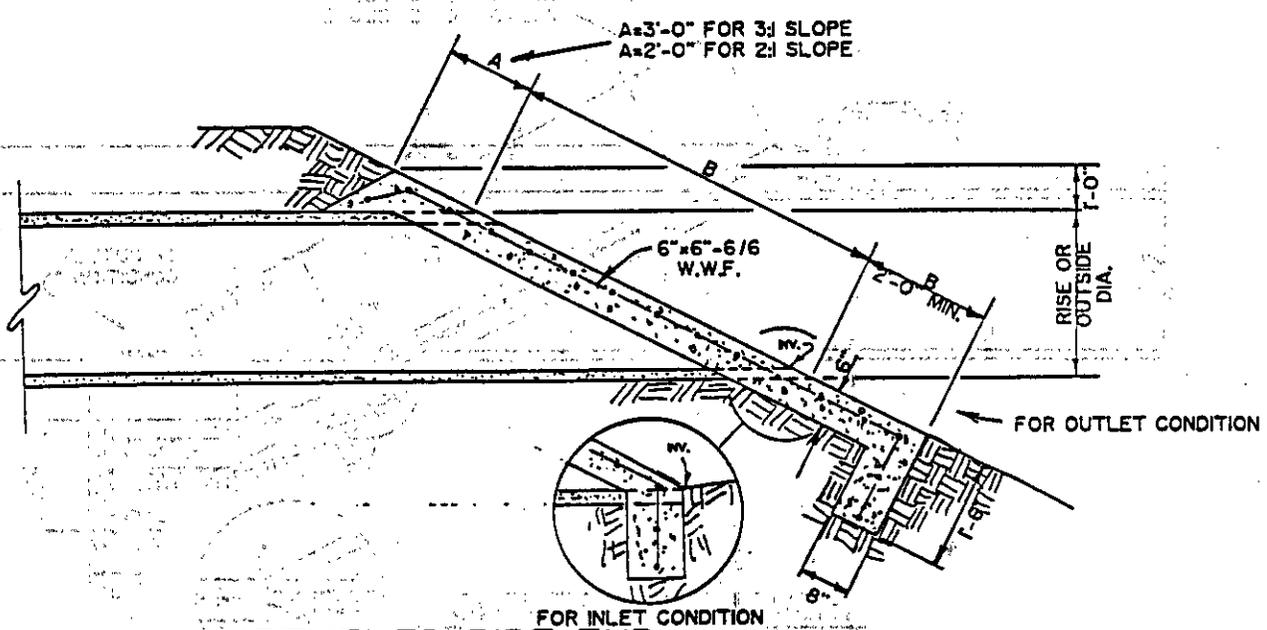
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

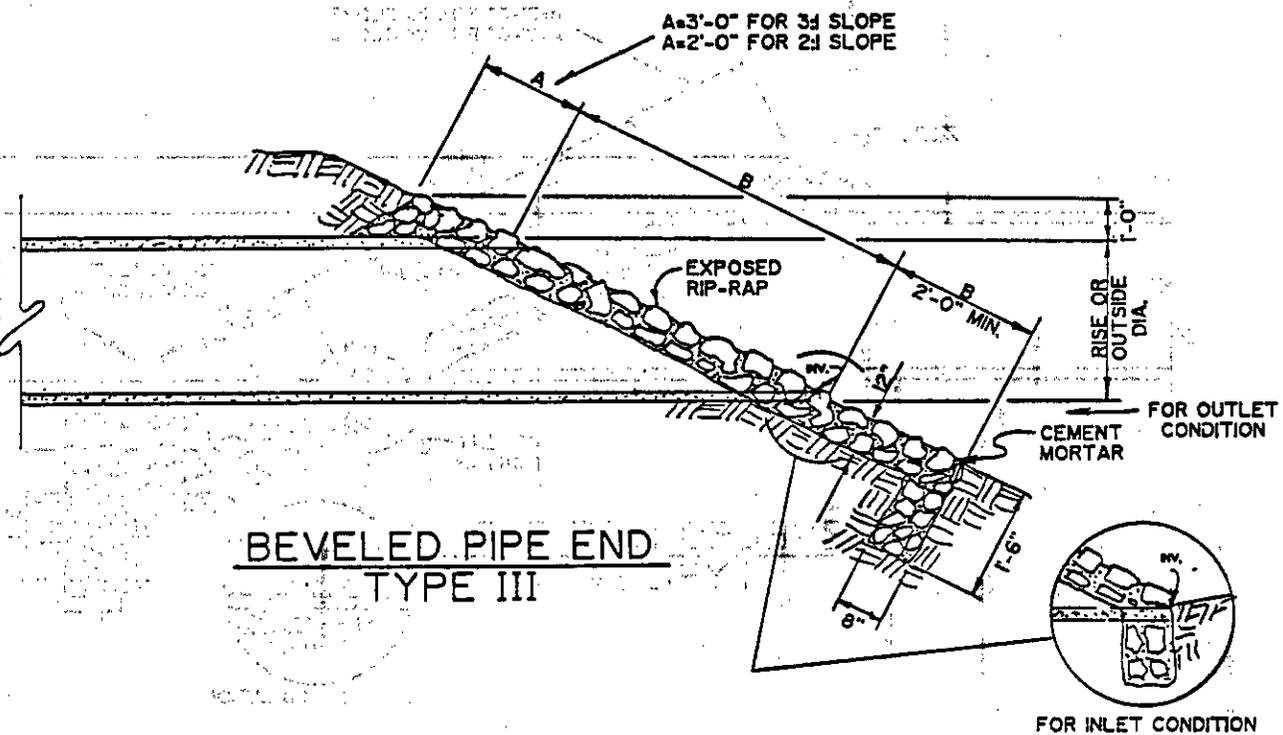
CONCRETE & LIMESTONE RIP-RAP SLOPE PAVED HEADWALLS-ARCH PIPE DETAIL

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

DR-153B
DRAWING NO.

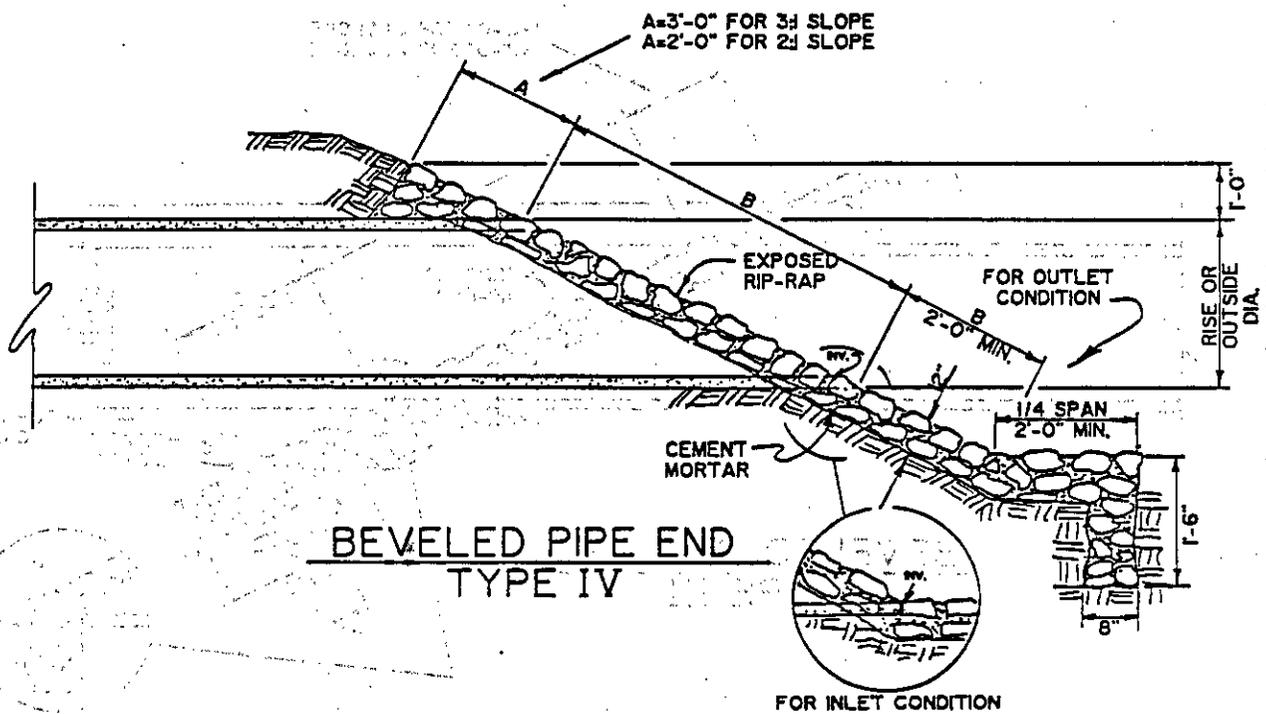
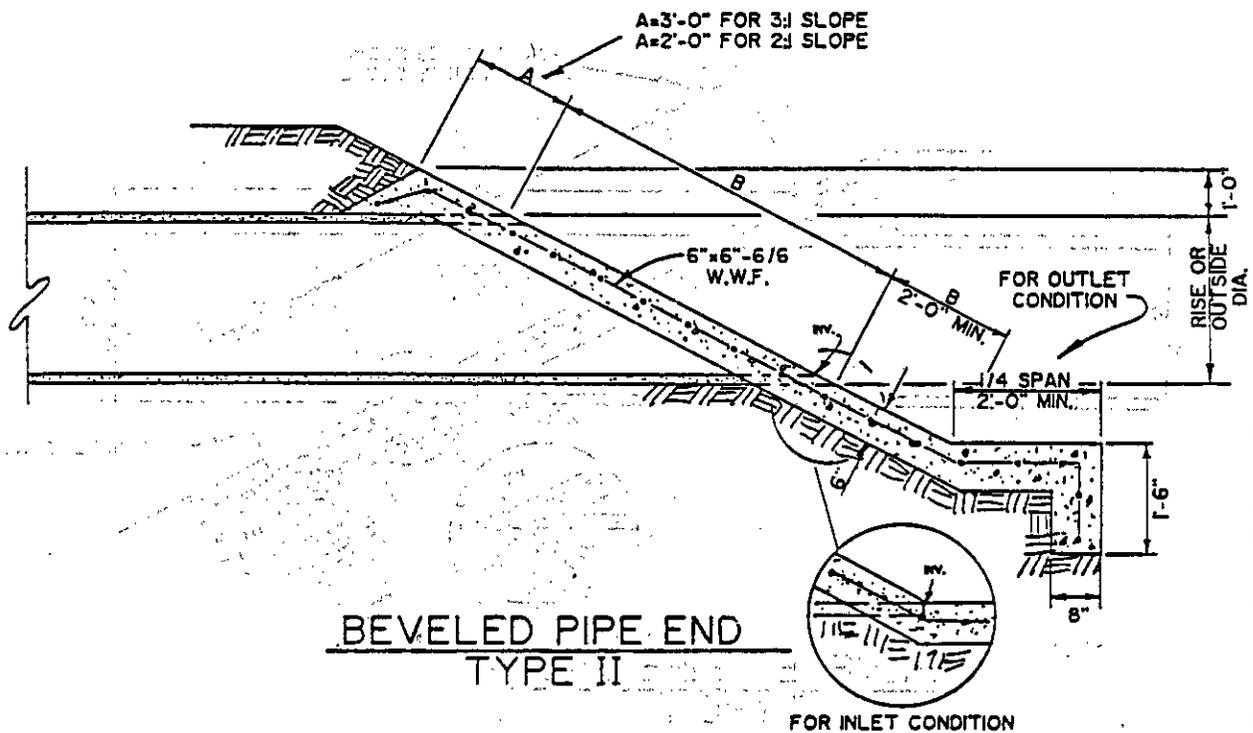


**BEVELED PIPE END
TYPE I**



**BEVELED PIPE END
TYPE III**

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			CONCRETE & LIMESTONE RIP-RAP SLOPE PAVED HEADWALLS-ARCH PIPE DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-153C DRAWING NO.



REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

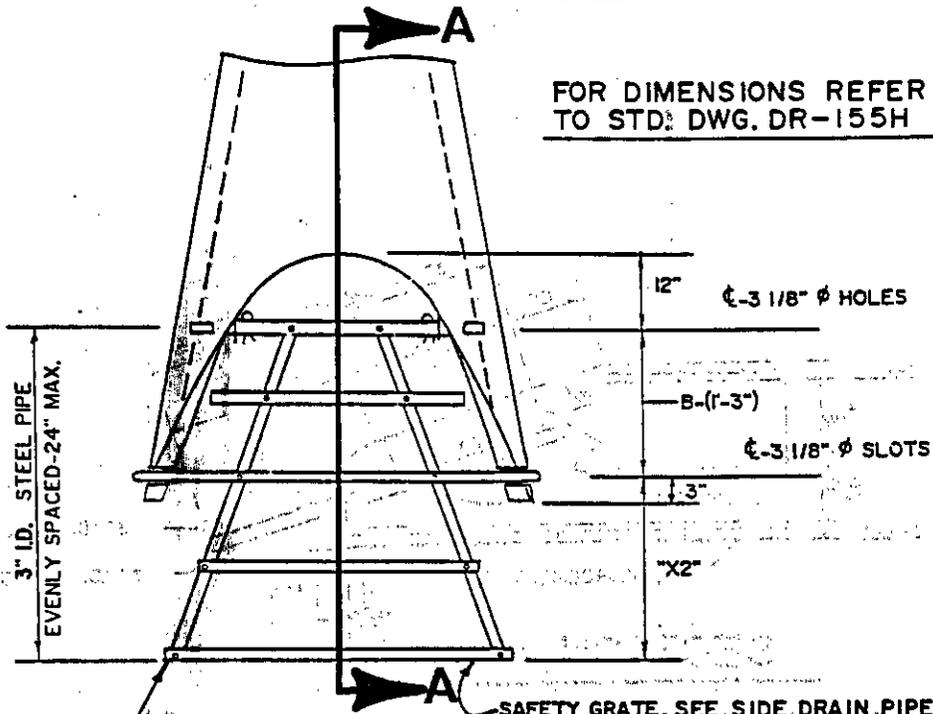
CITY OF HUNTSVILLE

CONCRETE & LIMESTONE RIP-RAP
SLOPE PAVED HEADWALLS-ARCH PIPE
DETAIL

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

DR-153D
DRAWING NO.

TRAFFIC FLOW



FOR DIMENSIONS REFER TO STD. DWG. DR-155H

IF STRUCTURES LIE WITHIN CLEAR ZONE, THEN THESE BARS MUST MEET SCHEDULE 6 GIVEN IN FIGURE 3-1 OF THE HUNTSVILLE STORM WATER MANAGEMENT MANUAL.

* ADD BARS WHEN B IS GREATER THAN 45" TO KEEP BAR SPACING AT 30" OR LESS.

SAFETY GRATE, SEE SIDE DRAIN PIPE GRATE DETAIL ON STD. DWG. DR-155B

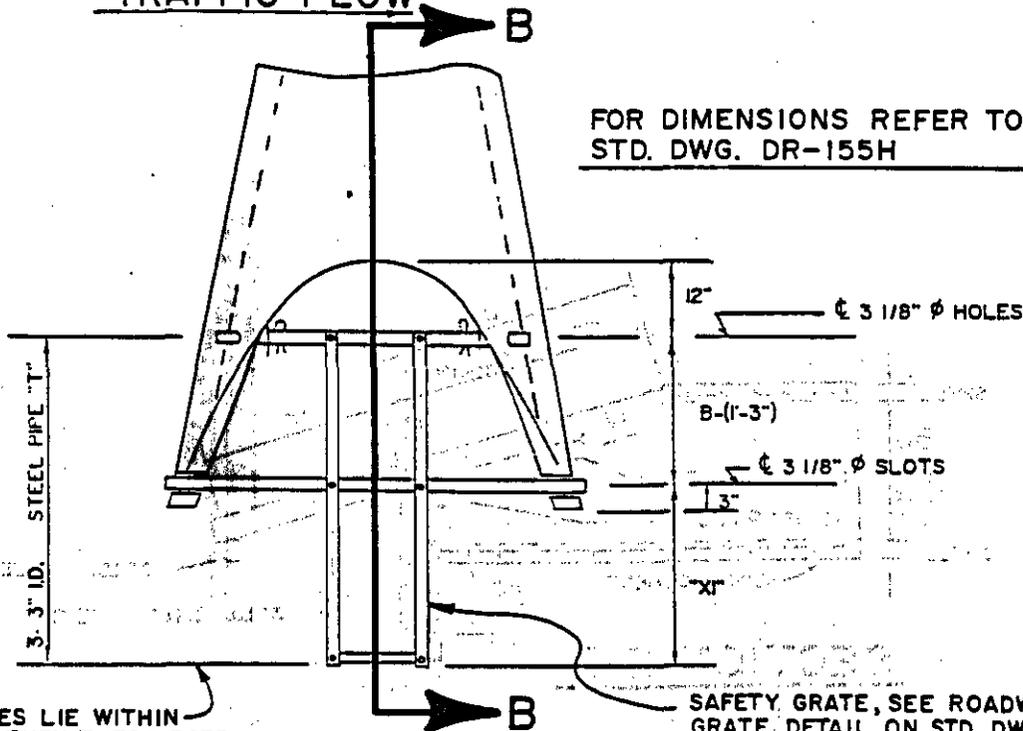
PLAN FOR DRAIN PIPES PARALLEL TO TRAFFIC FLOW

GENERAL NOTES

1. RAW METAL EXPOSED BY CUTTING AND DRILLING OF PIPE FOR GRATE ASSEMBLY WILL REQUIRE GALVANIZING REPAIR PAINT.
2. SAFETY GRATE TO BE USED WHERE ROADWAY EMBANKMENT IS SHALLOW AND OPEN END OF FLARED SECTION IS INSIDE CLEAR ZONE OR WHEN DIRECTED BY THE ENGINEER OF PUBLIC WORKS.
3. FLARED END SECTION SHALL BE CLASS 3.
4. PIPE AND ACCESSORIES FOR GRATES SHALL BE SCHEDULE 40, GALVANIZED STEEL (ASTM A120). HARDWARE SHALL BE GALVANIZED.
5. IT IS EXPECTED THAT FLARED END UNITS WILL BE PRODUCED TO MEET THE ABOVE REQUIREMENTS. SLIGHT VARIATIONS FROM THE ABOVE DIMENSIONS MAY BE ALLOWED PROVIDED APPROVAL IS OBTAINED FROM THE ENGINEER OF PUBLIC WORKS.
6. HOLES AND SLOTS TO ATTACH GRATE, IF REQUIRED, SHALL BE CAST ALONG WITH END SECTION.
7. 2-1/4" ϕ HOLES EACH PLACED AS SHOWN TO ACCOMODATE 2-3/4" ϕ TIE BOLTS, USED IN TYING SECTIONS TOGETHER.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	FLARED END SECTIONS FOR LOW SPEED STREETS	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-155A DRAWING NO.

TRAFFIC FLOW →



FOR DIMENSIONS REFER TO
STD. DWG. DR-155H

IF STRUCTURES LIE WITHIN CLEAR ZONE, THEN THESE BARS MUST MEET SCHEDULE 6 GIVEN IN FIGURE 3-1 OF THE HUNTSVILLE STORM WATER MANAGEMENT MANUAL.

* ADD BARS WHEN B IS GREATER THAN 45" TO KEEP BAR SPACING AT 30" OR LESS.

SAFETY GRATE, SEE ROADWAY PIPE GRATE DETAIL ON STD. DWG. DR-155D

PLAN FOR DRAIN PIPES PERPINDICULAR TO TRAFFIC FLOW

GENERAL NOTES

1. RAW METAL EXPOSED BY CUTTING AND DRILLING OF PIPE FOR GRATE ASSEMBLY WILL REQUIRE GALVANIZING REPAIR PAINT.
2. SAFETY GRATE TO BE USED WHERE ROADWAY EMBANKMENT IS SHALLOW AND OPEN END OF FLARED SECTION IS INSIDE CLEAR ZONE OR WHEN DIRECTED BY THE ENGINEER OF PUBLIC WORKS.
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6. HOLES AND SLOTS TO ATTACH GRATE, IF REQUIRED, SHALL BE CAST ALONG WITH END SECTION.
7. 2-1/4" ϕ HOLES EACH PLACED AS SHOWN TO ACCOMODATE 2-3/4" ϕ TIE BOLTS, USED IN TYING SECTIONS TOGETHER.

REVISIONS

DESCRIPTION	NAME	DATE
DIRECTOR		DATE

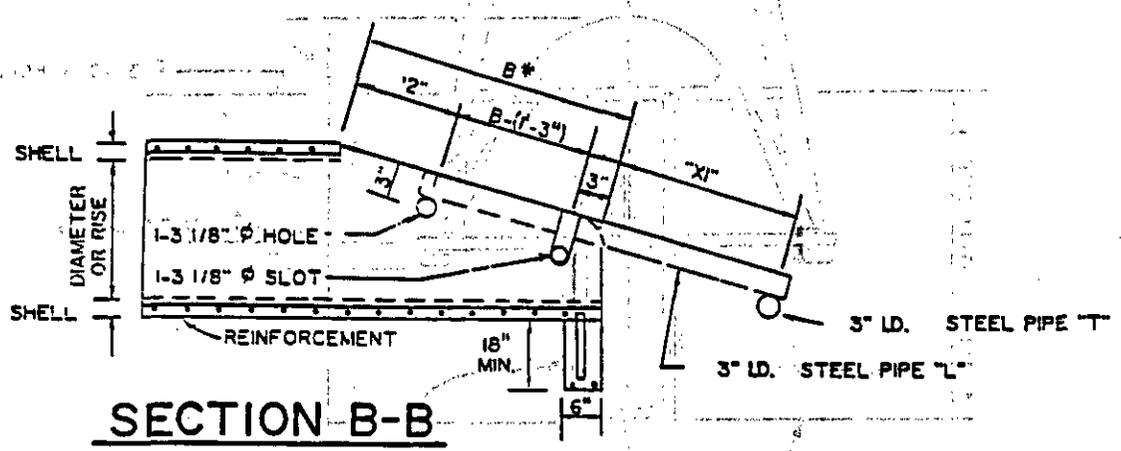
CITY OF HUNTSVILLE

FLARED END SECTIONS
FOR LOW SPEED STREETS

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

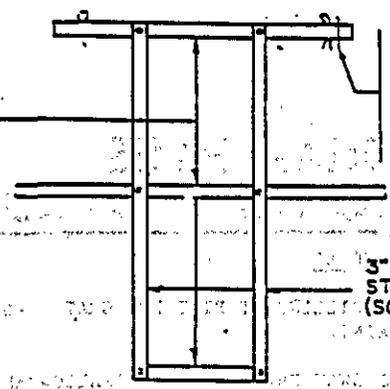
DR-155C
DRAWING NO.

SEE DRAWING FOR DIMENSIONS AND NOTES
 HUNT-93, PART 012



SECTION B-B

3" I.D.
 STEEL PIPE "T"
 (SCHEDULE 40)



COTTER PIN &
 1/4" THICK
 P.L. WASHER
 OR EQUAL
 FASTENING DEVICE

3" I.D.
 STEEL PIPE "L"
 (SCHEDULE 40)

SEE "L"
 30 MAX.

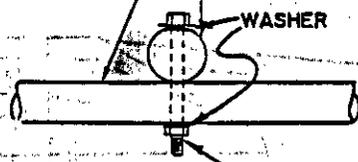
ROADWAY PIPE GRATE DETAIL

THIS DRAWING IS THE PROPERTY OF THE CITY OF HUNTSVILLE, ALABAMA. IT IS TO BE USED ONLY FOR THE PROJECT AND LOCATION SPECIFIED HEREON. IT IS NOT TO BE REPRODUCED, COPIED, OR TRANSMITTED IN ANY FORM OR BY ANY MEANS, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, OR BY ANY INFORMATION STORAGE AND RETRIEVAL SYSTEM, WITHOUT THE WRITTEN PERMISSION OF THE CITY OF HUNTSVILLE, ALABAMA. THE CITY OF HUNTSVILLE, ALABAMA, ASSUMES NO LIABILITY FOR ANY DAMAGE OR INJURY TO PERSONS OR PROPERTY ARISING FROM THE USE OF THIS DRAWING.

REVISIONS			CITY OF HUNTSVILLE					
DESCRIPTION	NAME	DATE	FLARED END SECTIONS FOR LOW SPEED STREETS					
					ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA			
							DR-155D DRAWING NO.	
DIRECTOR		DATE						

3" LD. PIPE (2) 1 1/16" Ø HOLES

3" LD. STEEL PIPE (2) 1 1/16" Ø HOLES



5/8" Ø x 7" H.H.
BOLT W/LOCK NUT
& 2 WASHERS

FASTENING DETAIL

(ROADWAY)

3" LD. STEEL PIPE (2) 1 1/16" Ø HOLES



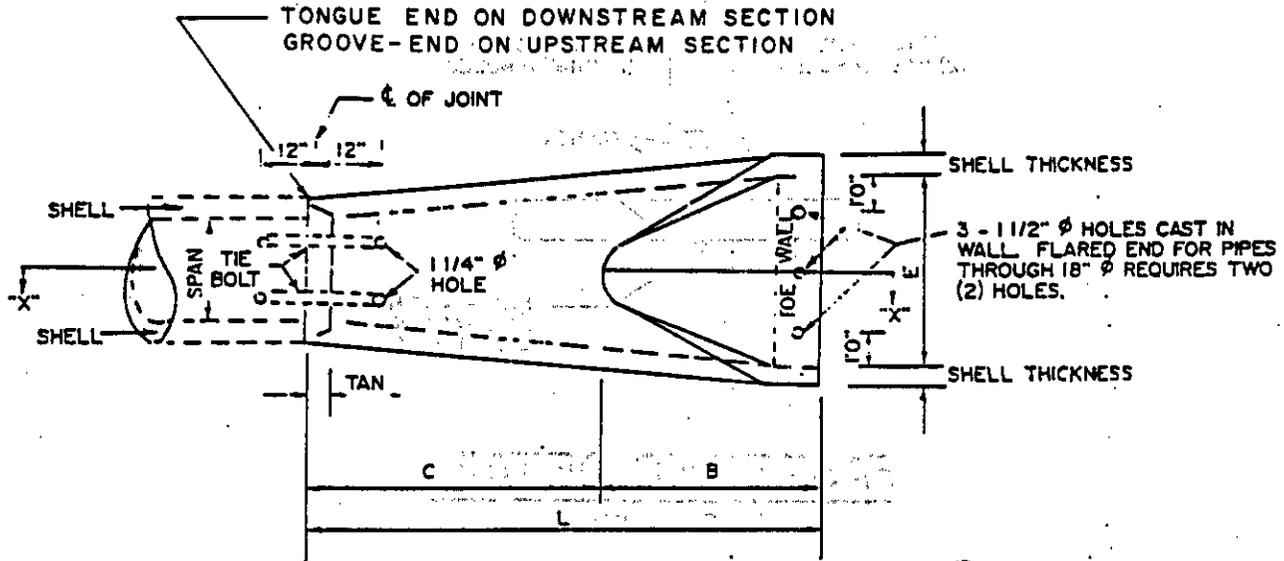
3" LD. STEEL PIPE (2) 1 1/16" Ø HOLES

5/8" Ø x 7" H.H.
BOLT W/LOCK NUT
& 2 WASHERS

FASTENING DETAIL

(SIDE DRAIN)

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	FLARED END SECTIONS FOR LOW SPEED STREETS	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-155E DRAWING NO.

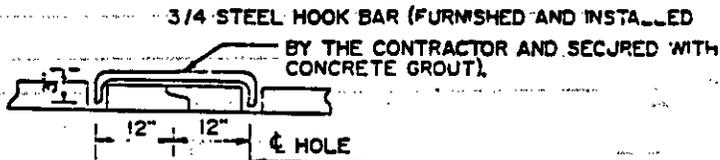
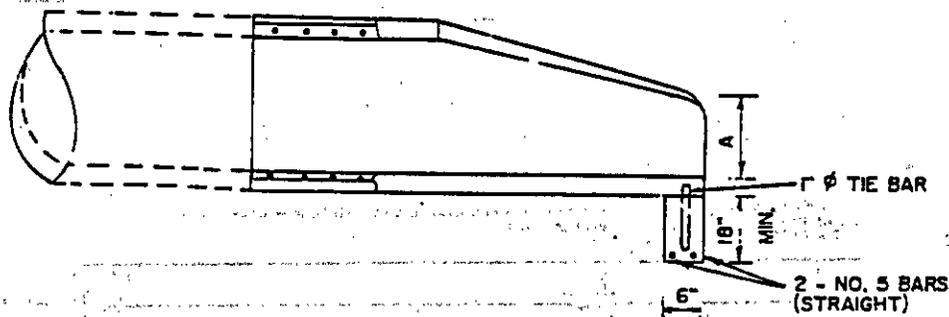
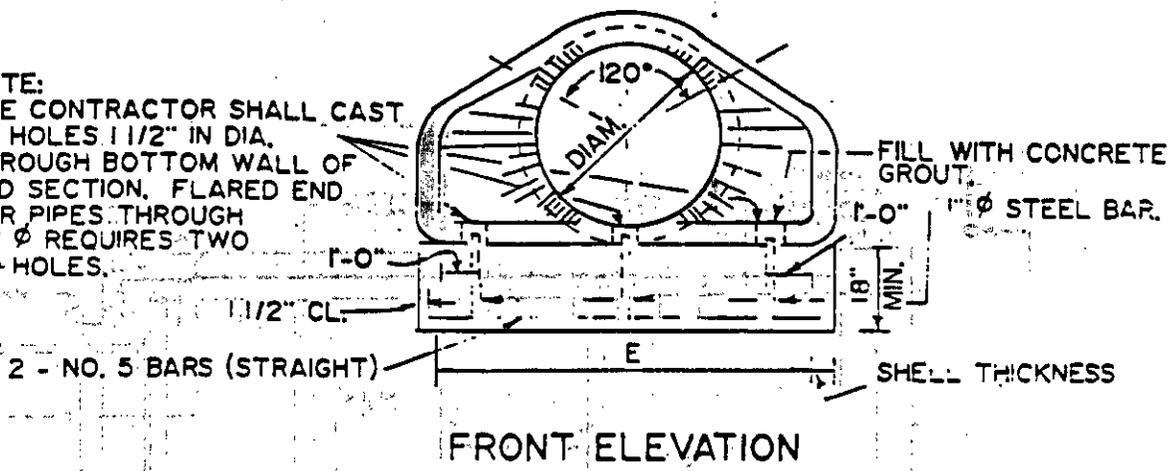


GENERAL NOTES

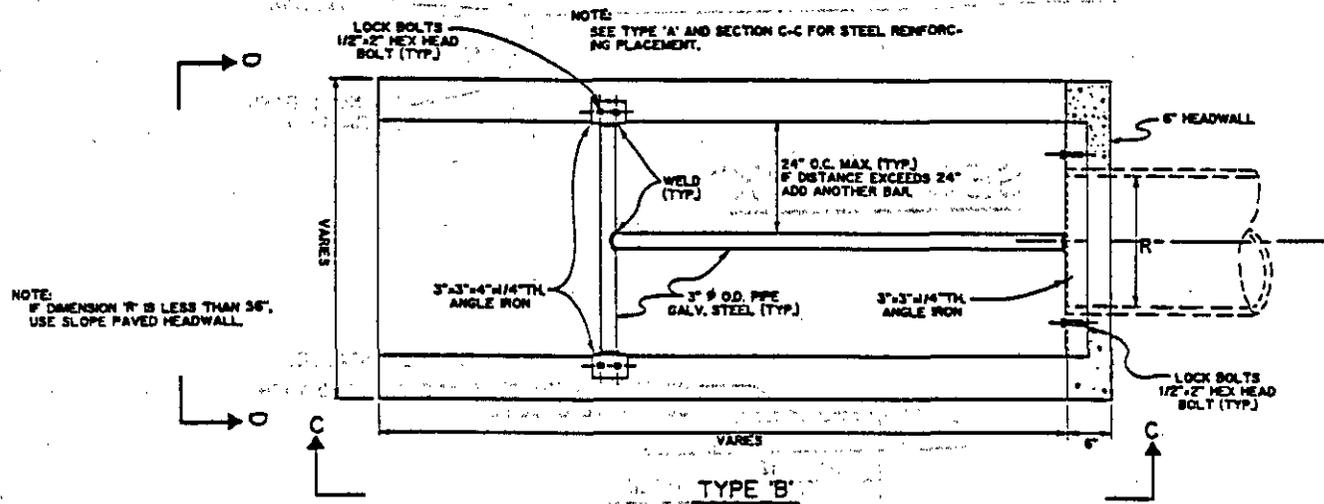
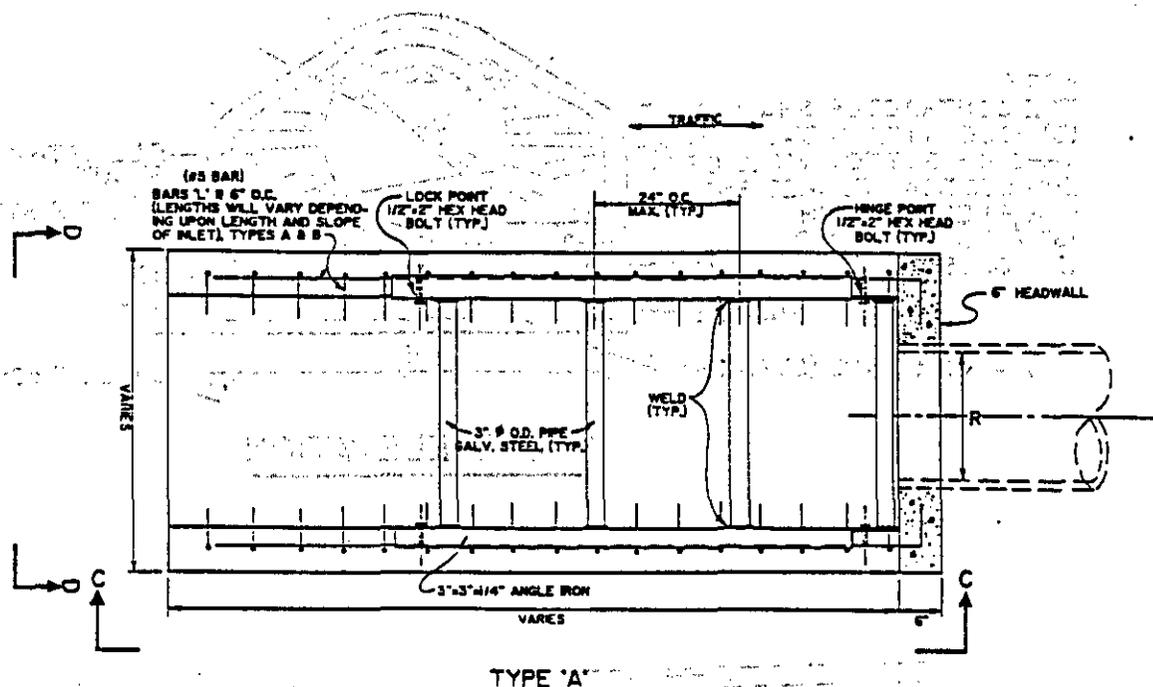
1. RAW METAL EXPOSED BY CUTTING AND DRILLING OF PIPE FOR GRATE ASSEMBLY WILL REQUIRE GALVANIZING REPAIR PAINT.
2. SAFETY GRATE TO BE USED WHERE ROADWAY EMBANKMENT IS SHALLOW AND OPEN END OF FLARED SECTION IS INSIDE CLEAR ZONE OR WHEN DIRECTED BY THE ENGINEER OF PUBLIC WORKS.
3. FLARED END SECTION SHALL BE CLASS 3.
4. PIPE AND ACCESSORIES FOR GRATES SHALL BE SCHEDULE 40, GALVANIZED STEEL (ASTM A120). HARDWARE SHALL BE GALVANIZED.
5. IT IS EXPECTED THAT FLARED END UNITS WILL BE PRODUCED TO MEET THE ABOVE REQUIREMENTS. SLIGHT VARIATIONS FROM THE ABOVE DIMENSIONS MAY BE ALLOWED PROVIDED APPROVAL IS OBTAINED FROM THE ENGINEER OF PUBLIC WORKS.
6. HOLES AND SLOTS TO ATTACH GRATE, IF REQUIRED, SHALL BE CAST ALONG WITH END SECTION.
7. 2-1/4" ϕ HOLES EACH PLACED AS SHOWN TO ACCOMMODATE 2-3/4" ϕ TIE BOLTS, USED IN TYING SECTIONS TOGETHER.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	FLARED END SECTIONS FOR LOW SPEED STREETS	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-155F DRAWING NO.

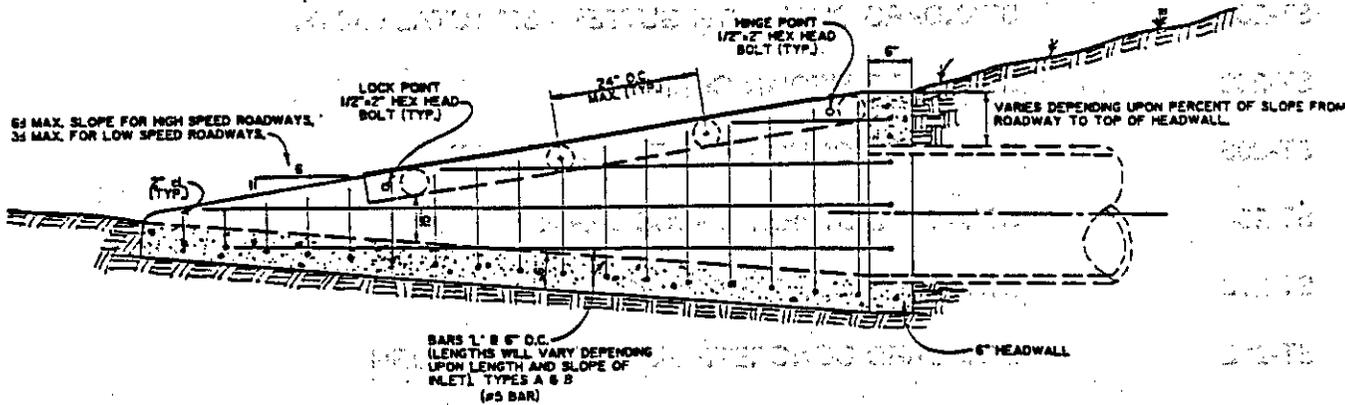
NOTE:
 THE CONTRACTOR SHALL CAST
 (3) HOLES 1 1/2" IN DIA.
 THROUGH BOTTOM WALL OF
 END SECTION. FLARED END
 FOR PIPES THROUGH
 18" Ø REQUIRES TWO
 (2) HOLES.



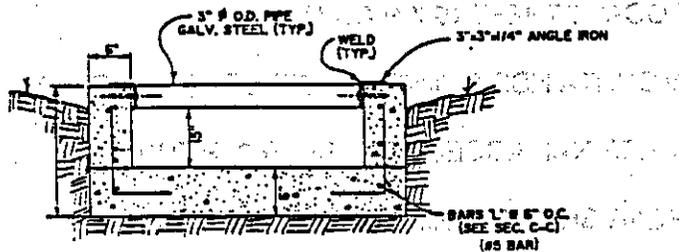
REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			FLARED END SECTIONS FOR LOW SPEED STREETS	
			ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	
DIRECTOR		DATE	DR-155G	DRAWING NO.



REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	ROADWAY PIPE SAFETY GRATE DETAIL	
			36" PIPE OR GREATER	
			ENGINEER OF PUBLIC WORKS	DR-158A
DIRECTOR		DATE	CITY OF HUNTSVILLE, ALABAMA	DRAWING NO.



SECTION 'C-C'

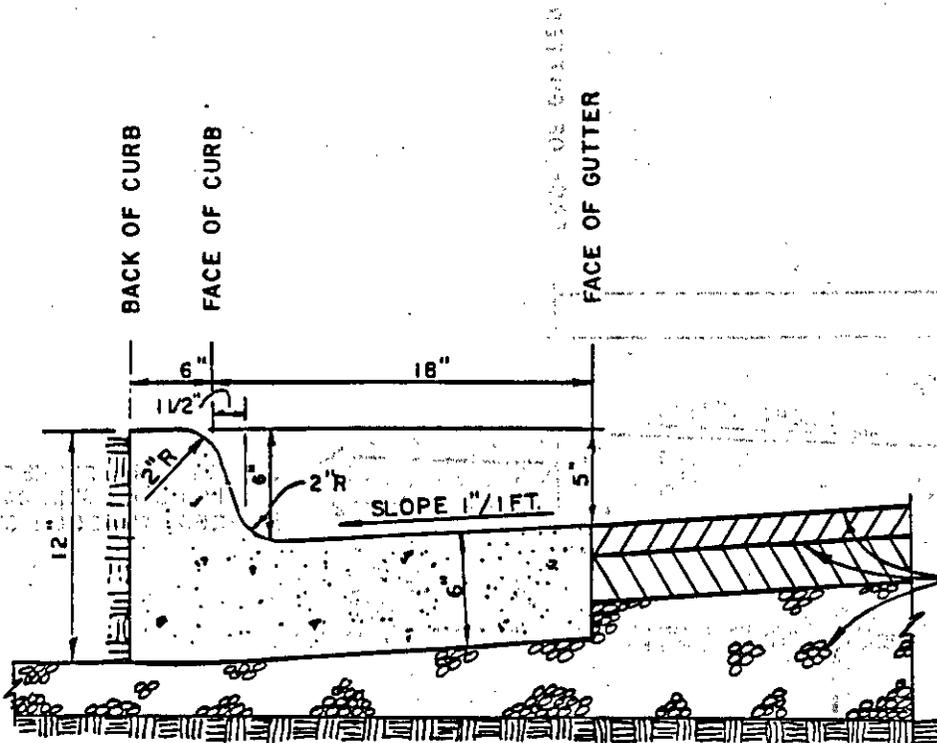


SECTION 'D-D'

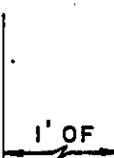
REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	ROADWAY PIPE SAFETY GRATE DETAIL 36" PIPE OR GREATER	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	DR-158B DRAWING NO.

STREET DETAILS

ST-200	STANDARD CURB WITH GUTTER - 24" TOTAL WIDTH
ST-201	STANDARD CURB WITH GUTTER - 30" TOTAL WIDTH
ST-202	STANDARD MEDIAN CURB
ST-203	STANDARD CONCRETE STREET HEADER
ST-204	STANDARD STREET CROSS DRAIN
ST-210	STANDARD CONCRETE SIDEWALK
ST-212	STANDARD CONCRETE SIDEWALK AT RETURN
ST-214	STANDARD HANDICAP RAMP (SIDE MOUNTABLE)
ST-215	STANDARD HANDICAP RAMP, NOTES AND DETAILS
ST-250	MAJOR ARTERIAL STREET (120' R.O.W.)
ST-251	MINOR ARTERIAL STREET (120' R.O.W.)
ST-252	MAJOR COLLECTOR STREET (80' R.O.W.)
ST-253	MINOR COLLECTOR STREET (60' R.O.W.)
ST-254	LOCAL STREET (50' R.O.W.)
ST-255	MOUNTAINSIDE DISTRICT STREET (40' R.O.W.)
ST-256	MARGINAL ACCESS STREET (40' R.O.W.)
ST-257	REAR SERVICE ROAD (30' R.O.W.)
ST-260	TYPICAL DRIVEWAY TURNOUT



SEE TYPICAL STREET SECTIONS ON STD. DWGS. ST-250 THROUGH ST-257



DENSE GRADED BASE

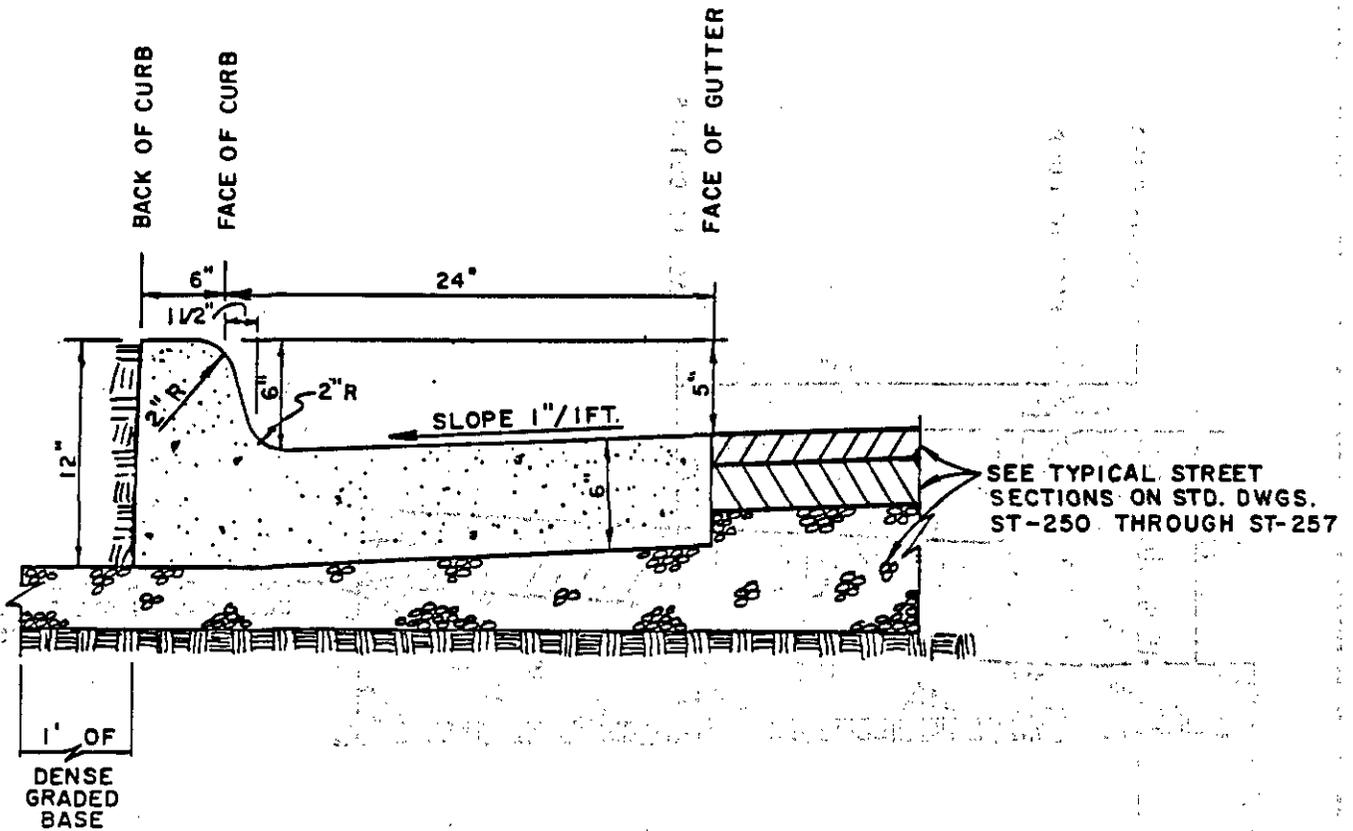
REVISIONS

DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

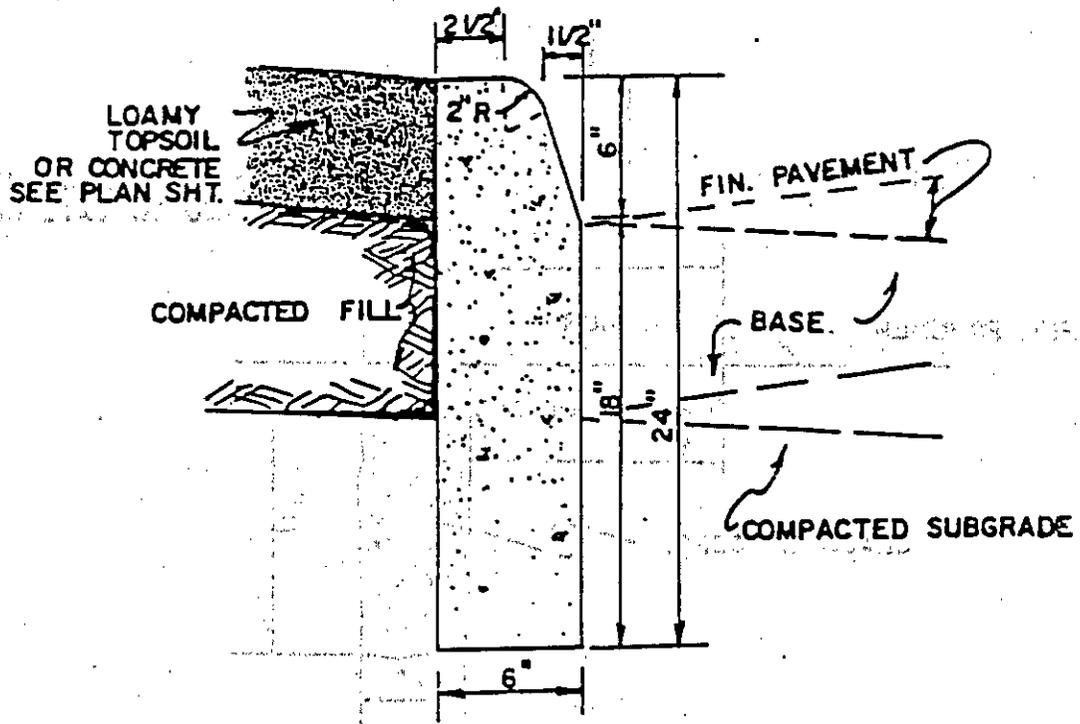
DETAIL FOR
STANDARD CURB WITH GUTTER
24" TOTAL WIDTH

DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	ST-200 DRAWING NO.
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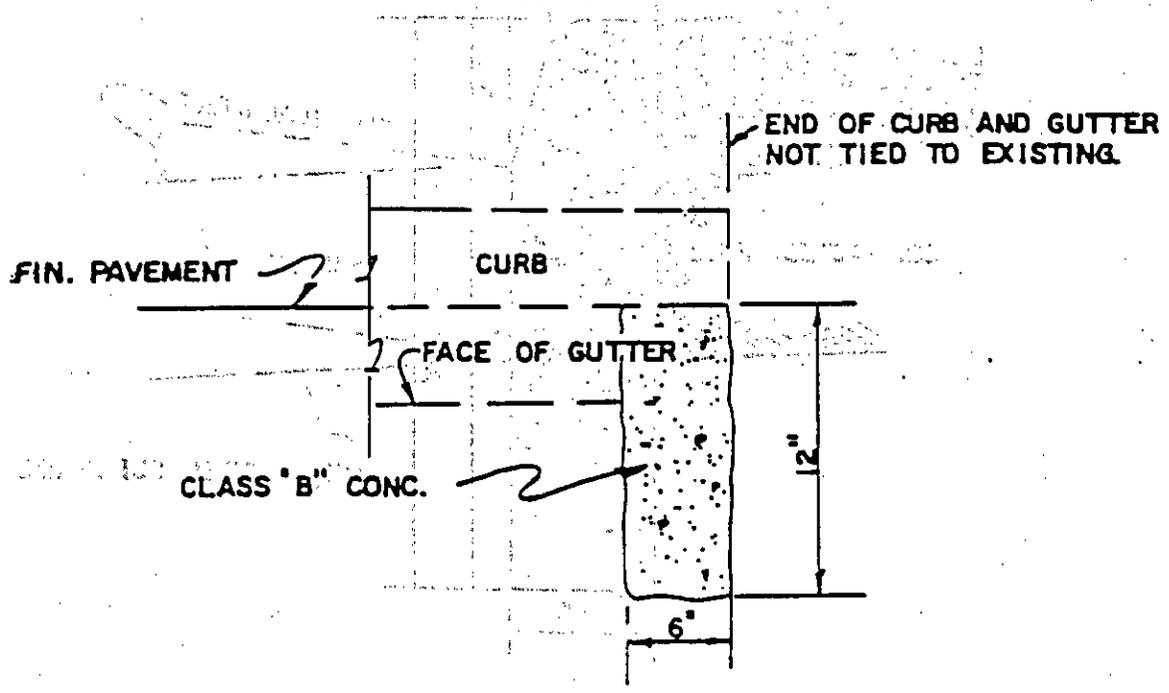
NOTE: THIS CURB IS AN ACCEPTABLE ALTERNATE WHEN APPROVED BY THE CITY OF HUNTSVILLE PUBLIC WORKS DEPARTMENT PRIOR TO CONSTRUCTION.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR STANDARD CURB WITH GUTTER 30" TOTAL WIDTH	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	ST-201 DRAWING NO.



STANDARD CURB FROM CDDA OF THE CITY OF HUNTSVILLE, ALABAMA
 FOR ROAD-TO-ROAD MEDIAN CURB. THE CURB SHALL BE 10 1/2" HIGH
 AND 2 1/2" WIDE AT THE TOP.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE		
			DETAIL FOR STANDARD MEDIAN CURB	
			ENGINEER OF PUBLIC WORKS	
			CITY OF HUNTSVILLE, ALABAMA	
DIRECTOR		DATE	ST-202	DRAWING NO.



NOTE: THIS DETAIL TO BE USED IN PLACES WHERE PUBLIC STREETS ARE DEAD-ENDED WITHOUT A PERMANENT CUL-DE-SAC (ie. FOR FUTURE EXTENSION).

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR	
			STANDARD CONCRETE STREET HEADER	
			ENGINEER OF PUBLIC WORKS	ST-203
			CITY OF HUNTSVILLE, ALABAMA	DRAWING NO.
DIRECTOR:		DATE:		

MATCH FACE
OF GUTTER

BACK OF CURB LINE

4'-0"

1'-6"

CURB

FINISHED STREET PAV'T

GUTTER

FIN STREET PAVEMENT

6x6-2 GAGE
WIRE MESH

6"

REVISIONS

DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

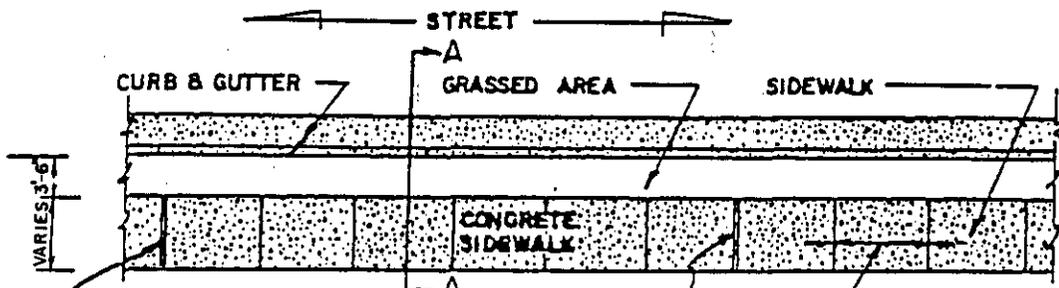
DETAIL FOR
STANDARD STREET CROSS DRAIN

DIRECTOR

DATE

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

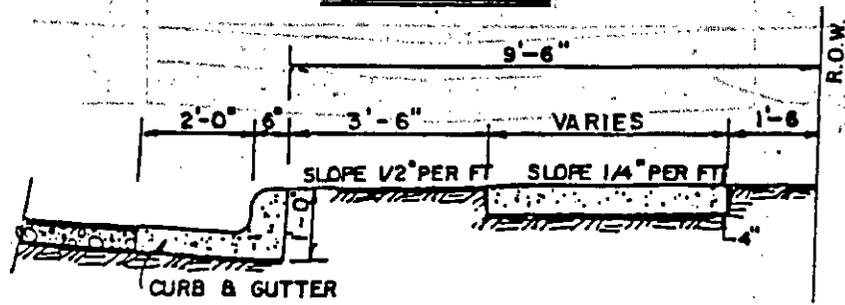
ST-204
DRAWING NO.



1/2" PREMOLDED EXPANSION JOINT (BITUMINOUS) USE NEXT TO BUILDINGS, STRUCTURES AND CURBS SPACING AT 75 FT. INTERVALS. ALL EDGES AND JOINTS TO BE ROUNDED TO 1/4-INCH RAD.

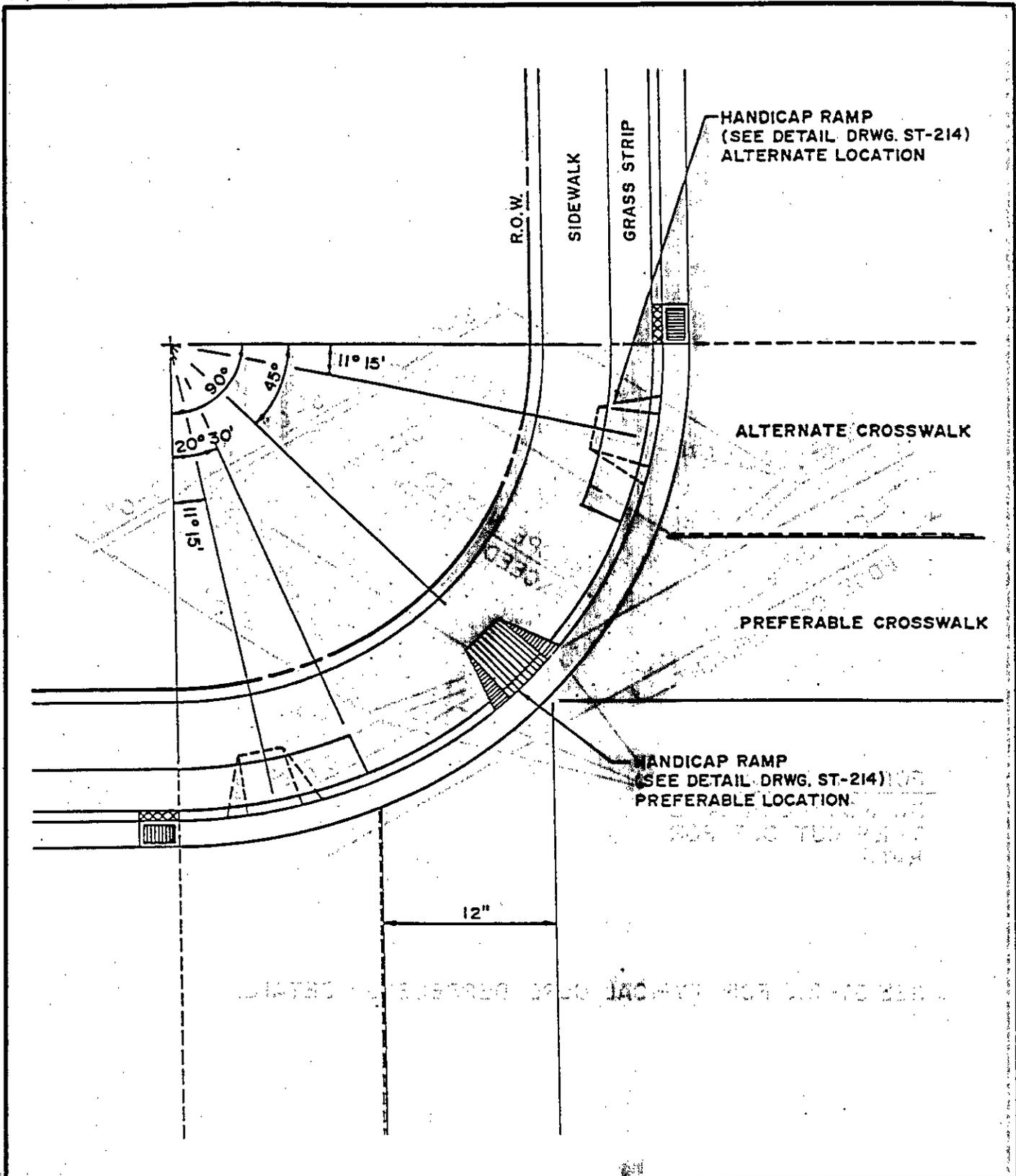
CONSTRUCTION JOINTS MAY BE FURMED BY 1/8" METAL PLATES REMOVED AFTER FINISHING, OR BY CUTTING SLAB AT 25 FT. INTERVALS, TO 1/3 OF FULL DEPTH. ROUND ALL EDGES WITH 1/4 INCH RAD. GROOVE FINISHING TOOL.

PLAN

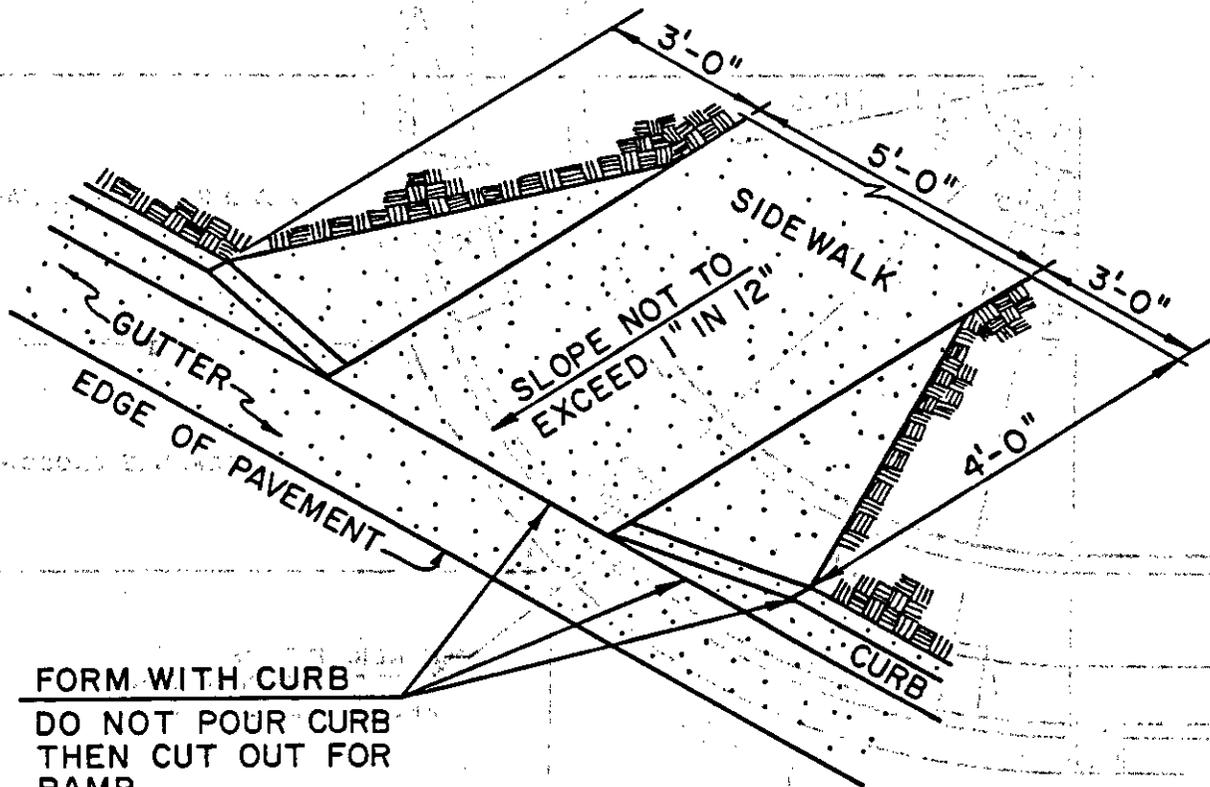


SECTION A-A

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR STANDARD CONCRETE SIDEWALK	
DIRECTOR	DATE		ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	ST-210 DRAWING NO.



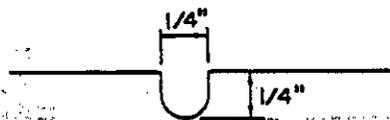
REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR STANDARD CONCRETE SIDEWALK AT RETURN	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	ST-212 DRAWING NO.



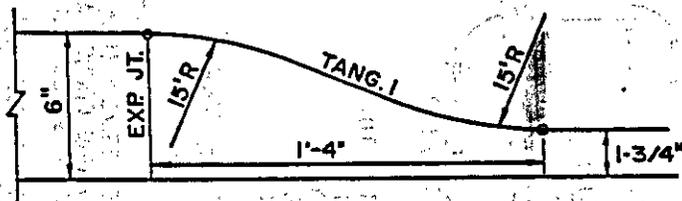
FORM WITH CURB
DO NOT POUR CURB
THEN CUT OUT FOR
RAMP.

SEE ST-215 FOR TYPICAL CURB DEPRESSION DETAIL.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR STANDARD HANDICAP RAMP (SIDE MOUNTABLE)	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	ST-214 DRAWING NO.



TYPICAL JOINT MARKING

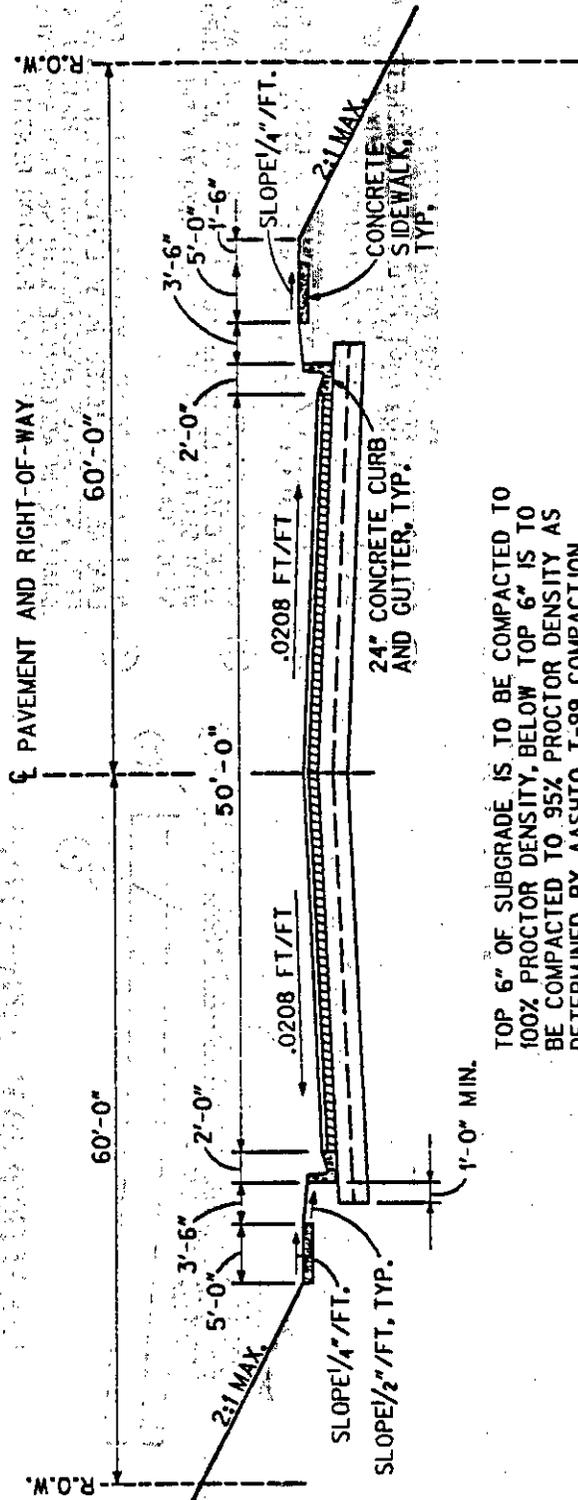


TYPICAL CURB DEPRESSION
FOR WALKS, W/ GRASS STRIP

NOTES:

1. DETAIL SHOWN ON THIS PLAN APPLY TO ALL CONSTRUCTION OR RECONSTRUCTION OF STREETS, CURB, OR SIDEWALKS.
2. CURB CUT RAMPS ARE TO BE LOCATED AS SHOWN ON THE PLANS.
3. RAMPS SHALL BE PROVIDED AT ALL CORNERS OF STREET INTERSECTION WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB. RAMPS SHALL ALSO BE PROVIDED AT WALK LOCATIONS IN MID-BLOCK.
4. SURFACE TEXTURE OF THE RAMP SHALL BE THAT OBTAINED BY A COARSE BROOMING TRANSVERSE TO THE SLOPE OF THE RAMP.
5. CARE SHALL BE TAKEN TO ASSURE A UNIFORM GRADE ON THE RAMP, FREE OF SAG AND SHORT GRADE CHANGES.
6. DRAINAGE STRUCTURES SHALL NOT BE PLACED IN LINE WITH RAMPS.
7. THE NORMAL GUTTER LINE PROFILE SHALL BE MAINTAINED THROUGH THE AREA OF THE RAMP.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR STANDARD HANDICAP RAMP NOTES AND DETAILS	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	ST-215 DRAWING NO.

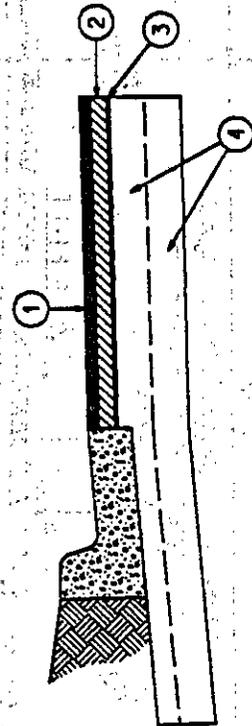


TOP 6" OF SUBGRADE IS TO BE COMPACTED TO 100% PROCTOR DENSITY, BELOW TOP 6" IS TO BE COMPACTED TO 95% PROCTOR DENSITY AS DETERMINED BY AASHTO T-99 COMPACTION TEST. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

FULL SECTION

MINIMUM REQUIREMENTS

- ① 168 LBS./S.Y. (1 1/2") HOT BITUMINOUS CONCRETE WEARING COURSE, ALA. HIGHWAY DEPT., REF. 416 MIX "A" OF SPECIFICATIONS (SILICEOUS AGGREGATE)
- ② 280 LBS./S.Y. (2 1/2") HOT BITUMINOUS CONCRETE BINDER COURSE, ALA. HIGHWAY DEPT., REF. 414 OF SPECIFICATIONS
- ③ 0.10 GAL./S.Y. EMULSIFIED ASPHALT OR 0.07 GAL./S.Y. TACK COAT. ALL MATERIALS ARE TO BE IN ACCORDANCE WITH SECTION 405 OF THE ALA. HIGHWAY DEPT. SPECIFICATIONS
- ④ 10" LAYER OF DENSE GRADED LIMESTONE BASE COURSE LAID AND COMPACTED IN 5" LIFTS, ALA. HIGHWAY DEPT., REF. 301 OF SPECIFICATIONS, ALL MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 825, TYPE "B", COMPACTION TO 100% PROCTOR DENSITY



PAVEMENT SECTION

NOTE

SEE PART 2 OF 3 OF THE STANDARD SPECIFICATIONS FOR REQUIREMENTS.

REVISIONS

DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

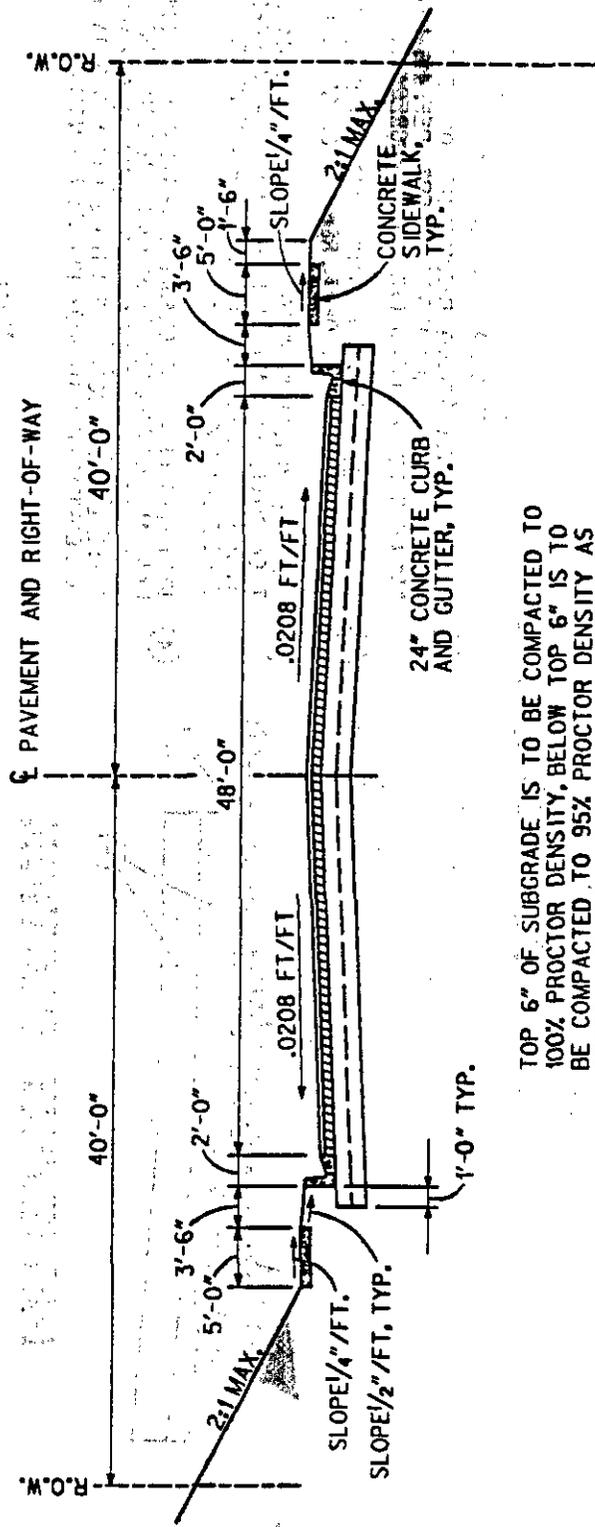
TYPICAL SECTION
MINOR ARTERIAL STREET
(120' R.O.W.)

DIRECTOR

DATE

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

ST-251
DRAWING NO.

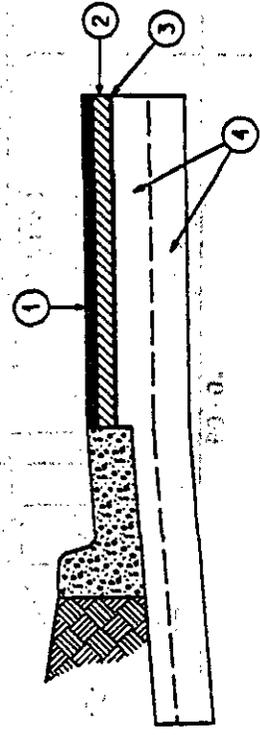


TOP 6" OF SUBGRADE IS TO BE COMPACTED TO 100% PROCTOR DENSITY, BELOW TOP 6" IS TO BE COMPACTED TO 95% PROCTOR DENSITY AS DETERMINED BY AASHTO T-99 COMPACTION TEST. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

FULL SECTION

MINIMUM REQUIREMENTS

- ① 168 LBS./S.Y. (1 1/2") HOT BITUMINOUS CONCRETE WEARING COURSE, ALA. HIGHWAY DEPT., REF. 416 MIX "A" OF SPECIFICATIONS (SILICEOUS AGGREGATE)
- ② 280 LBS./S.Y. (2 1/2") HOT BITUMINOUS CONCRETE BINDER COURSE, ALA. HIGHWAY DEPT., REF. 414 OF SPECIFICATIONS
- ③ 0.10 GAL./S.Y. EMULSIFIED ASPHALT OR 0.07 GAL./S.Y. TACK COAT. ALL MATERIALS ARE TO BE IN ACCORDANCE WITH SECTION 405 OF THE ALA. HIGHWAY DEPT. SPECIFICATIONS
- ④ 10" LAYER OF DENSE GRADED LIMESTONE BASE COURSE LAID AND COMPACTED IN 5" LIFTS, ALA. HIGHWAY DEPT., REF. 301 OF SPECIFICATIONS. ALL MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 825, TYPE "B", COMPACTION TO 100% PROCTOR DENSITY



PAVEMENT SECTION

NOTE
SEE PART 2 OF 3 OF THE STANDARD SPECIFICATIONS FOR REQUIREMENTS.

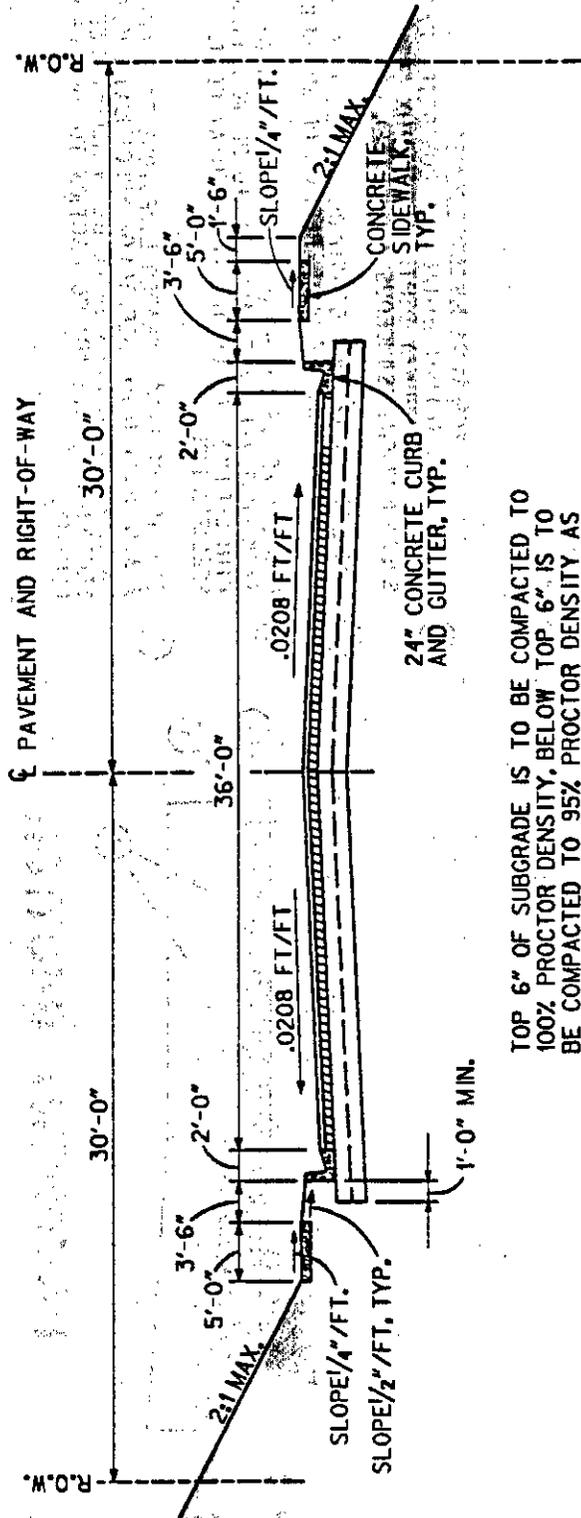
REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE

TYPICAL SECTION
MAJOR COLLECTOR STREET
(80' R.O.W.)

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

ST-252
DRAWING NO.

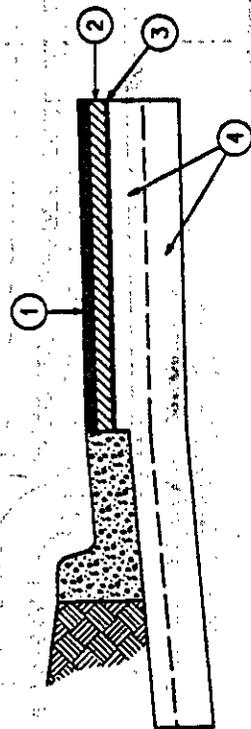


TOP 6" OF SUBGRADE IS TO BE COMPACTED TO 100% PROCTOR DENSITY, BELOW TOP 6" IS TO BE COMPACTED TO 95% PROCTOR DENSITY AS DETERMINED BY AASHTO T-99 COMPACTION TEST. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

FULL SECTION

MINIMUM REQUIREMENTS

- ① 168 LBS./S.Y. (1/2") HOT BITUMINOUS CONCRETE WEARING COURSE, ALA. HIGHWAY DEPT., REF. 416 MIX "A" OF SPECIFICATIONS (SILICEOUS AGGREGATE)
- ② 280 LBS./S.Y. (2 1/2") HOT BITUMINOUS CONCRETE BINDER COURSE, ALA. HIGHWAY DEPT., REF. 414 OF SPECIFICATIONS
- ③ 0.10 GAL./S.Y. EMULSIFIED ASPHALT OR 0.07 GAL./S.Y. TACK COAT. ALL MATERIALS ARE TO BE IN ACCORDANCE WITH SECTION 405 OF THE ALA. HIGHWAY DEPT. SPECIFICATIONS
- ④ 10" LAYER OF DENSE GRADED LIMESTONE BASE COURSE LAID AND COMPACTED IN 5" LIFTS, ALA. HIGHWAY DEPT., REF. 301 OF SPECIFICATIONS, ALL MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 825, TYPE "B", COMPACTION TO 100% PROCTOR DENSITY



NOTE

SEE PART 2 OF 3 OF THE STANDARD SPECIFICATIONS FOR REQUIREMENTS.

REVISIONS

DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

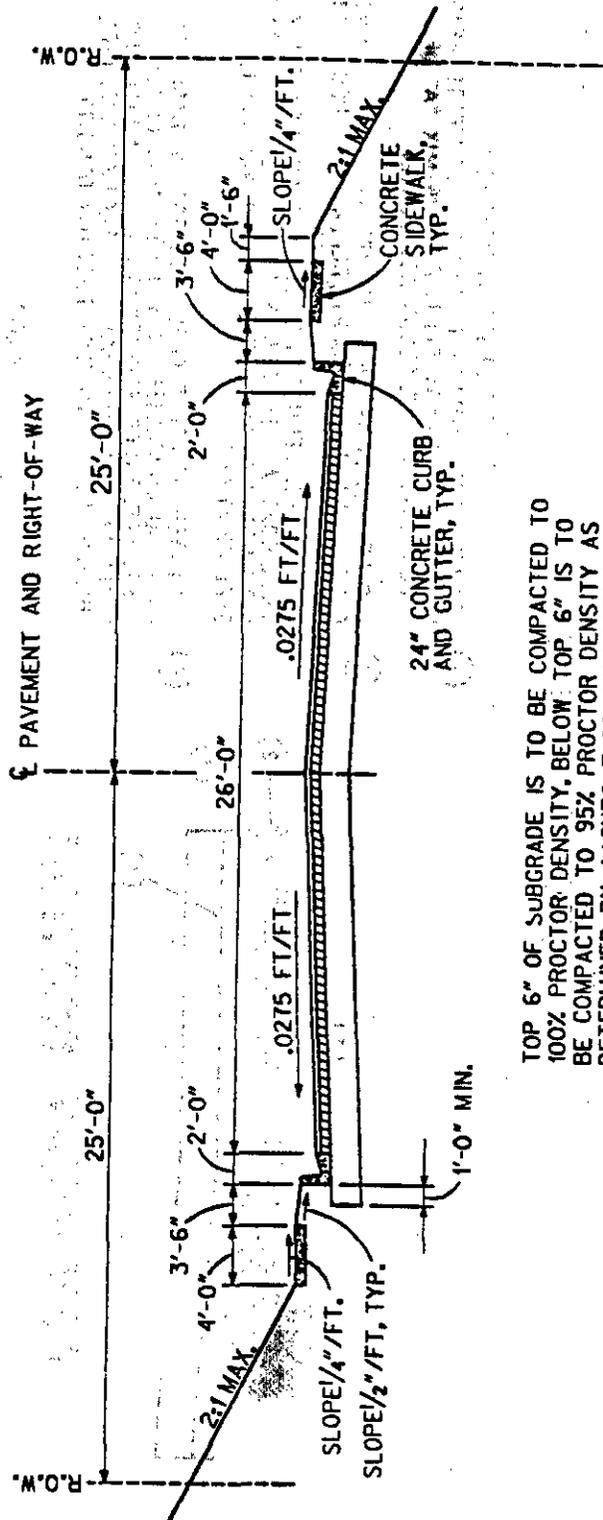
TYPICAL SECTION
MINOR COLLECTOR STREET
(60' R.O.W.)

DIRECTOR

DATE

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

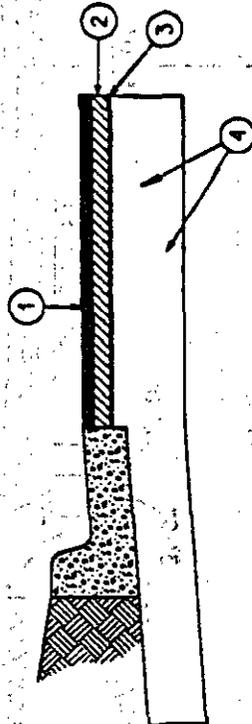
ST-253
DRAWING NO.



TOP 6" OF SUBGRADE IS TO BE COMPACTED TO 100% PROCTOR DENSITY, BELOW TOP 6" IS TO BE COMPACTED TO 95% PROCTOR DENSITY AS DETERMINED BY AASHTO T-99 COMPACTION TEST. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

FULL SECTION

- MINIMUM REQUIREMENTS**
- ① 112 LBS./S.Y. (1") HOT BITUMINOUS CONCRETE WEARING COURSE, ALA. HIGHWAY DEPT., REF. 416 MIX "A" OF SPECIFICATIONS (SILICEOUS AGGREGATE).
 - ② 224 LBS./S.Y. (2") HOT BITUMINOUS CONCRETE BINDER COURSE, ALA. HIGHWAY DEPT., REF. 414 OF SPECIFICATIONS.
 - ③ 0.10 GAL./S.Y. EMULSIFIED ASPHALT OR 0.07 GAL./S.Y. TACK COAT. ALL MATERIALS ARE TO BE IN ACCORDANCE WITH SECTION 405 OF THE ALA. HIGHWAY DEPT. SPECIFICATIONS.
 - ④ 5" LAYER OF DENSE GRADED LIMESTONE BASE COURSE, ALA. HIGHWAY DEPT., REF. 301 OF SPECIFICATIONS, ALL MATERIALS MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 825, TYPE "B", COMPACTION TO 100% PROCTOR DENSITY.



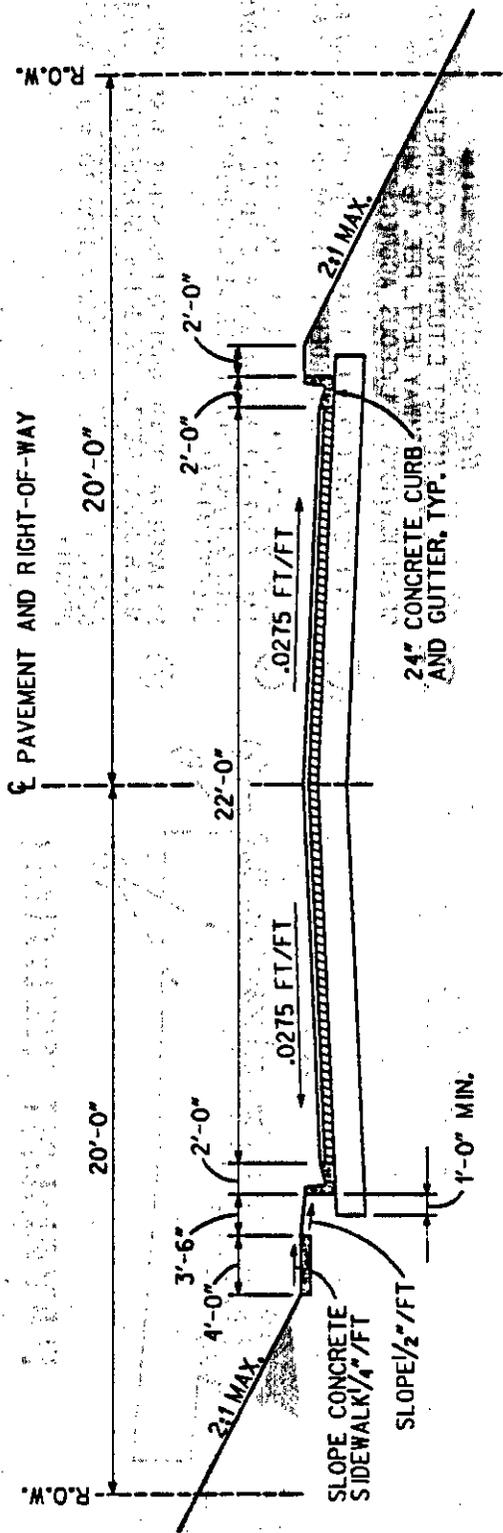
PAVEMENT SECTION

NOTE

SEE PART 2 OF 3 OF THE STANDARD SPECIFICATIONS FOR REQUIREMENTS.

REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

CITY OF HUNTSVILLE	
TYPICAL SECTION LOCAL STREET (50' R.O.W.)	
ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	ST-254 DRAWING NO.

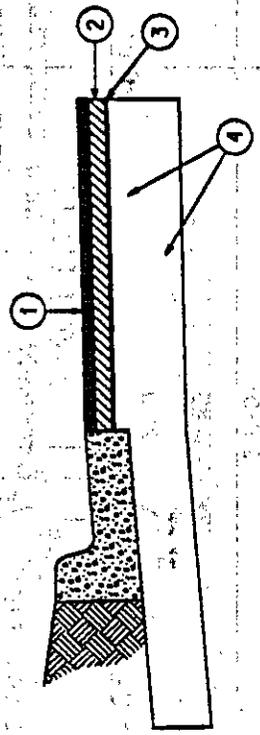


TOP 6" OF SUBGRADE IS TO BE COMPACTED TO 100% PROCTOR DENSITY, BELOW TOP 6" IS TO BE COMPACTED TO 95% PROCTOR DENSITY AS DETERMINED BY AASHTO T-99 COMPACTION TEST. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

FULL SECTION

MINIMUM REQUIREMENTS

- ① 112 LBS./S.Y. (1") HOT BITUMINOUS CONCRETE WEARING COURSE, ALA. HIGHWAY DEPT., REF. 416 MIX "A" OF SPECIFICATIONS (SILICEOUS AGGREGATE).
- ② 224 LBS./S.Y. (2") HOT BITUMINOUS CONCRETE BINDER COURSE, ALA. HIGHWAY DEPT., REF. 414 OF SPECIFICATIONS.
- ③ 0.10 GAL./S.Y. EMULSIFIED ASPHALT OR 0.07 GAL./S.Y. TACK COAT. ALL MATERIALS ARE TO BE IN ACCORDANCE WITH SECTION 405 OF THE ALA. HIGHWAY DEPT. SPECIFICATIONS.
- ④ 5" LAYER OF DENSE GRADED LIMESTONE BASE COURSE, ALA. HIGHWAY DEPT., REF. 301 OF SPECIFICATIONS, ALL MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 825, TYPE "B", COMPACTION TO 100% PROCTOR DENSITY.



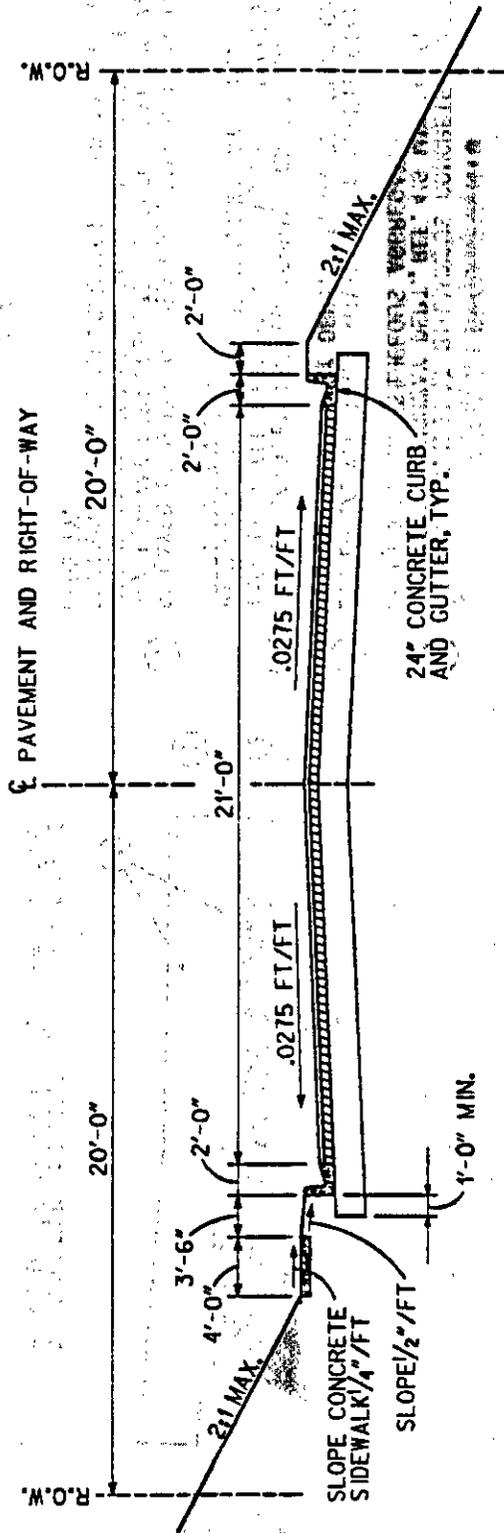
PAVEMENT SECTION

NOTE

SEE PART 2 OF 3 OF THE STANDARD SPECIFICATIONS FOR REQUIREMENTS.

REVISIONS		
DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE	
TYPICAL SECTION MOUNTAIN SIDE STREET (40' R.O.W.)	
ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	ST-255 DRAWING NO.

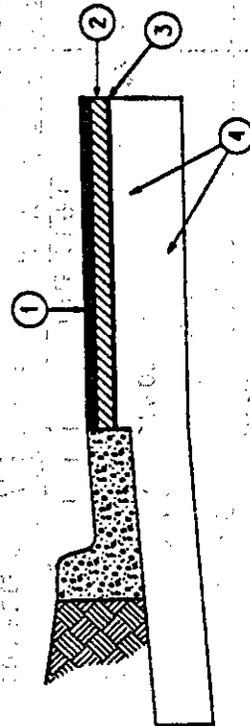


TOP 6" OF SUBGRADE IS TO BE COMPACTED TO 100% PROCTOR DENSITY, BELOW TOP 6" IS TO BE COMPACTED TO 95% PROCTOR DENSITY AS DETERMINED BY AASHTO T-99 COMPACTION TEST. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.

FULL SECTION

MINIMUM REQUIREMENTS

- ① 112 LBS./S.Y. (1") HOT BITUMINOUS CONCRETE WEARING COURSE, ALA. HIGHWAY DEPT., REF. 416 MIX "A" OF SPECIFICATIONS (SILICEOUS AGGREGATE).
- ② 224 LBS./S.Y. (2") HOT BITUMINOUS CONCRETE BINDER COURSE, ALA. HIGHWAY DEPT., REF. 414 OF SPECIFICATIONS.
- ③ 0.10 GAL./S.Y. EMULSIFIED ASPHALT OR 0.07 GAL./S.Y. TACK COAT. ALL MATERIALS ARE TO BE IN ACCORDANCE WITH SECTION 405 OF THE ALA. HIGHWAY DEPT. SPECIFICATIONS.
- ④ 5" LAYER OF DENSE GRADED LIMESTONE BASE COURSE, ALA. HIGHWAY DEPT., REF. 301 OF SPECIFICATIONS. ALL MATERIALS MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 825, TYPE "B", COMPACTION TO 100% PROCTOR DENSITY.



PAVEMENT SECTION

NOTE

SEE PART 2 OF 3 OF THE STANDARD SPECIFICATIONS FOR REQUIREMENTS.

REVISIONS

DESCRIPTION	NAME	DATE

CITY OF HUNTSVILLE

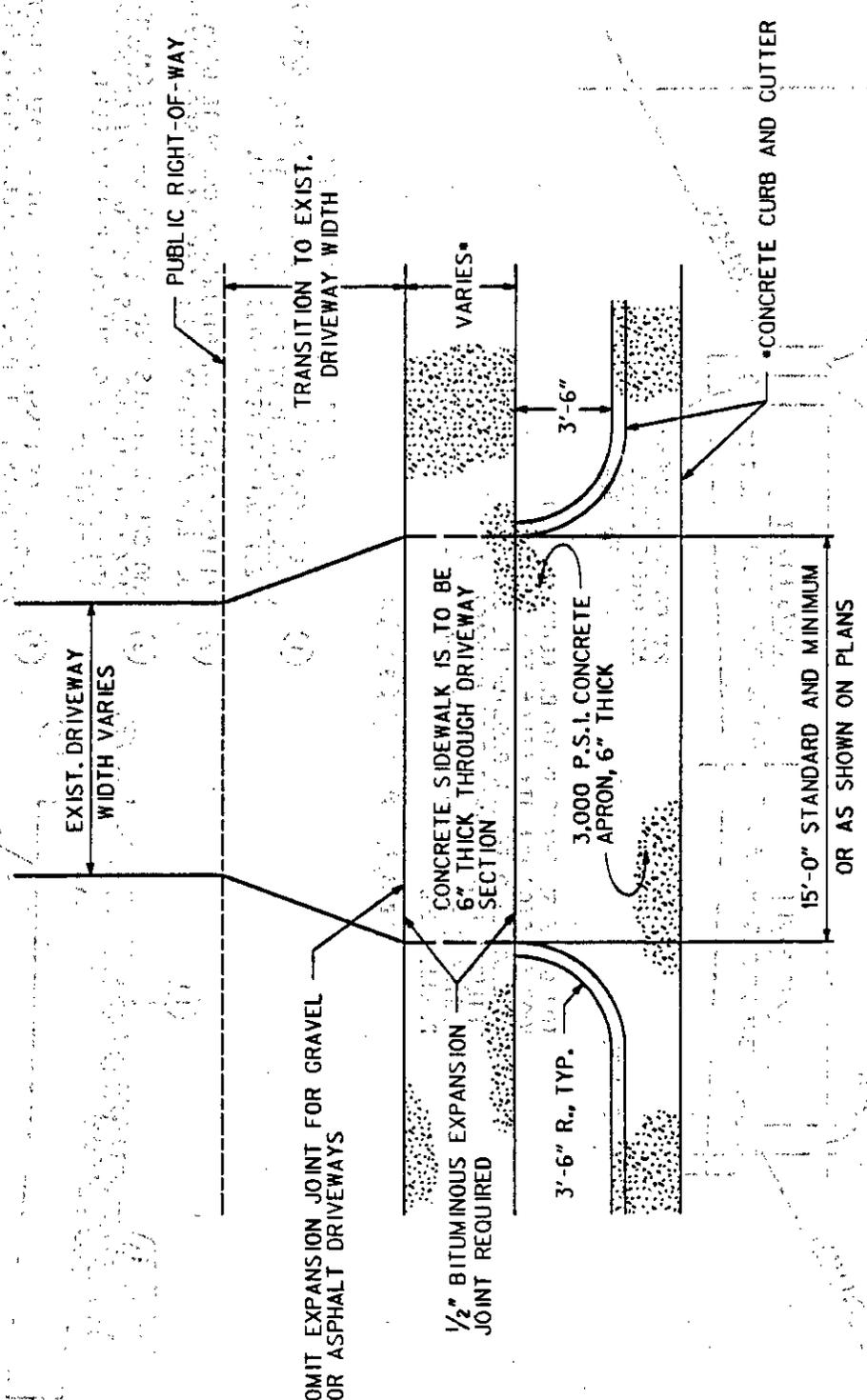
TYPICAL SECTION
MARGINAL ACCESS STREET
(40' R.O.W.)

DIRECTOR

DATE

ENGINEER OF PUBLIC WORKS
CITY OF HUNTSVILLE, ALABAMA

ST-256
DRAWING NO.



REVISIONS		
DESCRIPTION	NAME	DATE
DIRECTOR		DATE

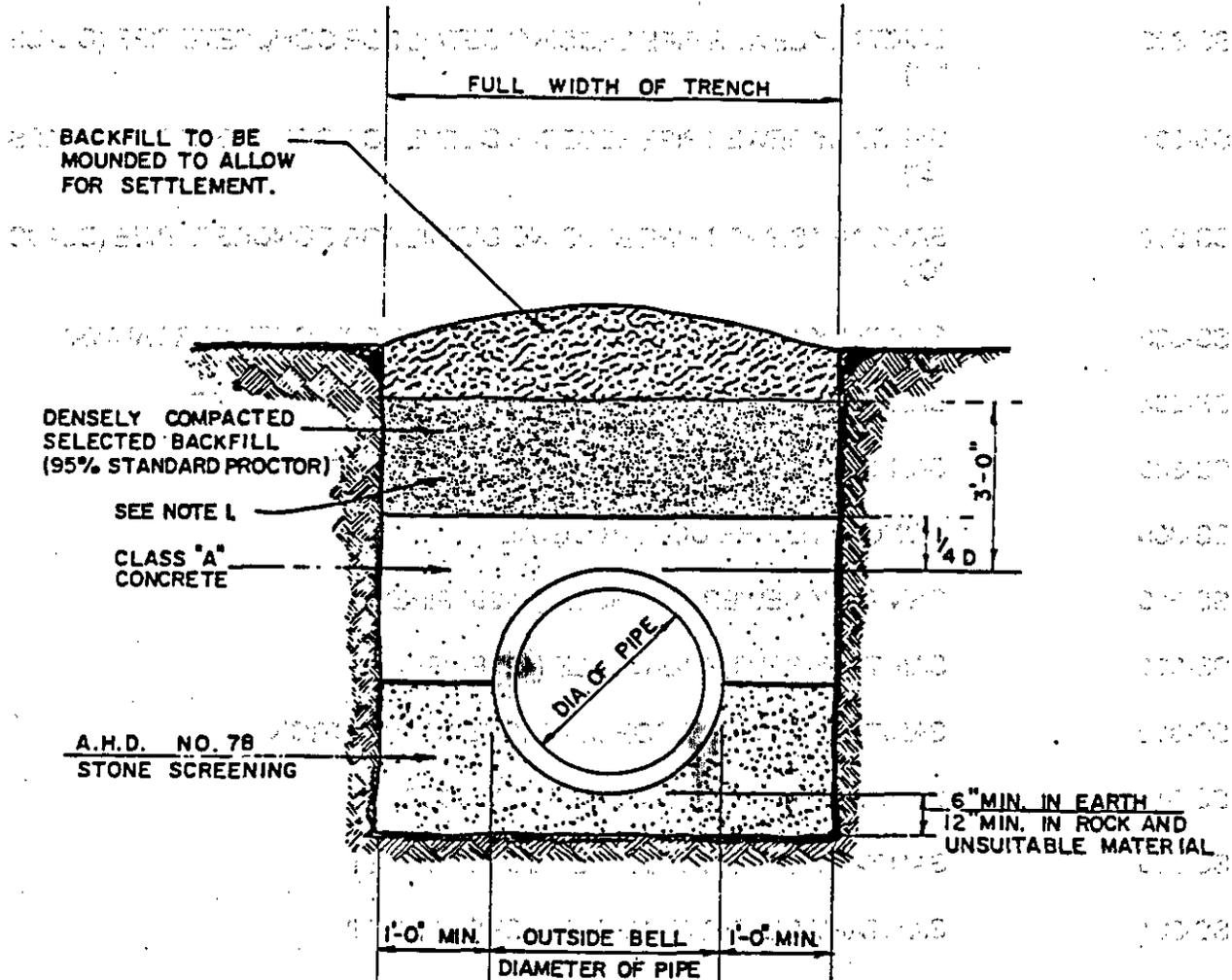
CITY OF HUNTSVILLE

DETAIL FOR
TYPICAL DRIVEWAY TURNOUT

ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	ST-260 DRAWING NO.
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SANITARY SEWER DETAILS

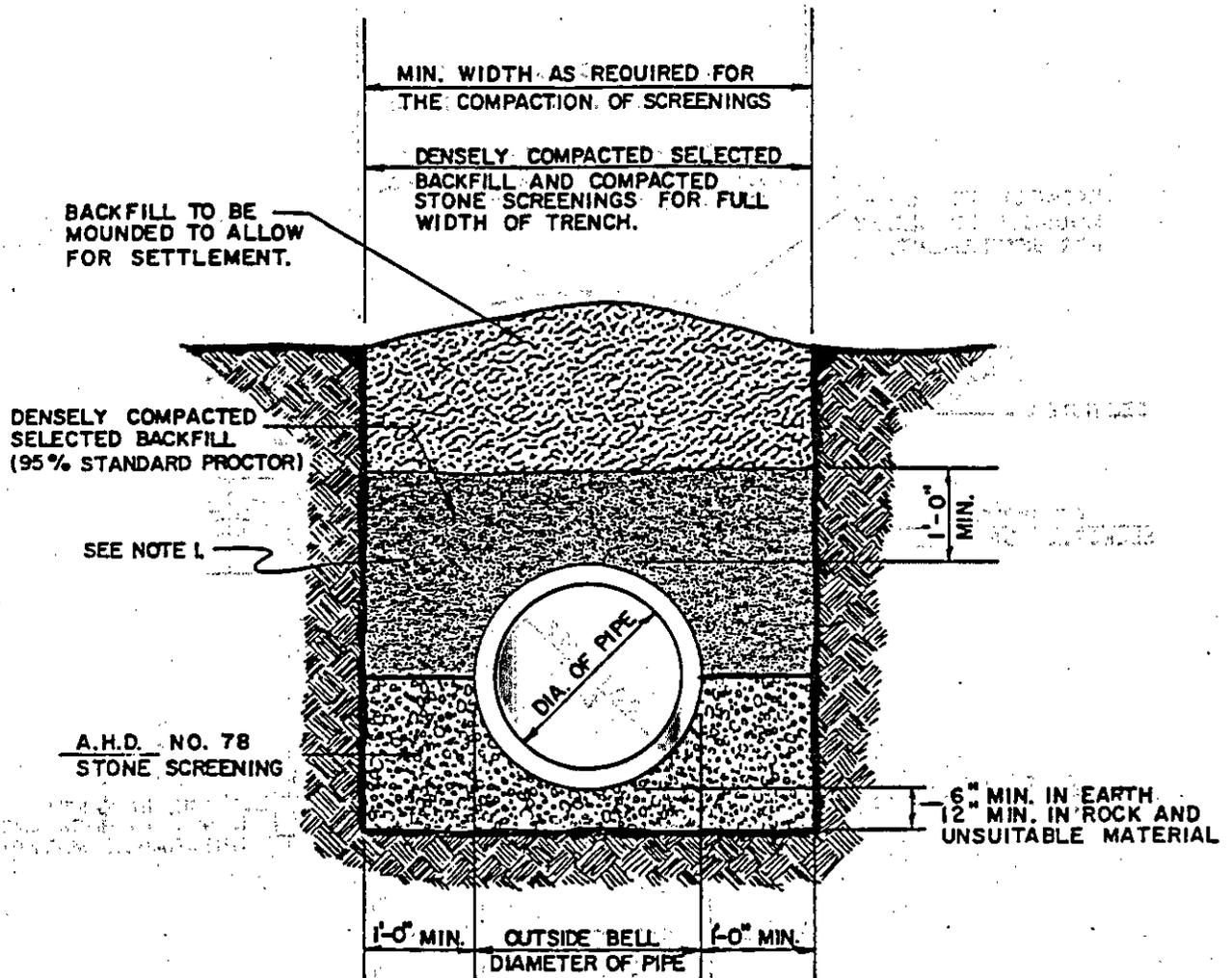
- SS-300 SANITARY SEWER PIPE BEDDING DETAIL FOR CONCRETE PIPE (CLASS "A")
- SS-301 SANITARY SEWER PIPE BEDDING DETAIL FOR CONCRETE PIPE (CLASS "B")
- SS-302 SANITARY SEWER PIPE BEDDING DETAIL FOR CONCRETE PIPE (CLASS "C")
- SS-303 SANITARY AND STORM SEWER BEDDING FOR CUTS IN ROADWAY
- SS-304 SANITARY SEWER PIPE BEDDING DETAIL FOR PVC PIPE
- SS-305 SANITARY SEWER PIPE BEDDING DETAIL FOR DUCTILE IRON PIPE
- SS-306 CONCRETE PIPE COLLAR DETAIL
- SS-310 SANITARY SEWER MANHOLE (6"-36" PIPE)
- SS-311 SANITARY SEWER MANHOLE (42" PIPE)
- SS-312 SANITARY SEWER DROP MANHOLE CONNECTION
- SS-313 SANITARY SEWER JUNCTION MANHOLE
- SS-320 SANITARY SEWER MANHOLE COVER TYPE I
- SS-321 SANITARY SEWER MANHOLE COVER TYPE II
- SS-330 SANITARY SEWER STEPS



(CLASS 'A')
SANITARY SEWER PIPE BEDDING
DETAIL FOR CONC. PIPE

NOTE:
 1. IN TRAFFIC AREAS USE CRUSHED STONE, DENSE GRADED BASE OR APPROVED CLASS I BACKFILL COMPACTED IN 6" LAYERS TO 95% STANDARD PROCTOR DENSITY UP TO WHERE STREET SUBGRADE REQUIREMENTS DICTATE.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR SANITARY SEWER PIPE BEDDING FOR CONCRETE PIPE (CLASS A)	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	SS-300 DRAWING NO.

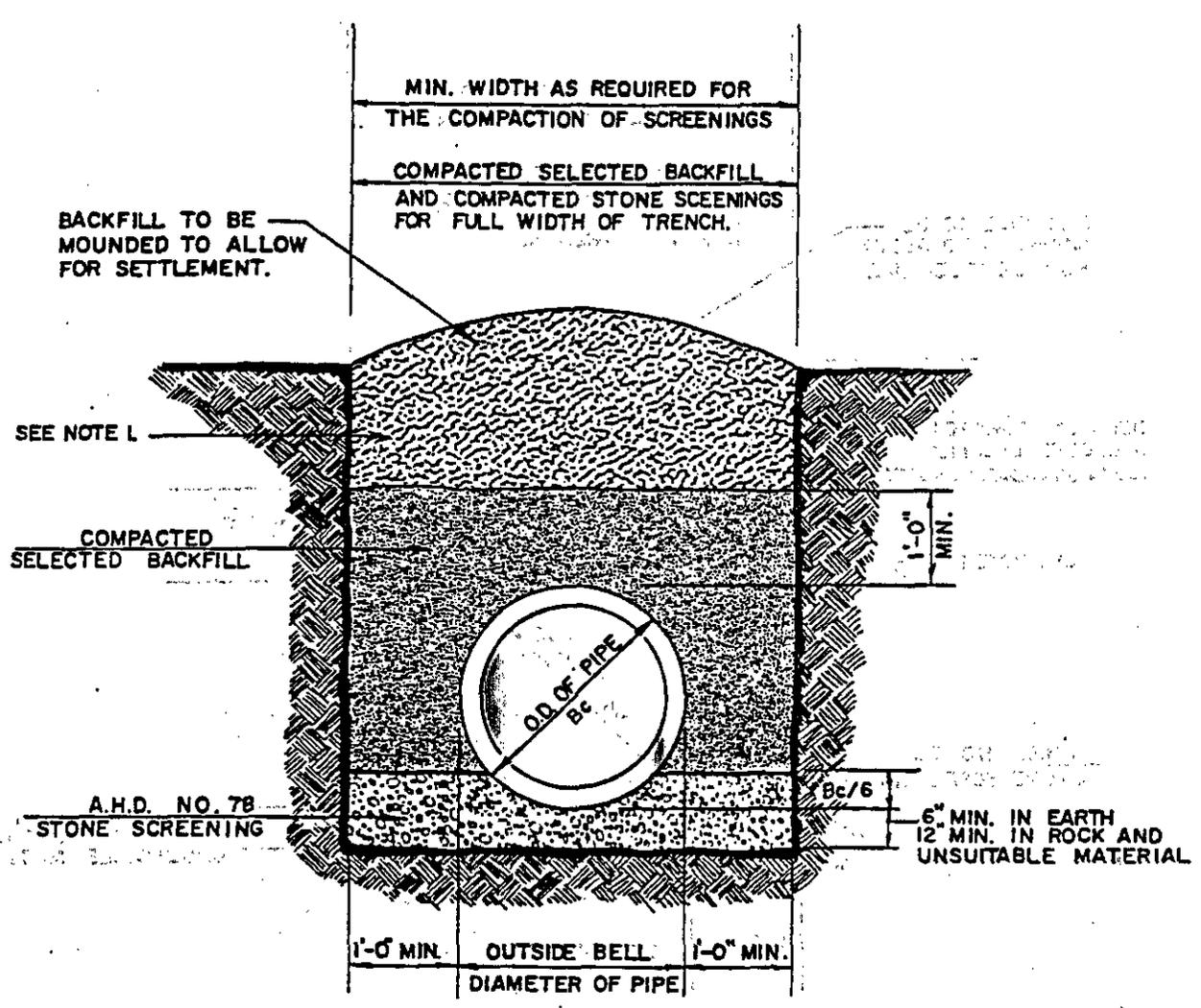


(CLASS 'B')

SANITARY SEWER PIPE BEDDING DETAIL FOR CONCRETE PIPE

NOTE:
 1. IN TRAFFIC AREAS USE CRUSHED STONE, DENSE GRADED BASE OR APPROVED CLASS I BACKFILL COMPACTED IN 6" LAYERS TO 95% STANDARD PROCTOR DENSITY UP TO WHERE STREET SUBGRADE REQUIREMENTS DICTATE.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR	
			SANITARY SEWER PIPE BEDDING FOR	
			CONCRETE PIPE (CLASS B)	
			ENGINEER OF PUBLIC WORKS	SS-301
DIRECTOR		DATE	CITY OF HUNTSVILLE, ALABAMA	DRAWING NO.

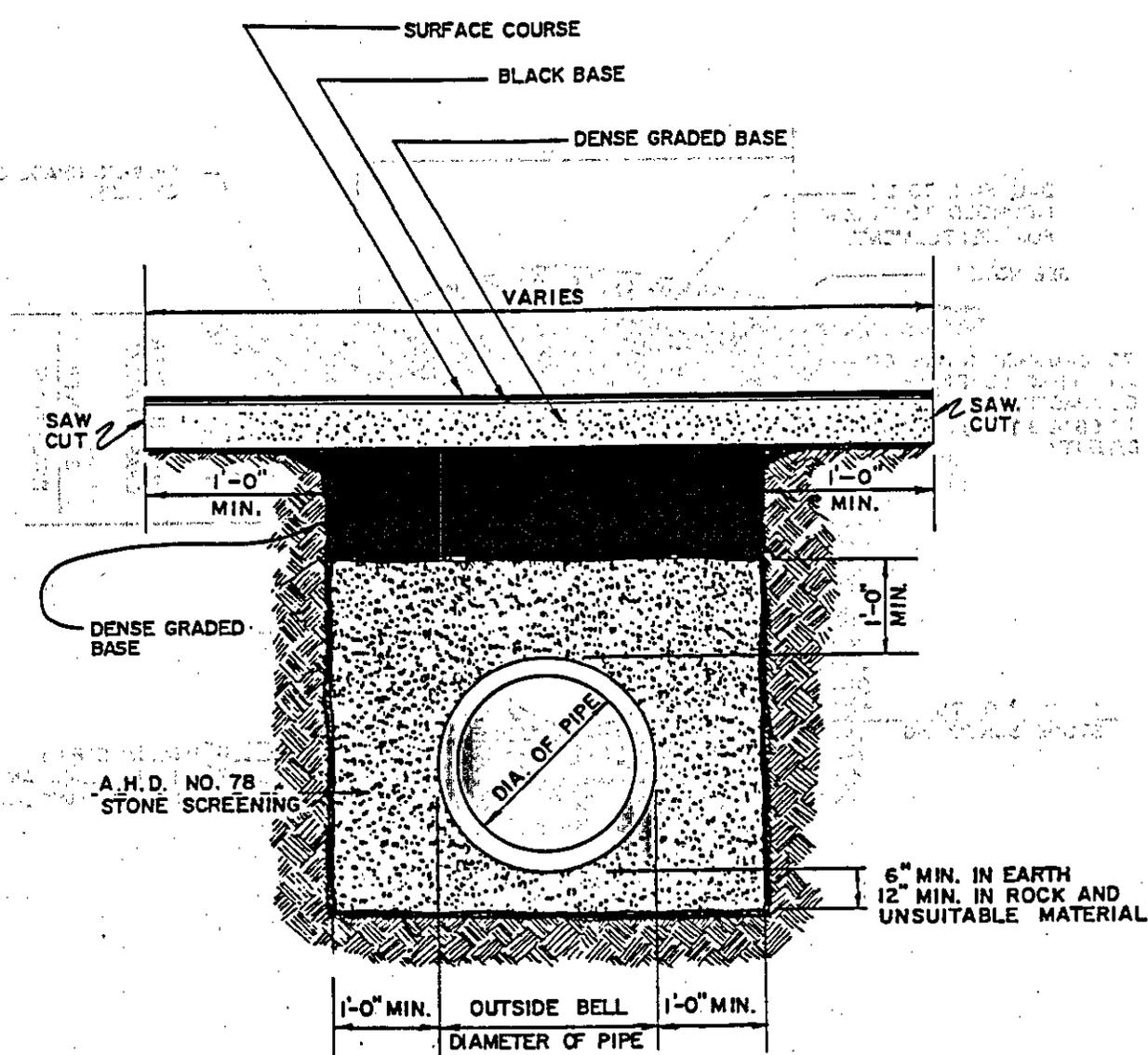


(CLASS 'C')

SANITARY SEWER PIPE BEDDING DETAIL FOR CONCRETE PIPE

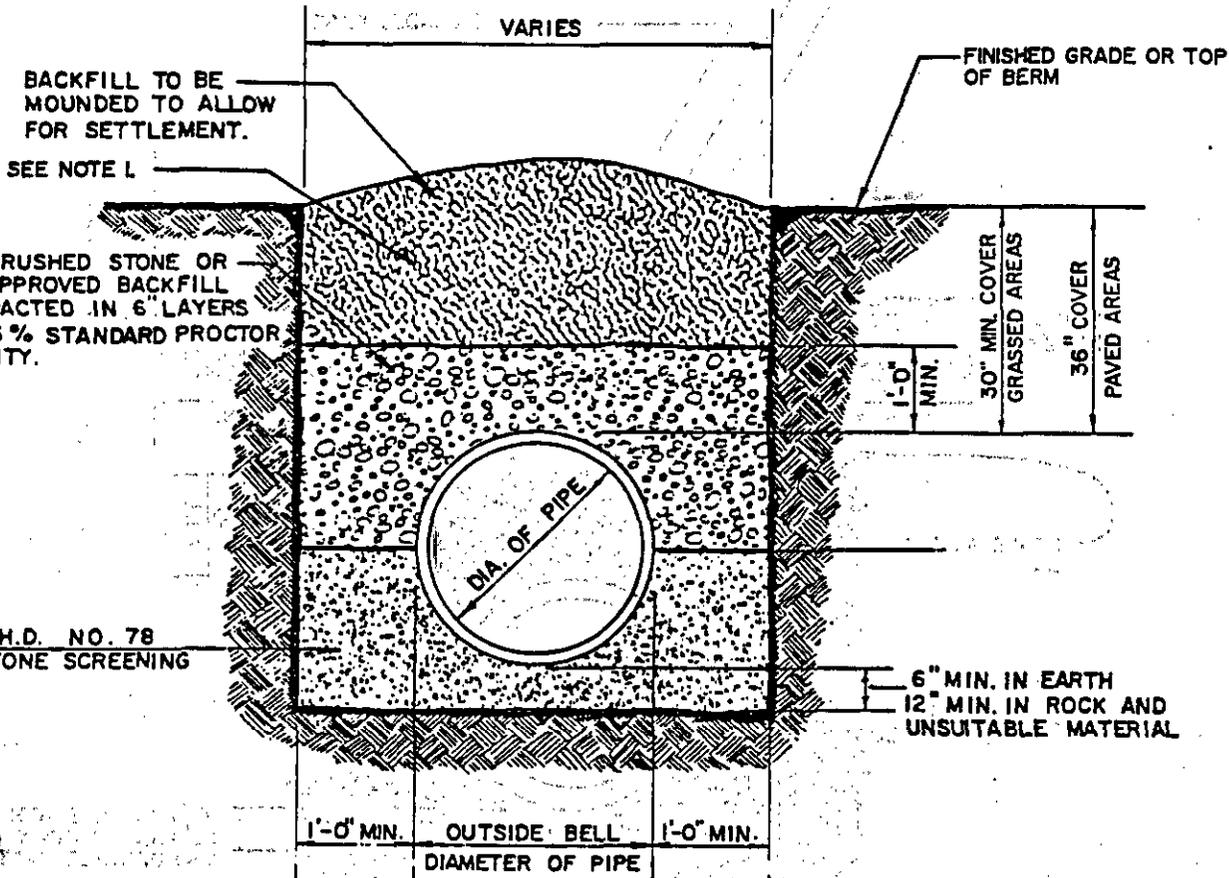
NOTE:
 1. IN TRAFFIC AREAS USE CRUSHED STONE, DENSE GRADED BASE OR APPROVED CLASS 1 BACKFILL COMPACTED IN 6" LAYERS TO 95% STANDARD PROCTOR DENSITY UP TO WHERE STREET SUBGRADE REQUIREMENTS DICTATE.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR SANITARY SEWER PIPE BEDDING FOR CONCRETE PIPE (CLASS C)	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	SS-302 DRAWING NO.



SANITARY AND STORM SEWER PIPE BEDDING FOR CUTS IN ROADWAYS

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR SANITARY & STORM SEWER BEDDING FOR CUTS IN ROADWAY	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	SS-303 DRAWING NO.



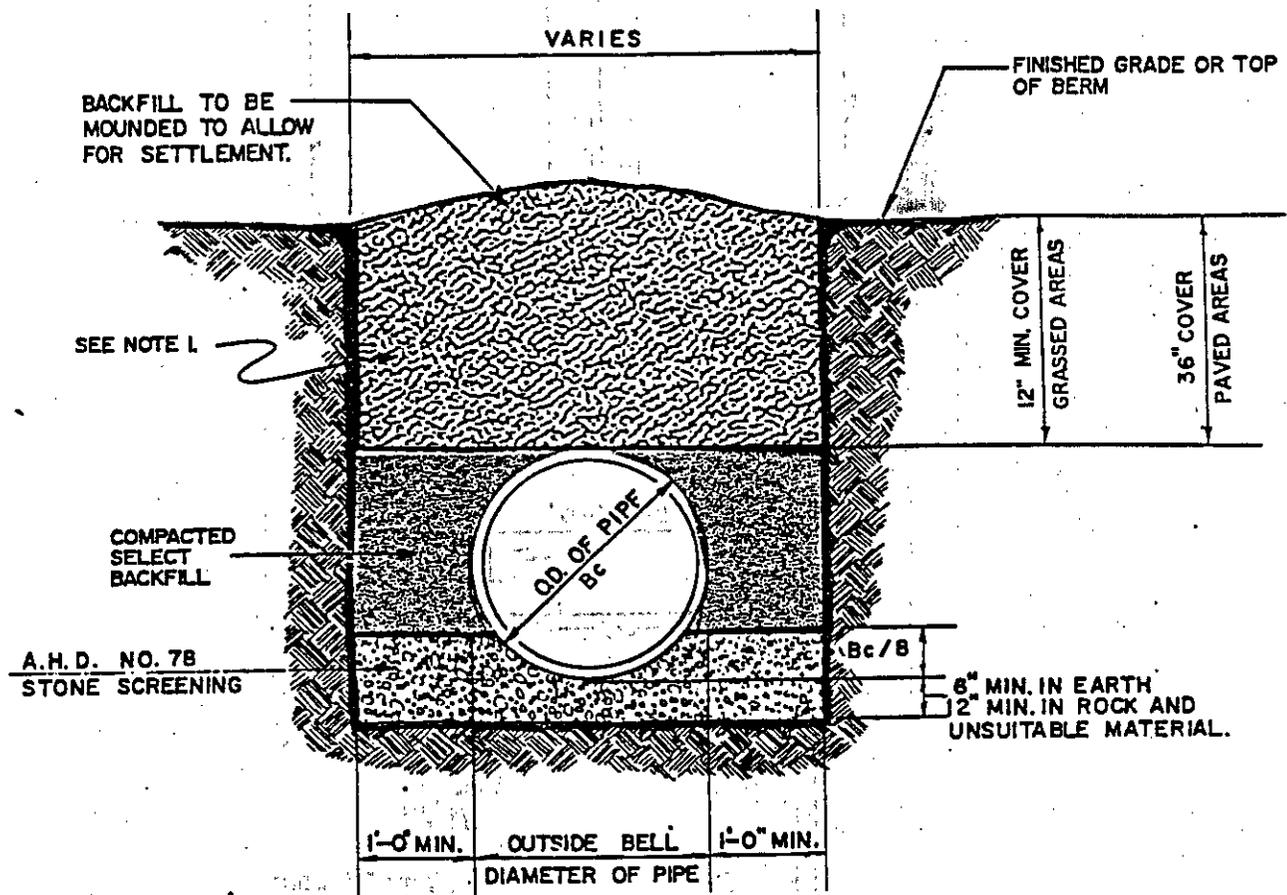
SANITARY SEWER PIPE BEDDING DETAIL FOR PVC PIPE

NOTE:

- I. IN TRAFFIC AREAS USE CRUSHED STONE, DENSE GRADED BASE OR APPROVED CLASS I BACKFILL COMPACTED IN 6" LAYERS TO 95% STANDARD PROCTOR DENSITY UP TO WHERE STREET SUBGRADE REQUIREMENTS DICTATE.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR SANITARY SEWER PIPE BEDDING FOR P.V.C. PIPE	
DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	SS-304 DRAWING NO.	

THESE DRAWINGS ARE THE PROPERTY OF THE CITY OF HUNTSVILLE, ALABAMA. THEY ARE TO BE USED ONLY FOR THE PROJECT AND AT THE LOCATION SPECIFIED THEREON. ANY REPRODUCTION OR USE OF THESE DRAWINGS FOR ANY OTHER PROJECT OR AT ANY OTHER LOCATION IS STRICTLY PROHIBITED. THE CITY OF HUNTSVILLE, ALABAMA, IS NOT RESPONSIBLE FOR ANY DAMAGE TO PERSONS OR PROPERTY CAUSED BY THE USE OF THESE DRAWINGS.



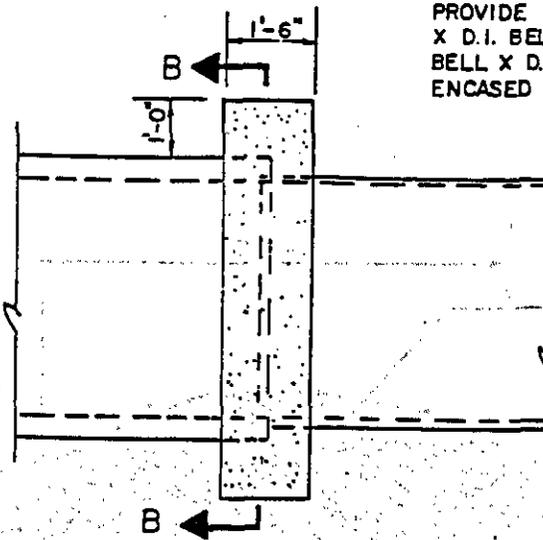
SANITARY SEWER PIPE BEDDING DETAIL FOR DUCTILE IRON PIPE

NOTE:

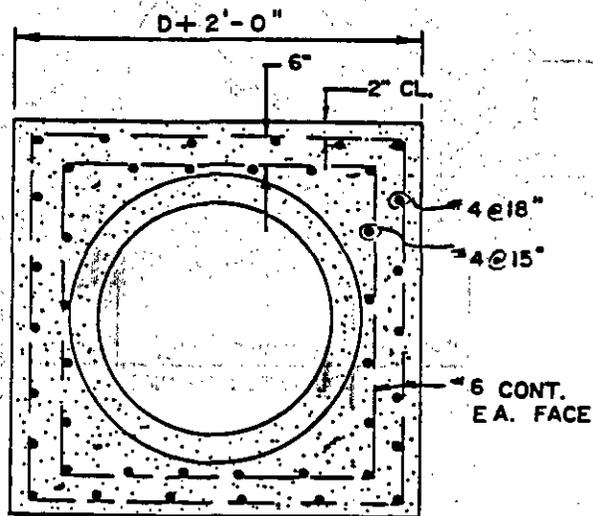
- I. IN TRAFFIC AREAS USE CRUSHED STONE, DENSE GRADED BASE OR APPROVED CLASS I BACKFILL COMPACTED IN 6" LAYERS TO 95% STANDARD PROCTOR DENSITY UP TO WHERE STREET SUBGRADE REQUIREMENTS DICTATE.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	DETAIL FOR	
			SANITARY SEWER PIPE BEDDING FOR	
			DUCTILE IRON PIPE	
			ENGINEER OF PUBLIC WORKS	
			CITY OF HUNTSVILLE, ALABAMA	
DIRECTOR		DATE	SS-305 DRAWING NO.	

PROVIDE FOR "AMSEAL" SPIGOT
X D.I. BELL ADAPTER OR "AMSEAL"
BELL X D.I. BELL ADAPTER AND
ENCASED IN CONCRETE AS SHOWN.



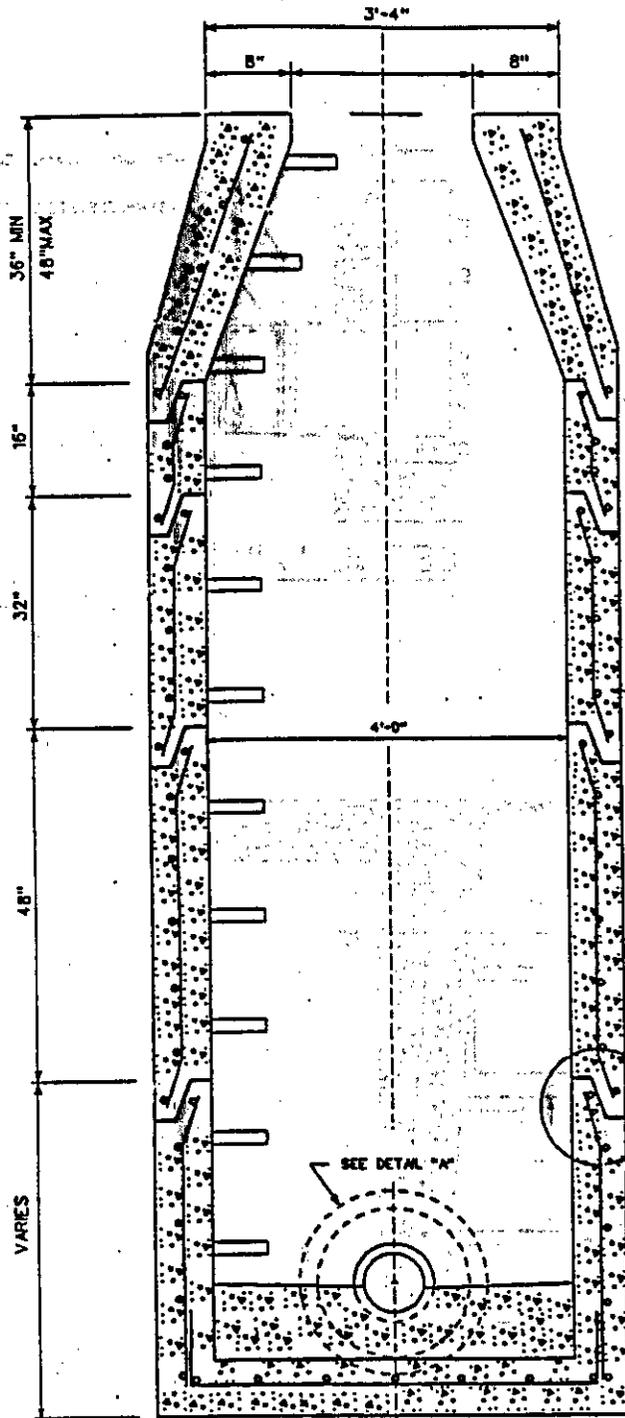
PLAN



SECTION B-B

CONCRETE PIPE COLLAR DETAIL

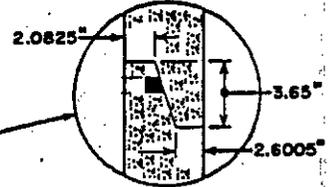
REVISIONS			CITY OF HUNTSVILLE
DESCRIPTION	NAME	DATE	
			DETAIL FOR CONCRETE PIPE COLLAR
			ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA
DIRECTOR		DATE	SS-306 DRAWING NO.



NOTES

1. FOR MANHOLE STEP DETAILS REFER TO STANDARD DWG. SS-330.
2. FOR ADDITIONAL DETAILS ON MANHOLES WITH 42" PIPES REFER TO STANDARD DWG. SS-311.
3. FOR RING AND COVER DETAIL REFER TO STANDARD DWG. SS-320 AND SS-321.

4000 P.S.I. CONCRETE
(28 DAY COMPRESSIVE STRENGTH)

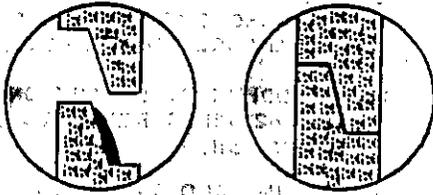


TYPICAL JOINT
(1" O" RING TYPE GASKET)

TYPICAL SECTION

(BASE SECTION FOR 6"-36" PIPE SHOWN)

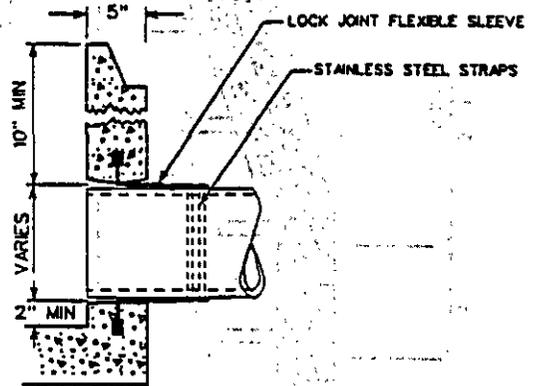
REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	STANDARD SANITARY MANHOLE DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	SS-310A DRAWING NO.



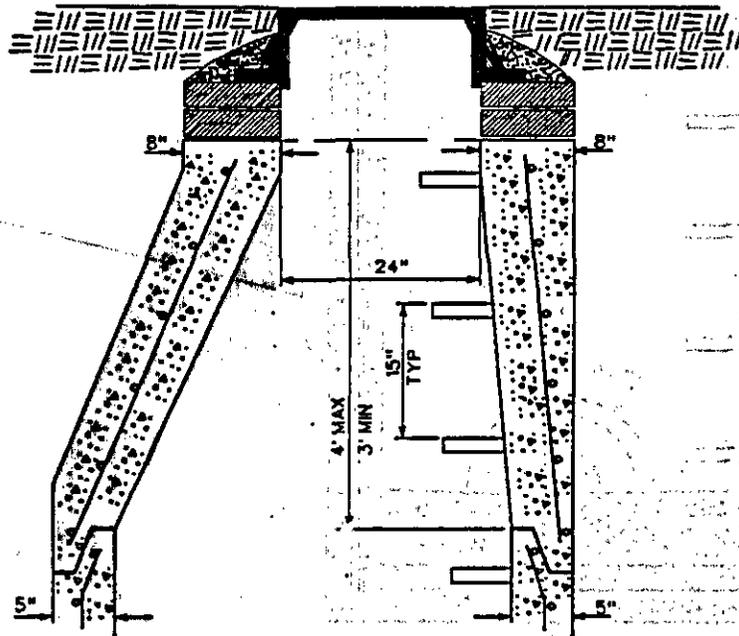
OPTIONAL JOINT METHOD
(BITUMINOUS SEALANT)

NOTE: ALL JOINTS SHALL BE OF SUCH DESIGN AS WILL PERMIT EFFECTIVE JOINING WITH NO LEAKAGE AND INFILTRATION AND TO PERMIT PLACEMENT WITHOUT APPRECIABLE IRREGULARITIES ON THE INTERIOR WALL

JOINT DETAIL



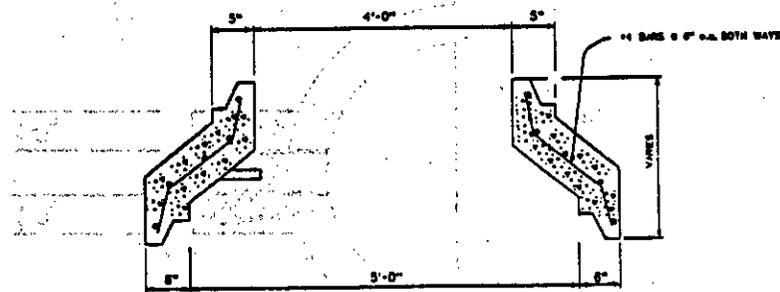
DETAIL "A"



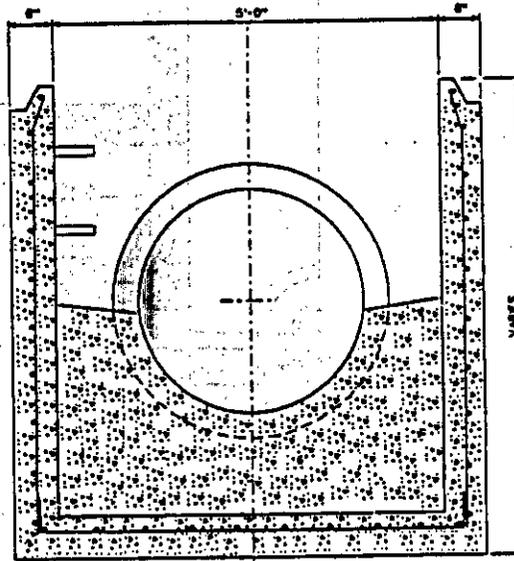
TOP SECTION

(ECCENTRIC)

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	STANDARD SANITARY	
			MANHOLE DETAIL	
DIRECTOR	DATE	ENGINEER OF PUBLIC WORKS	SS-310B	
		CITY OF HUNTSVILLE, ALABAMA	DRAWING NO.	



TRANSITION SECTION

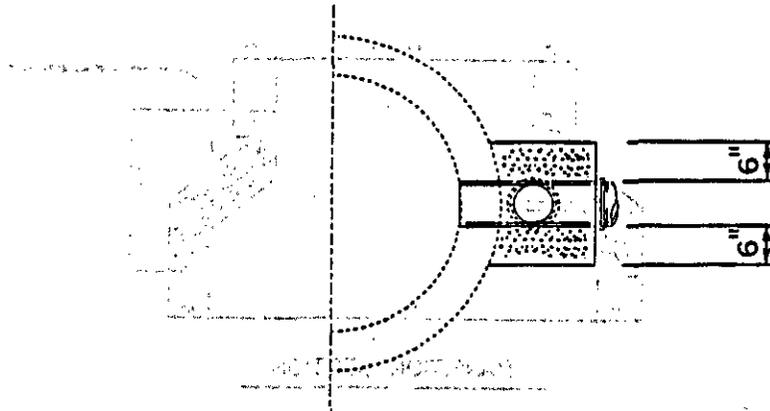


BASE SECTION FOR 42" PIPE

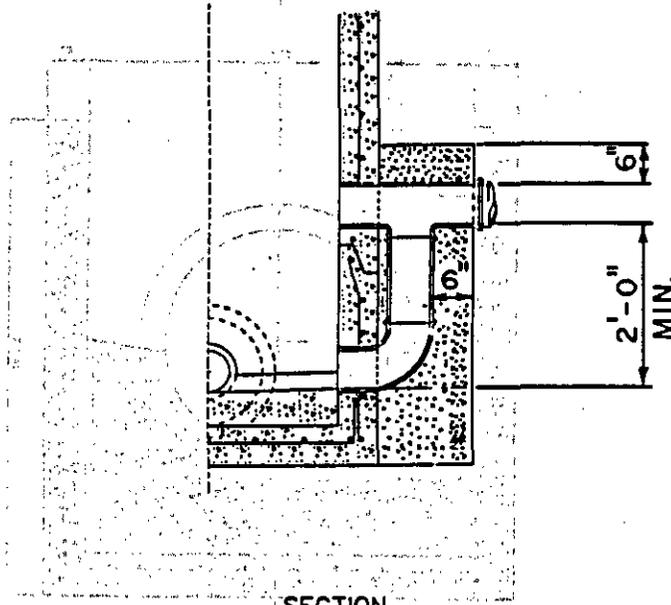
NOTES

1. FOR ADDITIONAL MANHOLE DETAILS REFER TO STANDARD DWG. SS-310.

REVISIONS			CITY OF HUNTSVILLE					
DESCRIPTION	NAME	DATE	MANHOLE BASE AND TRANSITION DETAIL FOR MANHOLES WITH 42" PIPE					
					ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA			
							SS-311 DRAWING NO.	
DIRECTOR		DATE						



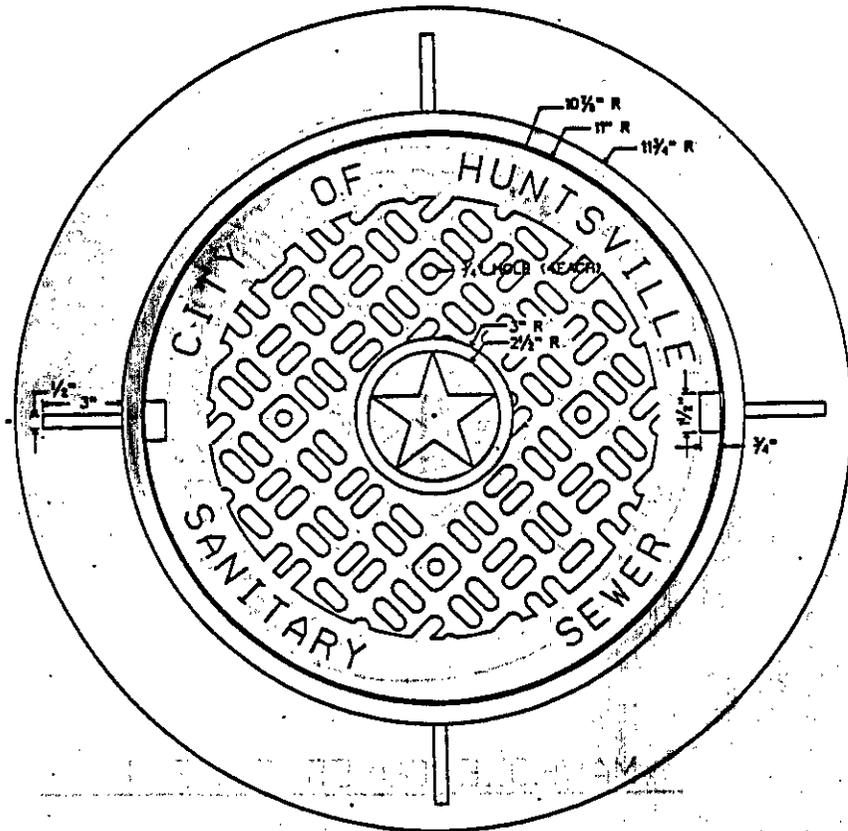
PLAN VIEW



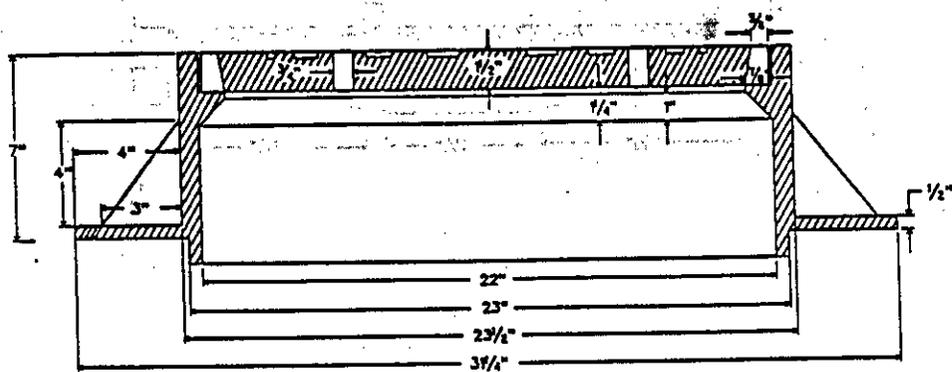
SECTION

NOT TO SCALE
 ALL DIMENSIONS UNLESS OTHERWISE SPECIFIED
 ALL DIMENSIONS IN FEET AND INCHES UNLESS OTHERWISE SPECIFIED

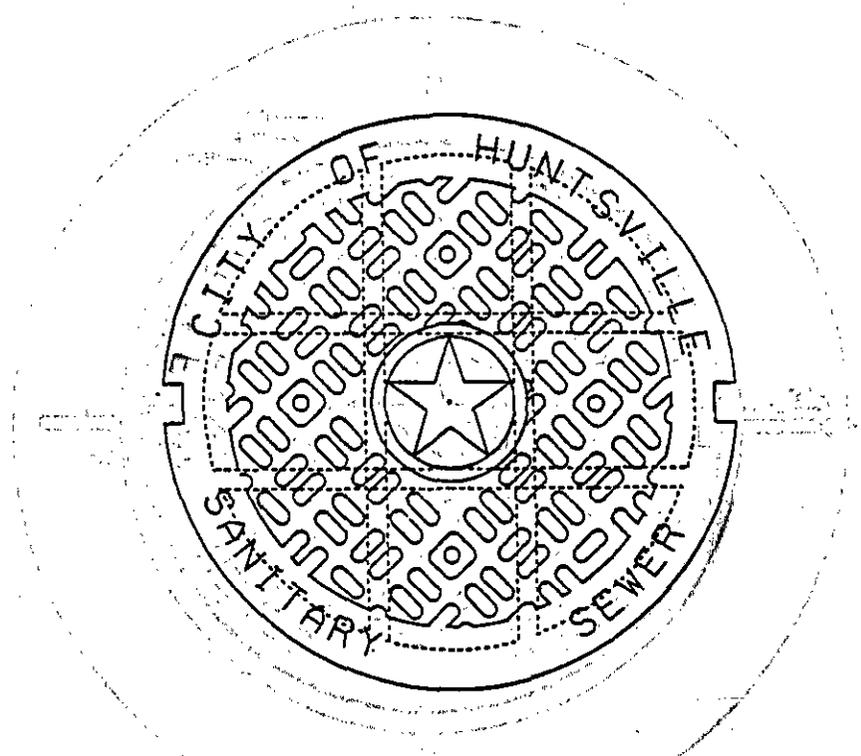
REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	SANITARY SEWER MANHOLE DROP CONNECTION DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	SS-312 DRAWING NO.



MANHOLE RING & COVER TYPE I

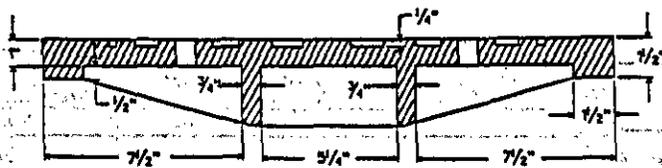


REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	NON TRAFFIC SANITARY SEWER MANHOLE TYPE I RING AND COVER DETAIL	
			ENGINEER OF PUBLIC WORKS	
			CITY OF HUNTSVILLE, ALABAMA	
DIRECTOR		DATE	SS-320 DRAWING NO.	

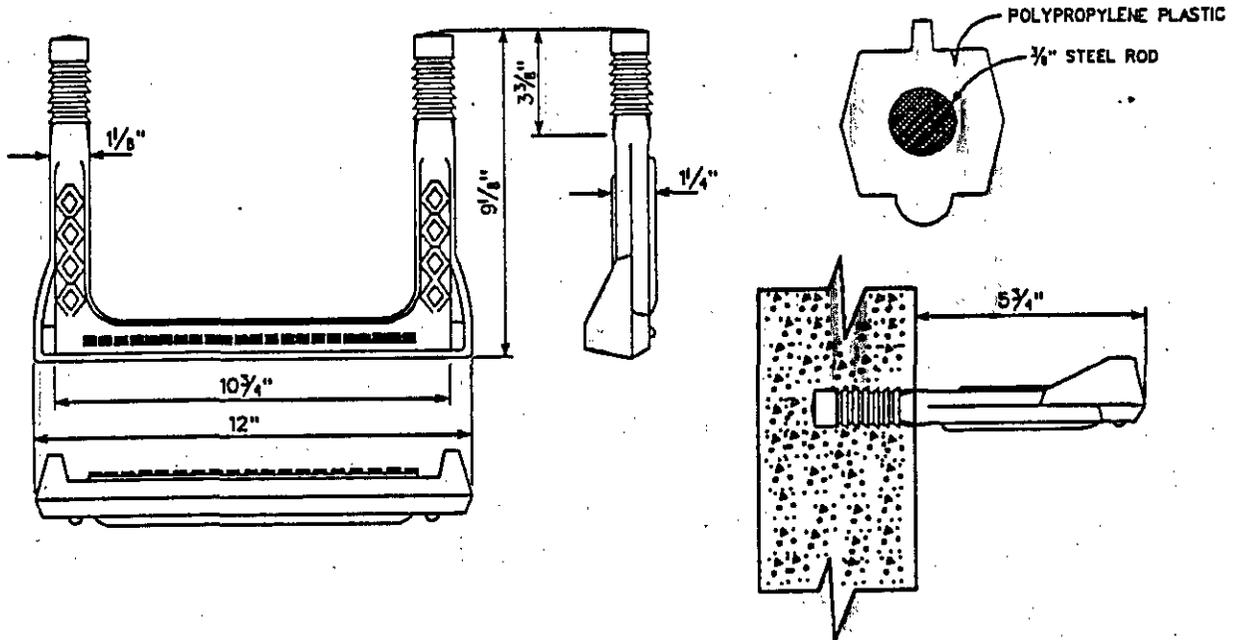


MANHOLE COVER TYPE II

NOTE: ALL DIMENSIONS NOT SHOWN SAME AS TYPE I



REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	TRAFFIC	
			SANITARY SEWER MANHOLE TYPE II	
			RING AND COVER DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	SS-321 DRAWING NO.



NOTE: MANHOLE STEPS SHALL BE MANUFACTURED FROM ALUMINUM OR POLYPROPYLENE PLASTIC REINFORCED WITH A 3/8" OR LARGER STEEL ROD. STEPS SHALL BE EMBEDDED IN THE RISER, BASE, AND TOP SECTIONS A MINIMUM OF 3" AT THE TIME OF CONSTRUCTION. MANHOLE STEPS SHALL BE A MINIMUM OF 10 3/4 INCHES WIDE AND EXTEND FROM THE MANHOLE WALL A MINIMUM OF 5 3/4 INCHES.

REVISIONS			CITY OF HUNTSVILLE	
DESCRIPTION	NAME	DATE	SANITARY SEWER MANHOLE STEP DETAIL	
DIRECTOR		DATE	ENGINEER OF PUBLIC WORKS CITY OF HUNTSVILLE, ALABAMA	SS-330 DRAWING NO.