

DEVELOPMENT REGULATIONS

City of Byram

ADOPTED BY THE

MAYOR AND BOARD OF ALDERMEN

PREAMBLE

ORDINANCE NO. _____

AN ORDINANCE REQUIRING SUBDIVISION PLATS AND ADOPTING DEVELOPMENT REGULATIONS FOR THE CITY OF BYRAM, MISSISSIPPI, AND PROVIDING FOR THE ADMINISTRATION AND ENFORCEMENT THEREOF.

WHEREAS, the statutes of the State of Mississippi, Sections 17-1-23 and 17-1-25 of the Mississippi Code of 1972, empower the City to enact development regulations and to provide for their administration, enforcement, and amendment; and

WHEREAS, the Mayor and Board of Aldermen deem it necessary, for the purpose of promoting the health, safety, and general welfare of the City, to enact such a regulation; and

WHEREAS, the Mayor and Board of Aldermen have prepared such regulations designed to set forth certain procedures, standards of design and specifications to be followed in the development or redevelopment of land and subdivisions in the City of Byram to assure that development of the City is orderly, healthful, efficient, and economical; therefore,

BE IT ORDAINED BY THE MAYOR AND BOARD OF ALDERMEN OF THE CITY OF BYRAM, MISSISSIPPI: That the following Development Regulations and Standards of Design and Specifications for Development are hereby adopted as an official Ordinance of the City of Byram, Mississippi.

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ARTICLE II
GENERAL

200. Title

200.01 These regulations shall be known as the “City of Byram Development Regulations” and may be so cited.

201. Purpose

201.01 These regulations have as their purpose and are designed to:

201.01-01 Establish procedures governing the development of land and the filing and approval of subdivision plats in the City of Byram.

201.01-02 Establish procedures for commercial development.

201.01-03 Establish minimum standards governing streets, utilities, and other required improvements as well as compliance with zoning ordinance.

201.01-04 Establish minimum standards governing the preparation and filing of land subdivision plats and data to be submitted to the City for approval.

201.01-05 Ensure the proper coordination of future streets and their development with existing or planned streets.

201.01-06 Fix penalties for the violation of the provisions of these regulations

201.01-07 Provide that the City may vary these regulations in certain cases or under certain conditions.

202. Scope

202.01 It shall be unlawful for any person or entity to lay out, subdivide, re-subdivide, plat, or re- plat any land into lots, blocks, or streets, or to sell property therein, for residential, commercial or industrial purposes, which has not been subdivided, re-subdivided, platted, or re-platted according to this regulation.

Notwithstanding the provisions of this ordinance to the contrary, owners of commercial, industrial or public or semi- public property may elect to subdivide property by metes and bounds without necessity of platting in accordance with the following procedures:

1. When an election is made to subdivide by metes and bounds without a plat, a site plan sufficient to meet all requirements now existing or as may be adopted, shall be submitted for Development/Architectural Review along with a landscaping plan and a plan showing all reserved easements and rights-of-way protecting access to the remaining property.
2. The applicant shall also submit a plan depicting all exterior building elevations, a material board and a color rendering with all exterior colors shown.

3. The Director of Public Works shall ensure that the overall goals, objectives, specifications and purposes of this ordinance are fully met.

202.02 The Mayor and Board of Aldermen shall withhold improvements of any nature whatsoever, including the acceptance and maintenance of streets and the connection of water or sewerage facilities, until a plat of the subdivision has been approved by the Mayor and Board of Aldermen and lawfully recorded in the Chancery Clerk's office. Lots shall not be sold nor any plat recorded until such plat has been approved as required herein.

202.03 All land subdivision of two (2) or more lots or parcels, any one of which has an area less than two (2) acres, either by plat or metes and bounds description, for the purpose of transfer of ownership or building development, or regardless of size when the dedication or vacation of any street, road, or alley is involved, shall require a plat to be filed with and approved by the Mayor and Board of Aldermen.

203. Exceptions from the Regulations

203.01. General

The following types or classes of land improvement or boundary modifications are excluded from compliance with these regulations. The provision for and granting of the following specified exceptions shall in no way be construed as conferring to any excepted tract of land any special privilege that is denied by this ordinance to other lands similarly situated within this jurisdiction.

203.02 Land in Agricultural Use

The division of land into tracts of two acres or more for bona-fide agricultural purposes is hereby excluded from these regulations provided such division of land does not require or involve the construction of a public street, road or highway.

203.3 Property Line Adjustment

The transfer of land between adjacent property owners and involving minor property line adjustment is hereby excluded from the provisions of these regulations provided no additional building site is created by the property line adjustment. All adjustments of a property line are required to comply with the City of Byram Zoning Ordinance and Building Codes.

203.4 Cemeteries

The interior layout of cemeteries is hereby excluded from these regulations, but the layout of the boundaries of the cemetery and the boundary lines of any street joining or entering a public thoroughfare shall comply with these regulations.

204. Definitions

204.01 For the purpose of interpreting this regulation, the following definitions shall be used. The work “shall” is mandatory and not discretionary.

204.01-01 Alley: A minor way used primarily for vehicular service to the rear or side of properties otherwise abutting on a street.

204.01-02 Board: The Mayor and Board of Aldermen of the City of Byram.

204.01-03 Building Line: The distance from a property line from which buildings must be set back from the street or road right-of-way line on which the property abuts. In the case of private streets there shall be an assumed property line starting at the edge of the curb or street whichever is further.

204.01-04 Engineer: The City’s Engineer, either full time employee or as designated by the Board.

204.01-05 City Consulting Engineer: The designated City Consulting Engineer(s).

204.01-06 City Consulting Architect: The designated City Consulting Architect(s).

204.01-07 City Consulting Landscape Architect: The designated City Consulting Landscape Architect (s).

204.01-08 Collector Street: A street having a primary function of collecting and distributing traffic between local streets or areas and the major street or highway network.

204.01-09 Conditional: Granted or made on provisions set forth in a resolution or ordinance.

204.01-10 Cul-de-Sac: A short minor street having but one vehicular access to another street and terminated with a vehicular turnaround, and not intended to be extended in the future.

204.01-11 Lot: Any parcel of land having an area of less than two (2) acres.

204.01-12 Minor or Local Street: A street having a primary function of providing service and access to abutting properties and not designated or intended to carry large traffic volumes but having sufficient width for occasional parking.

204.01-13 100-Year Flood: The highest level of flooding that, on the average, is likely to occur once every one hundred (100) years. AKA the one percent chance flood.

204.01-14 Planning and Zoning Board: The duly appointed City of Byram Planning and Zoning Board. In the event such

appointed Planning and Zoning Board is not functioning, then the Mayor and Board of Aldermen shall be considered the Planning and Zoning Board.

204.01-15 Construction Plans: All drawings, including cross-sections, profiles, working details, and specifications, which the developer prepares for the purpose of showing the type, character, extent, and details of the improvements required under these regulations.

204.0 1-16 Re-subdivision: The re-subdivision of any part or all of any block or blocks of a previously platted subdivision, addition, lot, or tract.

204.0 1-17 Street: A right-of-way for vehicular traffic, whether designated a street, highway, thoroughfare, parkway, thruway, road, avenue, boulevard, place, or however otherwise designated.

204.01-18 Developer: Any person, owner, agent, or entity having control of any land within the City of Byram and proposing to develop or subdivide such land into lots.

204.01-19 Subdivision: Any division of any tract or parcel of land in two (2) or more lots or parcels any of which has an area of less than two (2) acres, for the purpose, whether immediate or future, of sale or building development. It also includes re-subdivision or re-platting of land, lots or tracts. Division of land into parcels of two (2) acres or more shall not be included within this definition, unless any such division of two (2) acres or more includes the planning or development of a new street or access easement.

204.01 -20 Preliminary Plat: All drawings which fulfill the intent of Article III, 302

204.01-21 Final Plat: All drawings which fulfill the intent of Article III, 303.

204.01-22 Record or As-Built Drawings: All drawings as defined under Construction Plans which may have been modified to show the actual field construction details or changes.

ARTICLE III
PLAT PROCEDURES

300. Blank

301. Pre-application Conference

301.01 A pre-application conference shall be held with the developer prior to preparation of the preliminary plat. The purpose of this conference is to afford the developer an opportunity to avail himself of the advice and assistance of the Public Works and Community Development Departments before preparation of the preliminary plat and before formal application for its approval.

301.02 In the pre-application conference, the developer shall provide general information on the type of development proposed. This information shall include data on existing zoning, land characteristics, and available community facilities and utilities. It shall also include information describing the subdivision proposal, such as number of residential lots; typical lot width and depth; business areas; playgrounds, park areas, and other public areas; proposed protective covenants; homeowners associations; and proposed utilities and street improvements. In the pre-application conference it shall be determined if the land is to be developed at one time or on a phased basis.

301.03 The developer shall also consult with other parties potentially interested in the development, such as the Mississippi State Department of Health, the Mississippi Department of Environmental Quality, the City of Jackson Water Department, and other local sewer utilities regarding the suitability of the location of the proposed development, the most advantageous subdivision plan, the arrangement of streets and lots, and the types of water and sewer systems to be installed.

302 Preliminary Plats and Construction Plans

302.01 Upon reaching conclusions regarding the general program and objectives, the developer may begin preparation of the required preliminary plat (s) together with construction plans for the required improvements specified in Article IV. The preliminary plat shall be at a scale of not less than one (1) inch equals one hundred (100) feet and shall show the following proposed improvements and conditions:

302.01-01 Title under which proposed subdivision is to be recorded, with names and addresses of owners, notation stating acreage, graphic scale, north arrow (true north), datum, benchmarks, and date of survey.

302.01-02 Vicinity map at a scale of approximately one (1) inch equals one thousand (1,000) feet or as appropriate, showing the location of the site for the proposed subdivision.

302.01-03 Bearings and distances along boundary and mathematical closure of survey.

302.01-04 Location, width, and purpose of easements.

302.01-05 Names, right-of-way and roadway widths of streets, and approximate grades and gradients; similar data for alleys, if any.

302.01-06 Lot lines and lot numbers.

302.01-07 Sites, if any, to be reserved or dedicated for parks, playgrounds, or other uses public or private. Any subdivision which will have more than 50 lots shall be required to dedicate areas for green space as required by the City.

302.01-08 Utility line sizes, with approximate invert elevations (where appropriate).

302.01-09 Sites, if any, for apartment buildings, shopping centers, churches, industries or other non-public uses exclusive of single-family dwellings.

302.01-10 Building setback lines.

302.01-11 Contours based on mean sea level shall be shown with a two (2) foot interval when slope is less than four (4) percent and with five (5) foot intervals for slopes over four (4) percent; and spot elevations along canals or ditches and at any breaks in grade or changes in elevation not readily discernible from the contours shall be shown.

302.01-12 Watercourses, marshes, flood areas, wooded areas, houses, and other significant features.

302.01-13 Any proposed protective covenants and homeowners associations.

302.01-14 All pages must be signed and sealed by a design professional registered to practice in the State of Mississippi.

302.02 Construction plans for required improvements as specified in Article IV shall be submitted for review and approval by the Public Works Director.

302.02-01 The improvements specified herein shall be designed by and constructed under the inspection of a registered professional engineer, registered to practice in Mississippi.

302.02-02 In order to obtain approval for the construction of improvements in a subdivision, the developer shall submit construction plans showing the types of improvements contemplated. Construction plans shall be accompanied by a geotechnical investigation for all proposed developments and subdivisions. Said plans shall be submitted

and approved by the Public Works Director before construction is begun in the development/subdivision. The construction plans shall be prepared on sheets twenty-four (24) by thirty-six (36) inches and shall consist of a combination plan and profile for each street and a typical cross-section of the proposed grading, drainage, base course, and pavement. Detailed plans shall be submitted for the water and sanitary sewer systems and for culverts, drainage structures, and bridges. The plan and profile sheets (streets and sanitary sewers) shall be drawn to a horizontal scale designated by the Public Works Director and referenced to State Plane Coordinates.

302.3 Four (4) copies of the preliminary plat as well as a digital copy of the plat in a format as specified by the Department of Community Development, for required improvements specified in Article IV, shall be submitted initially to the Planning and Zoning Board with a letter requesting approval. This data shall be submitted at least fifteen (15) days prior to the Planning and Zoning Board meeting at which it is to be considered. Failure of the Planning and Zoning Board to review an application within sixty (60) days after submission to the City Clerk shall permit the applicant to submit the application directly to the Board. Three copies of the construction plans shall be submitted to the Public Works Department for review and approval.

302.4 Following a review of the preliminary plat, construction plans and other material submitted for conformity to these regulations, and following negotiations with the developer on changes deemed advisable and the type of improvements to be made in the proposed development, the Community Development and Public Works Departments, respectively, shall express informally their approval or disapproval and state of conditions. The Community Development Department shall maintain a project file of departmental comments.

302.5 The Planning and Zoning Boards decision concerning the Preliminary Plat can be appealed to the Board within 3 working days of the Planning & Zoning Board action. The preliminary plat approval may be extended for one additional year if a written request is submitted by the developer for action of the Planning & Zoning Board. A total of two one-year extensions can be granted by the Planning & Zoning Board subject to any ordinance revisions.

302.6 Approval of the preliminary plat shall not constitute approval of the final plat, nor shall the preliminary plat be recorded in the Chancery Clerk's office. Approval of the preliminary plat by the Board shall not constitute authorization for the developer to proceed with construction of the subdivision until written certification from the Mississippi State Department of Health, the Mississippi Department of Environmental Quality, City of Jackson and any other utility company that the proposed systems are in conformance with all applicable laws and regulations is furnished to the Board. Construction of all required improvements is subject to inspection and approval by the Public Works Director and other appropriate officials or agencies which have a lawful

interest in the development. All construction shall be done in conformance with the approved preliminary plat and construction plans. The Community Development Department with the concurrence of the Public Works Department shall issue a permit to start work once all of the required approvals have been granted and all required fees have been paid. A permit card shall be posted on the subject property that is visible to the street. Failure to obtain and post the permit is a violation of this ordinance.

303. Final Plat

303.01 The final plat shall conform substantially to the preliminary plat as approved; and if desired by the developer, it may constitute only that portion of the approved preliminary plat which he proposes to record and develop at the time; provided, however, that such portion conforms to all requirements of these regulations. One (1) copy of the final plat or plats shall be provided on good muslin-backed paper, (KP5), eighteen (18) by twenty-four (24) inches, and four (4) copies of the final plat shall be provided on Mylar sheets accompanied by an index sheet showing the entire subdivision. A digital copy of the plat is required in a format as specified by the Department of Community Development. The final plat shall be prepared at a scale of one (1) inch equals one hundred (100) feet and shall contain the following information:

303.01-01 Primary control points, approved by the City Engineer, or descriptions and "Ties" to such control points to which all dimensions, angles and section lines with ties to lot corners shall be shown.

303.01-02 Tract boundary lines, right-of-way lines of streets and easements, and property lines of residential lots and other sites. Sufficient data shall be shown, accurate dimensions, bearings, deflection angles and radii, arcs, and central angles of all curves to determine readily and reproduce on the ground any lines on the map.

303.01-03 Name and width of each street or other right-of-way.

303.01-04 Location, dimension, and purpose of any easements.

303.01-05 Number to identify each lot or site.

303.01-06 Purpose for which sites, other than residential lots, are dedicated or reserved and any areas subject to flooding by a one hundred (100) year frequency flood shall be clearly identified and delineated. The floodway shall also be shown.

303.03-07 Building setback line on all lots and other sites.

303.01-08 Location and description of boundary monuments.

303.01-09 Title, graphic scale, north arrow (true north), and date.

303.01-10 Any proposed protective covenants in the form for recording.

303.01-11 A metes and bounds description of the subdivision boundary.

303.01-12 Certificates, Acknowledgments and Evidence of Approval.

Evidence of the formal approvals as required by the Development

Regulations other acknowledgments, certificates and statements required on the Record Plat shall be worded and prepared in substantial accordance with the following formats:

303.01-13

CERTIFICATES OF PERFORMANCE

SURVEYOR' S CERTIFICATE
STATE OF MISSISSIIPPI
COUNTY OF HINDS

I, _____ (Civil Engineer) (Land Surveyor) do hereby certify that I have subdivided and platted the following described land being situated in the _____ of the _____ of _____, Section _____, Township _____ Range _____, City of Byram, Hinds County, Mississippi, and being more particularly described as follows:

Beginning at the (Enter legal description of outer boundary here) to the point of beginning.

WITNESS MY SIGNATURE on this the ____ day of _____, 20__

Registration Number _____

(Land Surveyor) (Civil Engineer)

303.01-14

OWNER' S CERTIFICATE OF OWNERSHIP AND DEDICATION
STATE OF MISSISSIPPI
COUNTY OF HINDS

(I)(We) hereby certify that (I am) (We are) the Owners (s) of the property shown on the Plat and described in the Certificate of _____, the (Civil Engineer) (Land Surveyor) appearing hereon; have caused same to be subdivided and platted as shown; and the property is all (or a part of) that tract as recorded in Deed Book _____, Page _____, in the office of the Chancery Clerk of Hinds County, Mississippi; and that (I) (We) hereby adopt this plan of subdivision with (My) (Our) free consent, and dedicate all streets, alleys, walks, parks and other open spaces to public use or to private use as noted.

WITNESS MY SIGNATURE on this the ____ Day of _____, 20__

Owner

Proprietor

303.01-15

(SURVEYOR’S) (ENGINEER’S) CERTIFICATE OF COMPLIANCE
WITH DEVELOPMENT REGULATIONS
STATE OF MISSISSIPPI
COUNTY OF HINDS

I hereby certify that the monuments and markers shown here on are in place on the ground and the plan and plat shown and described hereon are a true and correct representation of a survey to the accuracy designated in the Development Regulations for the City of Byram, Hinds County, Mississippi.

WITNESS MY SIGNATURE on the _____ day of _____, 20____

REGISTERED
(ENGINEER) (SURVEYOR)

303.01-16

ACKNOWLEDGMENT OF SIGNATURES
STATE OF MISSISSIPPI
CITY OF BYRAM)
COUNTY OF HINDS

Personally appeared before me the undersigned authority in and for the jurisdiction aforesaid, the within named _____, _____ who acknowledges to me that he executed the foregoing instrument as Owner, and who acknowledged to me that he executed same as (Engineer) or (Land Surveyor), for the purpose therein contained.

Witness my hand and official seal of office on this the _____ day of _____, 20____

My Commission Expires:

NOTARY PUBLIC

303.01-17

CITY PLANNING AND ENGINEER'S APPROVAL
STATE OF MISSISSIPPI
CITY OF BYRAM
COUNTY OF HINDS

We have examined this plat and find that it conforms to all conditions set forth on the preliminary plat as approved by the Mayor and Board of Aldermen and thus recommend final approval.

Public Works Director

Chairman, City Planning and Zoning Board

303.01-18

CITY APPROVAL CERTIFICATE
STATE OF MISSISSIPPI
CITY OF BYRAM
COUNTY OF HINDS

I hereby certify that this is a true copy and that this plat was approved by the Mayor and Board of Aldermen in session on the _____ day of _____, 20____

ATTEST:

CITY CLERK
CITY OF BYRAM

MAYOR
CITY OF BYRAM

303.02 One (1) original KP5 and four (4) Mylar copies of the final plat shall be prepared and submitted to the Board and the Public Works Director within one (1) year after approval of the preliminary plat unless an extension (s) has been granted by the Planning & Zoning Board. A digital copy shall be provided as specified by the Department of Community Development.

303.03 It shall be the duty of the Public Works Director to examine the final plat to be certain that it conforms to existing streets, drainage, and utility systems and that all conditions set forth on the preliminary plat have been satisfied.

303.04 The final plat shall not be approved by the Board until the developer has done one (1) of the following:

303.04-01 Actually completed construction and passed inspection by Public Works Department and Community Development Department of all improvements as required in Article IV and as approved on the preliminary plat; or

303.04-02 Given to the board a performance bond, or certified check, letter of credit, or establish an escrow account in an amount equal to 1.5 times the total estimated cost of installation of the required improvements, as determined by the Public Works and Community Development Directors after inspection by the Public Works Department and Community Development Department. A bond or certified check, or letter of credit must be annually renewed by the developer.

303.5 At the time of dedication of the streets, roads, and utility systems to the City, the developer shall submit to the Board a title certificate to the land being subdivided.

303.06 Upon approval of the final plat by the Board, an endorsement shall be made thereon by the Mayor and attested by the City Clerk indicating approval together with the date of the approval by the Board. One (1) original Mylar copy of the final plat shall be returned to the developer; one (1) KP5 exact duplicate and one (1) original Mylar of the final plat shall be filed with the Chancery Clerk; one (1) Mylar copies shall be retained by the Community Development Director; one (1) Mylar copy shall be returned to the Engineer/Surveyor. A digital copy shall be provided as specified to the Community Development Director.

ARTICLE IV
REQUIRED IMPROVEMENTS AND DESIGN STANDARDS

400. Subdivision Improvements

400.01 In consideration of the acceptance by the City and assumption of the responsibility for maintaining the dedicated streets and utilities constructed therein, developers of the subdivision shall cause to be constructed, at no expense to the City, the following improvements according to the specifications set forth hereinafter.

400.02 All services for utilities shall be made available for each lot in such manner as will eliminate disturbing the street pavement and drainage structures when connections are made.

400.03 Upon completion of construction of any such utilities or improvements, three (3) sets of "Record Drawings or As-Built" (one shall be a Mylar reproducible set), dated, signed, and certified by the Engineer in charge, shall be filed with the Public Works Director showing all features as actually installed, including materials, size, location, depth or elevation, numbers, ends of lines, connections, wyes, valves, storm sewer drains, inlets, and all other pertinent information; all gate valves shall be referenced by two (2) point reference; all water and sewer services shall be noted on the "Record or As-Built Drawings" and located by two reference points and a distance from each reference point. Services shall be marked on the curb; however, reference points shall also be provided on the "Record Drawings or As-Built". A digital copy of "Record Drawing" is required as specified by the Public Works Director.

401. Streets

401.01 All streets built within the City of Byram must be constructed to the minimum City standards. The Public Works Director and Planning and Zoning Board shall review the street system for the proposed subdivision/development and shall classify all proposed streets in one of the following categories:

401.01-01 Arterial: Streets that serve major centers of activity.

401.01-02 Collector: Streets that carry traffic from local streets to arterial streets or highways, including the principal entrance streets of the Subdivision.

401.01-03 Local: Streets that are used primarily for access to abutting properties.

401.02 Street right-of-way widths shall be as follows:

<u>Type of Street</u>	<u>Minimum Right-of-Way Width</u>
Arterial	100 feet
Collector	60 feet
Local	50 feet

401.03 Minimum sight distance shall be as follows:

<u>Type of Street</u>	<u>Minimum Stopping Sight Distance</u>
Arterial	400 feet
Collector	300 feet
Local	200 feet

401.04 Traffic Calming

Street layout will be designed in such a way as to keep travel speeds at a minimum. Developers are to use traffic calming measures such as, but not limited to; discontinuous streets, curves, islands, medians, round-a-bouts, etc. to insure that speeds are kept low.

Prior to the installation of the final surface course, if there are verified speeding problems the developers shall be required to install additional traffic calming measures at no expense to the City of Byram.

401.05 The arrangement of streets in a subdivision shall either provide for the continuation of existing streets in surrounding areas; or conform to a plan for the neighborhood as a whole that has been devised to meet an unusual situation such as topography or other conditions that make continuation of existing streets impractical. Such a neighborhood plan shall be prepared by the developer and is subject to approval by the Board. All subdivisions shall be designed and constructed with a minimum of two (2) points of public ingress/egress.

401.06 No trees or shrubs taller than twenty-four (24) inches will be permitted to be planted at street intersection; however, controlled planting of shrubs and trees on public property, provided that plantings do not interfere with proper drainage and maintenance or obstruct vision required for public safety, may be permitted.

401.07 Street jogs with centerline offsets of less than one hundred twenty-five (125) feet shall be avoided.

401.08 A tangent of at least one hundred (100) feet shall be introduced between reverse curves on collector streets. Horizontal curves on collector streets shall have a minimum of a four hundred (400) foot radius computed from the center line. Horizontal curves on local streets shall have a minimum of a two hundred (200) foot radius computed from the centerline.

401.09 Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street shall intersect any other street at less than seventy-five (75) degrees.

401.10 Property lines at street intersections shall be rounded with a radius of ten (10) feet or with a greater radius or angled when the Public Works Director deems it necessary. The Public Works Director may require comparable cutoffs or chords in place of rounded corners. A comparable chord shall be considered a chord or line connecting the points of tangency of the radius it is replacing.

401.11 Half-streets shall be prohibited, except in such cases where there exists a half-street contiguous thereto. Wherever a half -street is adjacent to a tract to be subdivided, the other half of the street shall be platted within such tract.

401.12 Permanent dead-end streets shall not be longer than six hundred (600) feet unless special conditions warrant as determined by the City Engineer and shall be provided at the closed end with a turnaround having a paved surface diameter of at least eighty (80) feet and a street property line diameter of at least one hundred (100) feet.

401.13 Street names shall not be used which will duplicate or be confused with the names of existing streets. Street names shall be subject to the approval of the Board and the Hinds County Emergency 911 Coordinator.

402. Monuments

402.01 Monuments shall be placed at all corners or changes in alignment along the boundary of the subdivision and at all block corners, angle points, or curves in street right-of-way boundary lines. These monuments shall consist of a four (4) inch by four (4) inch concrete post not less than thirty (30) inches in length and reinforced with a single one-half (1/2) inch steel rod in the center that extends not less than one-fourth (1/4) inch above the top of the concrete.

402.02 Markers shall be placed at all corners or changes in alignment in lot boundaries. The markers shall consist of a reinforcing rod of not less than one - half (1/2) inch in diameter and not less than twenty-four (24) inches in length.

402.03 All monuments or markers shall be set with the top thereof flush with the finished grade. Where necessary to prevent disturbance, the monument shall be buried underground and referenced to permanent landmarks.

403. Easements

403.01 Easements across lots or centered on rear or side lot lines shall be provided for utilities where necessary and shall be at least fifteen (15) feet wide at ground level, or a width designated by the Public Works Director.

403.02 Where easements intersect or sharp changes in alignment are necessary, corners shall be cut off sufficiently to permit equipment access as determined by the Public Works Director.

403.03 Permanent buildings, paving, planting, or fences will not be permitted in easements without Board approval.

403.04 Any overhanging limbs, shrubbery, or vegetation of any kind may be removed from within the limits of easements at the sole discretion of the maintenance personnel of the utilities installed or to be installed in or above the easements.

403.05 Where a subdivision is traversed by a watercourse, drainage way, channel, or stream, there shall be provided a storm water easement or drainage easement conforming substantially to the lines of such watercourse or an accepted canal or drainage course. The easement shall provide at least 10 feet beyond top bank for adequate maintenance.

404. Blocks

404.01 The lengths, widths, and shapes of blocks shall be determined with due regard to:

404.01-01 Building sites that are suitable for the special needs of the uses contemplated.

404.01-02 Convenient access, circulation, control, and safety of street traffic.

404.01-03 Limitation and opportunities of topography.

404.02 As a usual practice, block lengths shall not exceed eighteen hundred (1,800) feet or be less than four hundred (400) feet.

405. Alleys

405.01 Alleys may be provided in commercial or industrial subdivisions.

405.02 The right-of-way width of an alley in commercial and industrial areas shall be a minimum of twenty-five (25) feet.

405.03 Alley intersections and sharp changes in alignment shall be avoided, but where necessary, corners shall be cut off sufficiently to permit safe vehicular movement and sight distance.

405.04 Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with a turnaround having an outside roadway diameter of at least eighty (80) feet and a right-of-way diameter of at least one hundred (100) feet. The Public Works Director may recommend to the Board a larger turnaround when it is determined necessary to provide adequate turnaround space.

406. Lots

406.01 All subdivisions shall be surveyed and laid out in such a manner that each and every lot intended for sale shall abut a dedicated public street or road.

406.02 Lot sizes and dimensions shall conform to the Zoning Ordinance.

407. Floodplain Areas

407.01 Land subject to flooding with a frequency of a one hundred (100) year flood shall not be subdivided unless precautionary measures are taken to eliminate or minimize flood hazards. All building finished floor elevations shall be raised to an elevation two (2) foot above the one hundred (100) year flood elevation in accordance with the latest FEMA map for the area or calculated for the area in which the proposed subdivision is situated. Provided, however, that no fill shall be made, or any subdivision constructed, which will increase flood hazards to other lands, or in any manner impede or restrict the flow of water in a flood situation. All areas which will remain subject to flooding after the subdivision is constructed shall be delineated on the final plat.

407.02 All utilities and facilities, such as water, sewer, gas, and electrical systems, shall be located, elevated, and constructed to eliminate or minimize flood damage; and adequate drainage shall be provided so as to reduce exposure to flood hazards.

407.03 All improvements within the City of Byram, must also comply with the City's adopted Flood Plain Ordinance.

408. Water System

408.01 Water main design and construction shall be as set out in the City of Byram Standards of Design and Specifications, the City of Jackson Specifications as well as any State and Federal requirements. Any differences between Byram and Jackson Specifications will require the use of the most restrictive of the two.

408.02 In the event that oversize water mains shall be installed within the proposed development to serve other areas, appropriate arrangements for construction must be made between the developer and the City prior to installation.

409. Sanitary Sewers

409.01 Sanitary sewerage facilities shall be provided in all development and shall conform to all applicable Federal and State laws pertaining to sewage collection and treatment as well as the City of Byram Standards of Design and Specifications.

409.02 In the event that oversize sewer mains shall be installed within the proposed development to serve other areas, appropriate arrangements for construction must be made between the developer and the City prior to installation.

410. Storm Drainage

410.01 Design, materials and construction shall conform to the City of Byram Standards of Design and Specifications for Developments.

410.02 Adequate protection of invert slopes shall be provided to prevent erosion.

411. General Grading

411.01 Grading and centerline gradients shall be in accordance with plans and profiles approved by the City Engineer.

411.02 Areas to be graded by cutting or filling shall be rough graded to within two-tenths (0.2) of a foot of the accepted elevation after necessary allowance has been made for the thickness of topsoil, paved areas, and other installations.

411.03 Final cross sections and profiles of streets and other installations shall conform to grades approved by the City Engineer. Elevations shall be based on mean sea level.

411.04 All timber, logs, trees, brush, biodegradable matter, and other rubbish shall be removed or otherwise disposed of in accordance with the rules and regulations of the Mississippi Department of Environmental Quality so as to leave areas that have been disturbed with a neat and finished appearance. These materials shall not be buried within the boundary of the development.

412. Erosion and Sediment Control

412.01 Installation of the above improvements shall be done in such a manner as to provide for the most effective control of erosion and sediment. All erosion control measures shall be in accordance with the State and Federal requirements. Practical combinations of the following technical principles shall be used:

412.01-01 The smallest practical area of land shall be exposed at any one time during development.

412.01-02 When land is exposed during development, the exposure shall be kept to the shortest practical period of time.

412.01-03 Temporary vegetation and/or mulching shall be used to protect critical areas exposed during development.

412.01-04 Sediment basins (debris basins, desilting basins, or silt traps) shall be installed and maintained to remove sediment from runoff waters from land undergoing development.

412.01-05 Provisions shall be made to effectively accommodate the runoff caused by changed soil conditions during and after development.

412.01-06 Permanent final vegetation and structures shall be installed as soon as practical in the development.

412.01-07 The development plan shall be fitted to the topography and soils so as to create the least possible erosion.

412.01-08 Whenever feasible, natural vegetation shall be retained and protected.

413. Storm Water Detention Facilities

413.01 This design standard shall apply to any residential development of five acres or more or any nonresidential development of one acre or more. This ordinance shall also apply to any residential development of less than five acres or any nonresidential development of less than one acre but having 50% or greater impervious surface.

Rate of run-off shall be determined at each point where run-off leaves the property being developed in its pre-development state. The storm water management system shall be designed so that the peak flow rate at any exit point in the post-developed conditions shall be less than or equal to the peak flow rate for that exit point in the pre-developed condition for the 2-year, 10-year, 25-year, and 100-year 24 hour storms.

The increased storm water runoff resulting from the proposed development shall be detained by retention or detention facilities, or by other means subject to the approval of the City Engineer.

Retention or detention facilities shall be designed with sufficient capacity to accommodate all runoff caused by the development in excess of that runoff which would occur from the site if left in its natural, undeveloped condition. This storage shall be sufficient to control the excess runoff for the 2-year, 10-year, 25-year, and 100-year storms (24-hour duration).

It is the responsibility of the developer to ensure that the storm water runoff from the proposed development shall not increase channel instability downstream, or change the timing of the 100-year peak flow so as to increase flood damages to existing developments or property. In determining downstream effects from storm water management structures and the development, hydrologic-hydraulic engineering studies shall extend downstream to a point where the proposed development represents less than ten percent of the total watershed draining to that point.

If detention storage is provided within the 100-year floodplain, NO storage volume for the facility may be considered below the base flood elevation established for that floodplain. Retention/detention facilities shall NOT be located in a regulatory floodway.

Drainage systems shall have the capacity to pass the 100 year-24 hour storm flow from all upstream areas through the development and will require the ditch plus ten (10) feet to be included in an easement that cannot be included in the minimum lot size.

413.02 The following information and data shall be furnished with the plans of each proposed residential, commercial and industrial development. This information and data must be prepared and certified by a licensed professional engineer registered in the State of Mississippi:

A topographic map with (as a minimum) two-foot interval contours of the land to be subdivided and such adjoining land whose topography may affect the layout or drainage of the subdivision. On such a map, the following shall be shown:

413.02.01 The banks and centerline of streams and channels.

413.02.02 The normal shoreline of lakes, ponds, and retention/detention basins, and lines of inflow and outflow;

413.02.03 The location, size and slope of storm water conduits and drainage swales.

413.02.04 Storm, sanitary and combined sewers and outfalls of record.

413.02.05 Delineation of upstream and downstream drainage features and

watersheds which might be affected by the development.

413.02.06 Base flood (100-year) elevations and regulatory floodways which have been identified for the property.

413.02.07 Environmental features including the limits of wetlands areas and any designated natural areas.

A comprehensive drainage plan designed to safely and completely handle the storm water runoff and to detain increased storm water runoff. This plan shall provide and be accompanied by maps and/or other descriptive material showing the following:

- i. The extent and area of each watershed tributary to the drainage channels in the development.
- ii. The storm sewers and other storm drains to be built, the basis of their design, the outfall and outlet locations and elevations; receiving stream or channel and its high water elevation and the functioning of the drains during high water conditions.
- iii. Existing streams and floodplains to be maintained and new channels to be constructed including their locations, cross-sections and profiles.
- iv. Proposed culverts and bridges to be built including their materials, elevations, waterway openings and basis of design.
- v. Existing retention/detention facilities to be maintained, enlarged or altered and new facilities to be built including their design.
- vi. The estimated location and percentage of impervious surfaces existing and expected to be constructed when the development is completed.
- vii. The slope, type, and size of all sewers and other waterways
- viii. Any proposed environmental enhancement or mitigation features.
- ix. Retention/detention basins to be built including a plot or tabulation of storage volumes with corresponding water surface elevations and of the basin outflow rates for those water surface elevations.
- x. For all retention/detention basins, design hydrographs of inflow and outflow for the 100-year peak flows from the site under natural and developed conditions.
- xi. Landscaping plan for retention/detention facility.
- xii. One or more typical cross-sections of all existing and proposed channels or other open drainage facilities, showing the elevation of the existing land and the proposed changes thereto, together with the high water elevations expected from storm water runoffs under the controlled conditions called for by this design standard, and the relationship of structures, street and other utilities.

413.03 Detention Basins: A detention basin is considered to be a surface water run-off storage facility which is designed to hold runoff temporarily during and immediately after a runoff event. This includes but is not limited to: swales with crosswise earthen berms, constructed or natural surface depressions, subsurface tanks, pipes or reservoirs. Detention basins will conform to the following standards:

413.03.01 The volume of storage provided in these basins, together with such storage as may be authorized in other detention facilities shall be sufficient to control the excess runoff from the 2-year, 10-year, 25 year, and 100-year storm of 24-hour duration.

413.03.02 The maximum planned depth of storm water stored shall not exceed five feet unless natural ground conditions lend themselves to greater depths.

413.03.03 The side slopes of the basin shall conform as closely as possible to natural land contours. Re-grading is preferable if necessary to keep the slopes under ten percent. Erosion control measures shall be provided as well as devices or measures to insure public safety.

413.03.04 Outlet control structures shall be designed as simply as possible and shall operate automatically. They will be designed to limit discharges into existing or planned downstream channels or conduits so as not to exceed predetermined safe capacities and not in excess of flows which would have occurred with the land in its natural, undeveloped condition. If necessary, velocity dissipation measures shall be employed to ensure that the discharge does not increase downstream erosion.

413.03.05 Emergency spillways should be constructed in cut sections whenever possible. In the event that a ramp spillway is required by site conditions, this spillway must be paved using either concrete or riprap from the beginning of the control section to at least five feet past the downstream toe of the dam. The emergency spillway must be designed to pass the 100 -year/24 hour storm.

413.03.06 Detention facilities shall, where possible, use natural topography and natural vegetation. In lieu of this, these facilities shall have planted trees and vegetation such as shrubs and permanent ground cover on their borders. In no case should trees or deep-rooted vegetation be planted in the levee itself. This requirement does not supersede the Landscape Ordinance of the City of Byram.

413.03.07 The Mayor and Board of Aldermen of the City of Byram may elect to require the facility to be enclosed by fencing. The Mayor and Board of Aldermen will approve the type, size and appearance of fencing.

413.04 Retention Basins: Basins designed with permanent pools shall conform to the standards for detention basins as specified in paragraph c. unless modified or amended as follows:

413.04.01 The minimum normal depth of the permanent pool shall be four feet.

413.04.02 For emergency purposes, cleaning or shoreline maintenance, facilities shall be provided or plans prepared for the use of auxiliary equipment to permit emptying and drainage.

413.04.03 Aeration facilities may be required, dependent on the quality of the influent and detention time.

413.04.04 The side slopes shall be of non-erosive material with a slope of 3:1 or flatter. The ledge shall be four to six feet wide three feet below normal water depth and sloped gently toward the shore to prevent people or objects from sliding into deep water. Alternate designs for side slopes may be considered under special circumstances where good engineering practice is demonstrated.

413.04.05 All retention basins shall have a minimum freeboard of 18 inches above the high water elevation of the routed 100-year/24 hour storm event.

413.04.06 Adequate area for sediment storage shall be provided in all retention basins. Sediment removal should be required no more than annually.

413.05 The developer shall be responsible for the maintenance of all improvements until such time as 80 percent of the lots have been improved with buildings and Occupancy permits issued or until such time as 80 percent of the lots in the development have been sold. However, the developer shall not transfer these improvements for the purpose of maintenance until he has complied with the above and until he has received final approval, final inspection, and a Certificate of Compliance from the City Engineer.

All improvements, including landscaping, shall be maintained in perpetuity and cannot be developed for any other use which would limit or cause to limit the use of the improvements. The improvements shall be owned and/or maintained by the Property Owner's Association of the development. Each property owner shall own a proportionate share of the improvements and shall bear his proportionate responsibility for the continued maintenance in accordance with the above.

Each property owner shall, within the contents of his deed, be liable for the combined maintenance of the improvements. A special note to this effect shall appear on any final plat of subdivision or any plat of condominium and their declarations.

The Property Owners' Association shall be formed in perpetuity for the maintenance of the improvements. Membership shall be mandatory by all property owners. Articles of agreement of the Property Owner's Association must be approved by the Board of Alderman of the City of Byram before recording.

In subdivisions consisting of five single-family residential lots or fewer, the provision of a Property Owners' Association may be waived, provided that other parts of this Section have been met.

When problems arise due to inadequate maintenance, the City Engineer of the City of Byram may inspect the improvements and compel the correction of the problem by written notice. In the case of failure of a facility, the Property Owners' Association may contract with the City of Byram for the correction of the problem, provided the City is adequately reimbursed.

413.06 Whenever drainage facilities are planned to service several projects or a specific area deemed necessary by the City of Byram, the City may elect to accept the drainage facilities by dedication to the City. When these projects are of a regional nature, the City of Byram will maintain these facilities. In these cases, access easements shall be provided to the city.

413.07 The City Engineer shall inspect all drainage facilities while under construction. When facilities are not constructed according to approved plans, the City of Byram has the explicit authority to compel compliance and have any situations corrected which are not according to the approved plans. All drainage facilities located on private property, whether dedicated to the City or not, shall be accessible at all times for inspection by the City Engineer or other responsible public official.

413.08 The requirement for onsite retention/detention facilities may be waived by the City of Byram if it is determined that a development project is too small, or if engineering, aesthetic or economic factors make a combined or regional facility more practical for construction by the city. In this case, the City of Byram shall require a fee and/or dedication of land from the developer, which the city shall use to construct the regional facility. This fee and/or dedication of land shall be based on the proportionate share for the development in its completely developed state of the present costs of constructing the regional facility.

ARTICLE V

REQUIRED IMPROVEMENTS AND STANDARDS OF PERFORMANCE

500. General Requirements

All grading, drainage, street construction, utility installation and other installation and construction must be accomplished by the developer in accordance with the requirements listed herein and the City of Byram Standards of Design and Specifications, a copy of which is attached hereto and is incorporated herein as an official ordinance of the City of Byram, Mississippi as if fully copied herein.

All improvements and installations to be dedicated to the City for maintenance shall be constructed from materials meeting or exceeding the requirements of the specifications on file with the Public Works Director and to the standards of construction contemplated by these regulations and outlined herein and in the Standards of Design and Specifications. All improvements must also be accompanied by a geotechnical investigation performed by a licensed engineer in the State of Mississippi.

501. Site Improvement, Grading and Drainage

All unsightly topographic features will be rounded, leveled, filled or otherwise graded to a pleasant appearance in a configuration commensurate with the overall development.

All trash and debris and other unsightly material will be removed from all premises located within the outer boundary of the tract of land being subdivided and/or developed. Erosion will be prevented and sediment controlled by the planting of grass and shrubbery or by other remedial procedures.

All building sites and lands immediately adjacent thereto, streets and other surfaces shall be graded and shaped in a manner that will cause storm water and snow melt to drain away from buildings and away from the subdivision in a natural water course or in a man-made channel acceptable to all parties involved.

The developer must provide for the discharge from the area of all storm water entering the subdivision from lands upstream in the storm water basin as well as for all rain water falling on the lands being subdivided, and will be required to obtain the written consent of all affected abutters of downstream water courses in those instances where downstream storm discharge is through widened, improved and/or relocated channels. For those drainage basins with an adopted Storm Water Management Plan, the plan shall be used to design storm water management facilities. Drainage plans shall conform to Article IV of these regulations.

502. Street Construction

All streets shall be laid out and located in general accord with the pattern, grade section and routing depicted in the comprehensive plan adopted or to be adopted by the Board.

Street construction shall comply with the construction minimums listed in the City of Byram Standards of Design and Specifications.

503. Water Distribution System

A means of delivering potable water from an approved water supply to each lot in a developed subdivision or to each residential unit in planned unit development at times of peak demand shall begin at the nearest existing water main and terminate with a suitable valve at the front lot (street) line of each lot or at the building wall or other proper location in planned unit development.

Water mains shall be correlated with and connected into the water distribution system in a manner commensurate with future needs and must comply with the requirements imposed by the Mississippi State Department of Health, the City of Jackson and the City of Byram. Consumers shall not be connected to the system through recently constructed facilities until a clear or negative sample report has been obtained from the Mississippi State Department of Health and written approval from the City of Jackson.

504. Wastewater Collection and Disposal System

A system of sewers and appurtenances shall be provided for the collection of wastewater from each lot or other contributing unit with subsequent transport of the wastewater to a place of treatment and/or disposal away from the area being developed.

All sewer mains and appurtenances shall be correlated with and connected into the sewage collection and transport system in a manner commensurate with future need including those of upstream properties, and shall be installed in accordance with the City of Byram Standards of Design and Specifications and written approval of the plans by the Mississippi Department of Environmental Quality, any certificated sewer utility and/or the Mississippi State Department of Health, as appropriate.

505. Other Utilities and Miscellaneous Requirements

All other utilities including street lighting shall be installed as directed in the franchise granted to the company providing the service and in accordance with the latest published edition of the appropriate industry recognized publications using design parameters recognized as suitable for central Mississippi.

An accurate map showing the exact location of both underground and above ground facilities shall be furnished to the City prior to formal acceptance of the record plat.

Street name signs and traffic signs must be provided at all street intersections and at such other locations as necessary to identify and locate the address of individual premises. The sign shall be identical to the standard street name signs for the City of Byram unless otherwise approved by the Public Works Director.

505.01 Electric Service and Street Lighting

A minimum of one (1) street light shall be provided at a spacing not to exceed 250 lineal feet and at each street intersection. The lights along the street shall be 150

watt high pressure sodium or an approved substitute with photoelectric cell for automatic operation. The lights at the intersection of arterial streets and arterial streets and collector streets shall meet the minimum standards of the American Association of State Highway and Transportation Officials and use a photoelectric cell for automatic operation. The poles shall be pre- cast concrete or an approved substitute. Steel utility poles are an approved substitute for pre-cast concrete utility poles, subject to review and approval by the Public Works Department.

All installation of conduit and wiring shall be underground. The electrical junction boxes and street lights shall be located as near as possible to the lot lines.

No transformer or pedestal shall be set in front of or within five (5) feet of a fire hydrant. Underground wiring and poles shall be located along front lot lines within the street right- of-way where possible. Underground wiring shall not be installed in the same trench with water or sewer utilities. Minimum horizontal and vertical clearances of two (2) feet and one (1) foot respectively shall be required, unless prior approval is obtained from the Public Works Department. All trenches shall be properly filled, leveled and re-leveled as required to maintain the natural slope. Any property corner survey markers destroyed by the electrical utility or its contractor during construction of the underground electrical service shall be reestablished by the electric utility at no cost to the owner, developer, or City.

505.01-01 Utility Services

All services for utilities shall be made available for each lot in such a manner that it will not be necessary to disturb the street pavement, curb, gutter, and drainage structure when connections are made. All services shall terminate at or beyond the lot line unless approved otherwise by the Public Works Department.

505.01-02 Trenching or Boring

No trenching or boring pits shall be allowed within two (2) feet of the back of curb. Under no circumstances should any trench or boring pit be left open over night without notifying the City of Byram Public Works Department. Any trench or pit left open shall be properly flagged or marked.

505.01-03 Easements

Utility and/or drainage easements of an appropriate width as required shall be provided with fifteen (15) feet being a minimum.

Where easements intersect or sharp changes in alignment are necessary, corners shall be tapered sufficiently to permit equipment access, subject to the approval of the Public Works Department.

No buildings or structures are permitted in City utility easements or road rights-of-way.

506. Supervision of Development

All installation and construction shall be observed by a registered professional engineer or his designated representative and/or a representative of the City, and a record made of the phase of development observed, whether or not such development complies with

these regulations, and the date of the observation. In the case of a subdivision or other development accepted upon recommendation of a registered professional engineer employed by the owner or the developer, the engineer shall submit to the City, under his professional seal, a certificate to the effect that the subdivision has been developed in substantial accordance with these regulations, with any and all exceptions noted thereon.

507. Warranty in Lieu of Completion

Any subdivision and/or development of lands subject to the requirements of this ordinance shall be subdivided and fully completed in accordance with the regulations and standards included herein prior to its adoption and/or acceptance by the Board.

The Board may, however, at their discretion, accept a partially developed subdivision or tract of land if the owner or developer or other proprietor thereof shall provide such bond or other warranty in lieu of completion as may be determined necessary by the Board.

ARTICLE VI
MISCELLANEOUS

600. Fees

600.01 Development Fees

Initial fees for preliminary plat review, construction plan review, inspections and final plat review shall be as established in Exhibit B hereto. Provided, however, the Mayor and Board of Aldermen shall regularly review said fee schedule and shall when they deem appropriate adopt by resolution updated fee schedules. These shall become effective in the time set out by each such resolution adopting updated fee schedules and shall be available to the public upon adoption.

601. One Year Warranty

Prior to the final acceptance by the City of Byram of the dedicated utilities and streets, a one year warranty (see Exhibit A) shall be submitted by all prime contractors for their phase of the work and by the owner for all the work performed. [The warranty begins after the final surface of asphalt has been installed.] The City of Byram does not accept the dedicated streets for maintenance until the final surface of asphalt has been installed.

602. Variances

602.01 Where the Board finds that extraordinary hardships may result from strict compliance with these regulations, they may vary the regulations so that substantial justice may be done and public interest secured, provided that such variance will not have the effect of nullifying the intent and purpose of these regulations.

602.02 In granting variances, the Board may require such conditions that are necessary, in their judgment, to secure substantially the objectives of the standards or requirements so varied or modified.

603. Penalties

603.01 Any person, firm, entity, or corporation using an approved and unrecorded plat in the sale of subdivided land or violating any of the terms or provisions of these subdivision regulations shall be guilty of a misdemeanor, and, upon conviction, may be punished by a fine of not more than One Thousand Dollars (\$1000.00) and not more than 90 days confinement in the county jail. Each violation and each day of failure to comply with the provisions of these regulations shall constitute a separate violation.

604. Amendments

604.01 The Board may from time to time adopt amendments that will tend to increase the effectiveness of these development regulations. The development regulations may

be revised or amended by the Board as required by law.

605. Validity

605.01 If for any reason any section, paragraph, subdivision, clause, phrase, or provision of this ordinance shall be held invalid, it shall not affect the remaining provisions of this, or any ordinance of the City, to which these rules and regulations relate.

606. Repealer

606.01 All ordinances or parts of ordinances in conflict with this ordinance or inconsistent with the provisions of this ordinance, are hereby repealed to the extent necessary to give this ordinance full force and effect.

607. Effective Date

607.01 This ordinance shall take effect and be in force thirty (30) days from and after its passage. Adopted on the _____ day of _____, 20____.

ATTEST:

Mayor, City of Byram, Mississippi

City Clerk,
City of Byram, Mississippi

Exhibit "A"

ONE YEAR WARRANTY

(SUBDIVISION
or
DEVELOPMENT)

All work performed by _____ and consisting generally of _____

is hereby guaranteed by the undersigned against defects resulting from the use of inferior materials, equipment or workmanship for one year from date of final completion and acceptance by the City of Byram, Mississippi or when the final surface of asphalt has been installed, whichever is later. If, in the opinion of the City Engineer for the City of Byram, Mississippi, the materials, equipment and/or construction fail to serve the purpose for which they are installed, the undersigned agrees to repair or replace the said defective parts or workmanship to the complete satisfaction of the City Engineer for the City of Byram, Mississippi and without cost to the City of Byram, Mississippi.

Title: _____

Date: _____

Date of Final Acceptance by the City of Byram, Mississippi.

Date of acceptance of Final Surface of Asphalt

EXHIBIT "B"
DEVELOPMENT FEES

PRELIMINARY PLAT FEE - At the time of filing an application for preliminary plat approval, the developer shall pay to the city clerk a filing fee of \$250.00. No action of the Board shall be valid until the fee has been paid to and accepted by the City Clerk. This fee shall be charged on all plats regardless of whether the plat is approved or disapproved.

CONSTRUCTION PLAN REVIEW FEE - At the time of submitting construction plans for approval, the developer shall pay to the clerk a fee \$1,000.00 plus \$25.00 per lot for single-family residential; or \$20.00 for each multi-family residential unit (each apartment or other multi-type unit); or a minimum of \$500.00 or \$100.00 per acre, whichever is greater, for a commercial or industrial facility. For subdivision with lots larger than one acre, an additional fee shall be \$25.00 per acre for the entire subdivision. Plan review shall not commence until the fee has been paid.

FINAL PLAT FEE - At the time of filing an application for final plat approval, the developer shall pay to the city clerk a filing fee of \$250.00. No action of the Board shall be valid until the fee has been paid to and accepted by the City Clerk. This fee shall be charged on all plats regardless of whether the plat is approved or disapproved.

INSPECTION FEES - As improvements are completed, the developer shall request an inspection and a fee of \$150.00 shall be paid to the city clerk for each approval inspection request. If the work is not approved, each subsequent inspection will require payment of an additional \$75.00 fee. A 48-hour notice is required for the following inspections:

1. Water/sewer tie in inspection
2. Proof roll inspection
3. Final construction inspection
4. Warranty inspection

STANDARDS OF DESIGN AND SPECIFICATIONS
FOR DEVELOPMENTS
CITY OF BYRAM, MISSISSIPPI

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PAVING AND DRAINAGE SPECIFICATIONS

Adopted by the Mayor
and Board of Aldermen
on March 11, 2010

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STANDARDS OF DESIGN AND SPECIFICATIONS

DESIGN STANDARDS

A. FILLING AND GRADING

All swampy or low areas shall be filled and/or drained to prevent ponding of water and nuisances occasioned thereby as well as rounded, leveled and/or otherwise graded to a configuration commensurate with the overall development.

All swales and other areas within twenty-five (25) feet of a building site shall be sloped to a gradient in excess of one (1) foot per one hundred (100) feet with the exception that deep well-defined flat and wide bottomed ditches may be sloped at gradients occasioned by the formulae outlined in the following part section of this resolution. Gradients causing flows of less than three (3) feet per second will not be permitted. Ditches with gradients causing velocities in excess of five (5) feet per second shall be lined with solid sod, concrete or other approved materials. Street grading will be accomplished as outlined in Section C.

B. STORM SEWERS, CULVERTS AND CHANNELS

The design of storm water drainage systems shall insure adequate control of storm water runoff through the use of properly sized and positioned drainage structures including, but not limited to, curb and gutter, curb and grate inlets, storm drains, box culverts, intersectional drains, open ditches and bridges. The design of all storm water drainage systems (main channels) shall be in accordance with the City of Byram's master drainage plan for the basin in which the development is located and shall provide for potential effects to upstream and downstream developments in the basin. Drainage facilities shall be designed to prevent excessive runoff onto adjacent properties. Cross drains shall be provided to accommodate all natural water flow and shall be of sufficient length to permit construction of a full width roadway including side slopes. Headwalls or flared end sections, aprons, channel bottom and slope protection shall be provided at the upstream and discharge end of the cross-drain as required by the director of public works/city engineer.

The following storm water design frequencies shall be used in computing design distribution:

TABLE INSET:

100- Year:	All major streams, channels, open ditches or drains within the corporate limits of Byram. All street profile grades must be above the 100-year urban storm water elevation/base flood elevation.
50- Year:	Minor streams, channels, open ditches or sub drains tributary to main streams.
25- Year:	Side drains and miscellaneous culverts where flooding would cause minor adverse affects.

No individual, partnership or corporation shall deepen, widen, fill, reroute or change the location of any existing ditch, stream or drainage canal without first submitting plans and obtaining written permission from the director of public works/city engineer.

The following design criteria shall apply to all storm drainage pipes and culverts:

- (1) *Calculation of design flows for drainage areas less than ten acres:* All pipes, side drains and open ditches shall be designed using the applicable frequency curve. The minimum storm drainage pipe shall be 15 inches and shall be obtained using the Rational Formula (below).
- (2) Storm sewer design velocities shall not exceed ten feet per second.
- (3) For small, compact drainage basins less than ten acres, the peak runoff shall be computed from the Rational Formula.

RATIONAL FORMULA:

$$Q = CIA \text{ (cfs)}$$

TABLE INSET:

Symbol	Unit	Description
Q	cfs	Discharge Computed by Rational Method
C	*	Coefficient of Runoff
I	in/hr	Intensity of Rainfall
A	Acres	Area of Drainage basin

* The value of "C" is obtained from Table A .

TABLE "A"

RUNOFF COEFFICIENT "C"
 VALUE OF "C"
 TABLE INSET:

	-----	SLOPES	-----
<i>Type of Area</i>	<i>Less than 3.5%</i>	3.5%--5.5%	<i>Greater than 5.5%</i>
Woodland	0.25--0.35	0.35--0.70	0.70--0.80
Grassed Areas	0.35--0.45	0.45--0.70	0.70
Paved (Imperv) Areas	0.95	0.95	0.95
Residential*	0.55--0.65	See Note	See Note
Commercial*	0.70--0.90		

* Values of "C" for these areas are computed as weighted average of grassed areas and impervious areas.

TABLE INSET:

Weighted "C" =	<u>(C grass) Grass Area</u>		<u>Imper. Area</u>
	Total Area	+ (C Imper.)	Total Area

* For average residential development the value of "C" shall be taken as 0.75.

FORMULA NO. 1:

TIME OF CONCENTRATION:

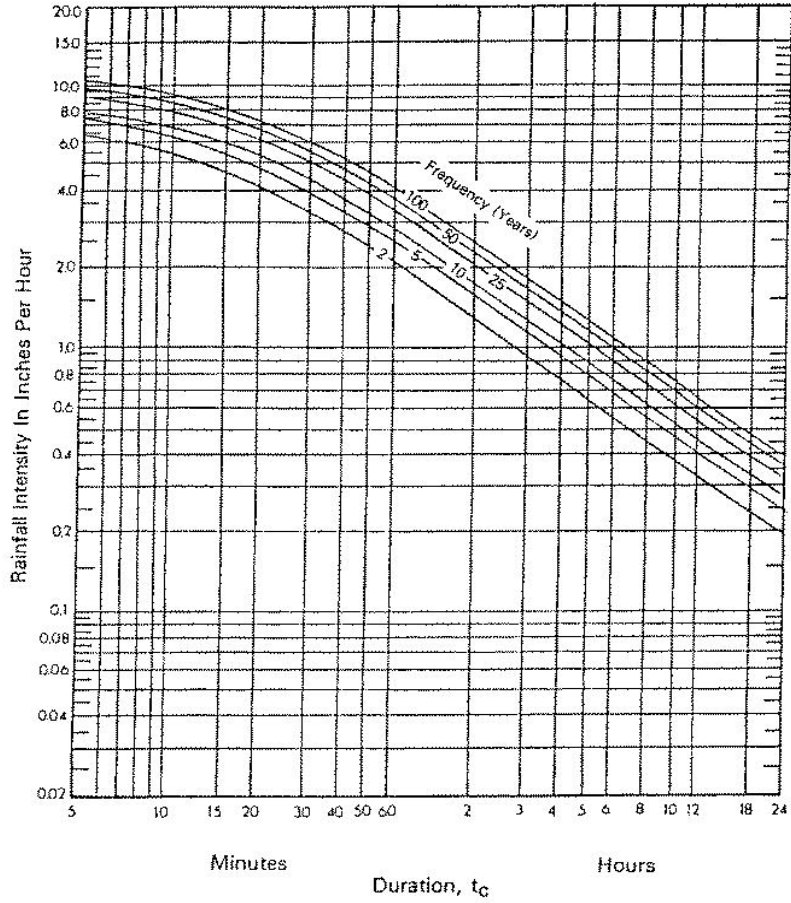
The following formula shall be used to calculate the time of concentration (min.) and rainfall intensity (in/hr) for use in the rational method:

$$t_c = \frac{[10 \times (L^{0.37})]}{[17^c \times (S^{0.21})]}$$

- t_c = time of concentration, minutes
- L = overland flow length, feet
- S = average slope of length of flow, %.
- C = runoff coefficient (rational)

The rainfall intensity "I" in inches per hour shall be estimated from Chart Number One by using Formula No. 1 to estimate the duration in minutes.

CHART NO. 1



Note: Based on data for Vicksburg, Jackson, & Meridian, MS.

**RAINFALL INTENSITY — DURATION — FREQUENCY CURVES
Region II**

CHART 1

Table "B" shall be used as a "rough" check on calculation of the time of concentration.

TABLE "B"

VELOCITY ESTIMATE GUIDE

TABLE INSET:

	<u>Average Velocity Feet-Per-Second For:</u>	
Average Slope of Channel From Farthest Point of Outlet	Small, Shallow Channels	Main Drainage Channels In Natural State
1 to 2 percent	2.0	3.0--5.0
2 to 4 percent	3.0	5.0--8.0
6 to 10 percent	5.0	

TABLE INSET:

AVERAGE VELOCITY
FEET-PER-SECOND
(FOR OVERLAND FLOW)

<u>Slope</u>	<u>Woodlands</u> <i>Upper Portion</i> <i>Watershed</i>	<u>Pastures</u> <i>Upper Portion</i> <i>Watershed</i>	<u>Natural Channel</u> <i>Not Well</i> <i>Defined</i>
1--3 percent	1.0	1.5	1.0
4--7 percent	2.0	3.0	3.0
8--11 percent	3.0	4.0	5.0
12--15 percent	3.5	4.5	8.0

Calculation of design flows for drainage areas greater than ten acres: Design flows shall be obtained by using the "Regional Flood-Frequency Equations for Urbanized Streams" as developed by the U.S. Geological Survey.

All pipes, side drains and open ditches shall be designed using the applicable frequency curve. Storm sewer design velocities shall not exceed ten feet per second.

The following requirements shall apply to the construction of streets, curb and gutter, inlets and minimum habitable building floor elevations:

- (1) The horizontal and vertical alignment of streets shall be compatible with the storm water runoff system and drainage design.
- (2) Street grades shall be coordinated with lot drainage as proposed in the grading plan. Street grades shall be above the 100-year frequency flood level.

(3) The hydraulic capacity of curb inlets shall be determined by generally accepted engineering procedures taking into consideration roughness and street cross slope. The design depth of flow in the curb and gutter section shall not exceed four inches.

(4) The hydraulic capacity of curb inlets shall be determined by generally accepted engineering procedures taking into consideration inlet geometry and characteristics of the gutter flow. Curb inlets shall be spaced to limit the spread of water to not more than one quarter of the street width during a design storm of five-year return period and 15-minute duration. Inlets shall also be placed at all low points in the gutter grade, at intersections where necessary to prevent gutter flow from crossing traffic lanes of an intersecting street or at points of special concern designated by the director of public works/city engineer.

(5) Finished floor of all buildings shall be a minimum of two feet above the 100-year flood elevation, commonly referred to as the base flood elevation (BFE). The structural design of all box culverts or bridges shall conform to the standards of the Mississippi Department of Transportation for a load capacity of HS-20 minimum. All culverts, cross-drains and storm sewers shall be constructed in accordance with the technical specifications contained herein.

The following equations, developed by the U. S. Geological Survey, shall be used to determine the 25-, 50- or 100-year flow:

$$UQ_{25} = 2.78A^{0.31} SL^{0.15}(RI2+3)^{1.76} (ST+8)^{-0.55} (13-BDF)^{-0.29} IA^{0.07} RQ_{25}^{0.60}$$

$$UQ_{50} = 2.67A^{0.29} SL^{0.15}(RI2+3)^{1.74} (ST+8)^{-0.53} (13-BDF)^{-0.28} IA^{0.06} RQ_{50}^{0.62}$$

$$UQ_{100} = 2.50A^{0.29} SL^{0.15} (RI2+3)^{1.76} (ST+8)^{-0.52} (13-BDF)^{-0.28} IA^{0.06} RQ_{100}^{0.63}$$

Where:

UQ_T is the urban peak discharge, in cubic feet per second, for the recurrence interval of T years;

A is the contributing drainage area, in square miles;

SL is the main channel slope, in feet per mile, measured between points which are 10 percent and 85 percent of the main channel length upstream from the study site (for sites where SL is greater than 70, 70 is used in the equations);

$RI2$ is rainfall intensity, in inches, for the 2-hour 2-year occurrence (U.S. Weather Bureau, 1961);

ST is basin storage, the percentage of the drainage basin occupied by lakes, reservoirs, swamps, and wetlands (in-channel storage of a temporary nature, resulting from detention ponds or roadway embankments, is not included in the computation of ST);

BFD is the basin development factor;

IA is the percentage of the drainage basin occupied by impervious surfaces, such as houses, buildings, streets, and parking lots: and

RQ T is the peak discharge, in cubic feet per seconds, for an equivalent rural drainage basin in the same hydrologic area as the urban basin, and for recurrence interval of T years.

*The basin development factor (BDF)
describes the conditions of the drainage system.*

*The following description of the BDF and
how it is computed is a quotation from
Sauer and others (1983):*

"The most significant index of urbanization that results from this study is a basin development factor (BDF), which provides a measure of the efficiency of the drainage system."

"This parameter, which proved to be highly significant in the regression equations, can be easily determined from drainage maps and field inspections of the drainage basin. The basin is first divided into thirds. Then, within each third, four aspects of the drainage system are evaluated and each assigned a code as follows:"

"(1) *Channel improvements.* If channel improvements such as straightening, enlarging, deepening, and clearing are prevalent for the main drainage channels and principal tributaries (those that drain directly into the main channel), then a code of 1 is assigned. Any or all of these improvements would qualify for a code of 1. To be considered prevalent, at least 50 percent of the main drainage channels and principal tributaries must be improved to some degree over natural conditions. If channel improvements are not prevalent, then a code of zero is assigned."

"(2) *Channel linings.* If more than 50 percent of the length of the main drainage channels and principal tributaries has been lined with an impervious material, such as concrete, then a code of 1 is assigned to this aspect. If less than 50 percent of these channels is lined, then a code of zero is assigned. The presence of channel linings would obviously indicate the presence of channel improvements as well. Therefore, this is an added factor and indicates a more highly developed drainage system."

"(3) *Storm drains, or storm sewers.* Storm drains are defined as enclosed drainage structures (usually pipes), frequently used on the second tributaries where the drainage is received directly from streets or parking lots. Many of these drains empty into open channels; however, in some basins they empty into channels enclosed as box or pipe culverts. When more than 50 percent of the secondary tributaries within a subarea (third) consists of storm drains, then a code of 1 is assigned to this aspect; if less than 50 percent of the secondary tributaries consists of storm drains, then a code of zero is assigned. It should be noted that if 50 percent or more of the main drainage channels and principal tributaries are enclosed, then the aspects of channel improvements and channel linings would also be assigned a code of 1."

"(4) *Curb and gutter streets.* If more than 50 percent of a subarea (third) is urbanized (covered by residential, commercial, and/or industrial development), and if more than 50 percent of the streets and highways in the subarea are constructed with curbs and gutters, then a code of 1 would be assigned to this aspect. Otherwise, it would receive a code of zero. Drainage from curb-and-gutter streets frequently empties into storm drains."

"The above guidelines for determining the various drainage-system codes are not intended to be precise measurements. A certain amount of subjectivity will necessarily be involved. Field checking should be performed to obtain the best estimate. The basin development factor (BDF) is the sum of the assigned codes; therefore, with three subareas (thirds) per basin, and four drainage aspects to which codes are assigned in each subarea, the maximum value for a fully developed drainage system would be 12. Conversely, if the drainage system were totally undeveloped, then a BDF of zero would result. Such a condition does not necessarily mean that the basin is unaffected by urbanization. In fact, a basin could be partially urbanized, have some impervious area, have some improvement of secondary tributaries, and still have an assigned BDF of zero."

"The BDF is a fairly easy index to estimate for an existing urban basin. The 50-percent guideline will usually not be difficult to evaluate because many urban areas tend to use the same design criteria, and therefore have similar drainage aspects, throughout. Also, the BDF is convenient for projecting future development. Obviously, full development of the drainage system and maximum urban effects on peaks would occur when BDF=12. Projections of full development or intermediate stages of development can usually be obtained from city engineers."

C. STREETS

The recommendations, standards, criteria and parameters of design listed in the latest published edition of A Policy on Arterial Highways in Urban Areas and Standard Specifications for Highway Bridges and Culverts, as distributed by the American Association for State Highway Officials shall apply to the geometrics, routing and safety features of street design and construction unless such recommendation, standard, criteria or parameter is in conflict with these regulations or any comprehensive plan adopted or to be adopted by the City of Byram.

Streets shall be constructed with a bituminous surfacing covering a crushed limestone, stabilized sand clay, soil cement or asphalt stabilized base of a thickness adequate to support the contemplated vehicular loading on the type of soil comprising the subgrade. The base shall be supported by a compact natural earth or an embankment compacted to the prescribed density and placed upon a subgrade free of debris and other objectionable materials. All streets shall be completely free of sections or isolated locations of earth with weak supporting characteristics.

Reinforced concrete barrier type curb and gutter shall be used to support the edge of pavements or surfacing on streets abutted by lands in, or designated for, commercial use as well as those locations where the barrier-type curb is required for channelization and control of traffic. A reinforced curb and gutter or raised edge curb shall be used in cut sections where the gradient of the street exceeds four percent (4%).

The requirements listed in the table "Construction Minimums for Streets" are hereby

established as the minimum dimensions for the category of street shown; however, the Board reserves the right to establish other and higher standards and criteria of design for any street proposed for maintenance by city forces. Detailed specifications for materials and construction shall be in compliance with the Paving and Drainage Specifications, City of Byram, Standards of Design and Specifications.

CONSTRUCTION MINIMUMS FOR STREETS

Component	Arterial Street	Collector Street	Local Street	Cul-de-Sac
Number of Travel Lanes	4	2	2	2
Width of Travel Lanes	12'	12'	10'	10'
Parking	Opt.	1 Side	1 Side	1 Side
Width of Parking Strip	8' (a)	8'	8'	8'
Radius of Pavement @ Intersection	36'	30'	20'	20'
Width of Sidewalk	Not Req'd	6' (b)	4' (b)	-
Width of Base	Pavement Width+2'	29'	25'	23'
Curb to Curb, Back to Back	Not Req'd	33'	29'	27'
Width of Shoulder	10'	-	-	-
Fore Slopes	4:1	-	-	-
Back Slopes	3:1	3:1	3:1	3:1
Depth of Ditch (c)	3.0'	-	-	-
Gradient of Roadway (C&G)	0.7%	0.7%	0.7%	0.7%
Gradient of Ditches	0.7%	-	-	-
Type Pavement	Asp. Conc.	Asp. Conc.	Asp. Conc.	Asp. Conc.
Thickness of Pavement (d)				
Base Thickness (d)				
Slope of Crown	2%	2%	2%	2%
Embankment Compaction	96%	96%	96%	96%
Sub-grade (Top 6 Inches)	96%	96%	96%	96%
Right-of-Way	100'	60'	50'	50'

- (a) Stabilized shoulder may be provided in lieu of Parking Strip.
- (b) Sidewalks shall be required in commercial areas and locations of high pedestrian density such as walks to schools, playgrounds, etc.
- (c) As measured vertically from the shoulder line to the ditch invert.
- (d) See Table 1, Minimum Requirements for Asphalt Pavements.

D. WATER DISTRIBUTION SYSTEM

Any and all elements of any water distribution system shall be designed and installed in accordance with the City of Jackson Specifications and the City of Byram Specifications and the plans shall be approved by the Mississippi State Department of Health. The physical connection by users on the system installed by the developer and the public or certificated private system shall not be made until the system being installed has been sterilized and a clear or negative bacteriological report obtained from the Mississippi State Department of Health.

Water mains for residential areas shall be designed to supply water to each customer at a rate in excess of fifteen (15) gallons per minute at a residual pressure of forty (40) psi plus the fire flows established herein.

Water mains in a fire protection grid shall be capable of delivering peak usage plus seven hundred fifty (750) gpm to each fire hydrant in a residential area and two thousand (2,000) gpm in commercial or industrial areas with a residual pressure of twenty (20) psi. In areas with multi-story buildings, the residual pressure shall be increased accordingly.

Design criteria and parameters not included herein shall be those outlined in the latest published edition of the Recommended Minimum Design Criteria for Public Water Systems, as distributed by the Mississippi State Department of Health, Division of Water Supply, and Recommended Standards for Water Works, as distributed by the American Water Works Association and/or the criteria and parameters distributed by other nationally recognized associations or institutes.

Water systems shall be designed to provide any additional capability that might be necessary to serve properties located beyond or away from elements of the distribution system; provided, however, a developer will not be required to install a water main in a residential subdivision that exceeds his requirements in diameter unless the parties being benefitted thereby agree to pay the additional cost of a larger main.

Water mains and appurtenances installed in areas other than those designated for residential use shall be capable of delivering water at rates and pressures commensurate with the required use and/or fire protection needs as established by the Public Works and Fire Departments. The diameters of distribution mains, service lines and appurtenances shall not be less than those shown in the following table, "Installation Minimums for Water Distribution Systems".

Component	Industrial Areas	Commercial Areas	Residential Areas
Diameter of Mains:			
For Fire Protection	8"	8"	8"
For Domestic Requirement	6"	6"	2"
Diameter of Service Lines	1"	3/4"	3/4"
Corporation Stop	1"	3/4"	3/4"
Service Termination Valve	1"	3/4"	3/4"
Fire Hydrants (Valve Opening)	5-1/4"	5-1/4"	5-1/4"

All distribution mains and system appurtenances shall be installed at a depth of thirty-six (36) inches or more in the utility strip or at such other location not under a paved surface as to be convenient for connecting consumers and/or maintaining mains.

Service lines shall be constructed prior to construction of the base course for streets or shall be installed by use of a boring process that will not disturb the surface of paved streets.

Design velocities shall range from two (2) to four (4) feet per second using Williams and Hazen formula with C=120. All mains shall have a minimum cover of thirty-six (36) inches.

E. WASTEWATER AND/OR SEWAGE COLLECTION AND DISPOSAL SYSTEM

The design criteria and parameters and standards of construction for sewer systems shall be those outlined in the latest published edition of State of Mississippi Wastewater Treatment Facilities Operations and Training Manual.

Within developments other than subdivisions, the sanitary wastewater main shall terminate as determined by the director of planning and development. All service lines shall terminate above ground and marked with a metal T-post painted red.

All wastewater mains shall be correlated with and connected into the public utility wastewater collection and transport system in a manner commensurate with future needs and shall be designed to provide any additional capability necessary to serve other properties located upstream in the natural drainage basin served by the wastewater main.

Any and all elements of any wastewater collection and transport system within the city shall be installed in accordance with the recommendations of and approval of the Mississippi Department of Environmental Quality, Office of Pollution Control, the City of Byram and any certificated sewer utility.

The minimum design standards of the sanitary wastewater collection system for each subdivision shall conform to the following:

1. Minimum pipe size: eight inches. Six-inch diameter pipe may be utilized for cul-de-sacs or dead end streets serving eight or fewer residences where no further development is possible.
2. Minimum pipe slope: 0.40 percent for eight-inch pipe, based on the Manning Formula and adequate to provide a minimum velocity of two feet per second assuming a roughness coefficient of .013 for large sizes.
3. Minimum velocity: two feet per second based on slope and roughness coefficient of .013.
4. Maximum velocity: nine feet per second.
5. Maximum depth of flow at full development.

TABLE INSET:

Collection	Sub interceptor	Interceptor
8"	10", 12", 15"	18" up
1/2 full	3/4 full	Full

6. Waste per load person: 100 gallons per day including base infiltration/inflow.

7. People per house: four.
8. Peak factor: 3.5 minimum.
9. Maximum manhole separation: 400 feet with manholes required at each grade change and horizontal alignment change.
10. Minimum cover: three feet.
11. Top manhole elevation: ground elevation, minimum. In flood prone areas, two feet above 100-year flood level.

The diameters of the sewer mains and service laterals shall not be less than those shown in the following table "Installation Minimums for Sewer Mains".

Component	Industrial Areas	Commercial Areas	Residential Areas
Collection Laterals - Mains	8"	8"	8"
Service Laterals	6"	6"	6"
Manhole Diameter	4'	4'	4'

All collection laterals, mains and system appurtenances shall be installed with a depth of cover in excess of three (3) feet in the utility strip or at other location not under a paved surface as convenient for connection to and/or maintenance of the mains. Portions of sewers may be located under pavement if street configurations dictate and may be located in easements outside street rights-of-way if the topography of the area so requires. Where depth of cover on a sewer is less than two and one-half (2 1/2) feet, the sewer shall be constructed of ductile iron pipe. Service laterals shall be installed at the one-third (1/3) point on the low side of the lot wherever practical. Service and collection laterals must be constructed prior to the construction of the base course for the street in which the lateral is installed. Sewer systems shall be designed to the gradient and at the capability necessary to serve properties upstream of the property being developed. However, a developer will not be required to install a sewer main in a residential subdivision that exceeds ten (10) inches in diameter unless the parties being benefited thereby agree to pay the additional cost of a larger main. Sanitary sewers shall be constructed in accordance with City of Byram, Sewage Collection Specifications. Manholes shall be installed at all changes in size, grade or alignment and shall have a spacing not to exceed four hundred (400) feet, unless approved in writing by the Public Works Department.

The use of wastewater lift stations should be minimized; however, when lift or pump stations cannot be avoided; same should be designed for ease of maintenance, maximum operating life and adequate pumping capacity. The design calculations must reflect flow rates and velocities for the lift or pump station including but not limited to the following:

1. Minimum of two pumps, which are non-clog with three-phase motors, each pump to have capacity to handle the expected peak load.
2. Adequate controls with overload and lightning protection and alternators.
3. Adequate pump housing and heaters to prevent freezing.

4. Adequate capacity for not more than 75 percent duty cycle under peak flow conditions.
5. Necessary access roads, access easements and wooden security fencing with double gate and lock.
6. Velocities in the force main shall be between 2.5 and eight fps.
7. Adequate vented wet-well.
8. A separate valve pit shall be required.

All wastewater collection mains, laterals and appurtenances shall be constructed in accordance with the approved construction plans and specifications.

DIVISION 100 - CONCRETE STRUCTURES

INDEX

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DIVISION 100

DETAILED SPECIFICATIONS – CONCRETE STRUCTURES

101 CONCRETE

101-10 GENERAL The requirements of this section apply to all concrete work, concrete surface treatments, cement finishes, cast-in anchorages, and similar work. Concrete work called for by other sections of these specifications, if not specifically described, otherwise, shall conform to the requirements of this section.

101-10.01 COMPOSITION Concrete shall be composed of fine and coarse aggregates, Portland Cement, water, and such admixtures as may be specified. See table 3 “MASTER PROPORTION TABLE FOR STRUCTURAL CONCRETE DESIGN” of MDOT Special Provision No. 907-804 for information on proportioning concrete mixtures.

Class B	3500 psi for Structures
Class C	3000 psi for Sidewalks, Curbs
Class D	2000 psi Concrete Encasement

All concrete shown in the MDOT table contains air entrainment. Any concrete not exposed to the environment does not require air entrainment. Mix designs submitted shall indicate where the mixture is to be used and whether or not it is an air entrained mix design.

101-20 CONCRETE MATERIALS

101-20.01 CEMENT Cement shall be Type I, Type II, or Type III Portland Cement, the composition, marking, handling, and storage of which shall conform to ASTM C-150. Type III (High Early Strength) cement shall be subject to the approval of the Engineer in each instance for its proposed use. Cement which has become damp, lumpy, or otherwise affected so as to reduce its strength shall not be used in the work. The Contractor shall furnish the City with Certified Mill Test Reports for all cementitious used on the work. The maximum replacement of Portland cement by weight is 25% for fly ash and 50% for ground granulated blast furnace slag.

101-20.02 AGGREGATES Coarse and fine aggregates used in Portland cement concrete must comply with the requirements listed in sections 703.01, 703.02, and 703.03 and of MDOT’s “Mississippi Standard Specifications For Road and Bridge Construction” and ASTM C 33.

The mixing water shall comply with the requirements listed in Section 5.1.3 of ASTM C-94 “The Standard Specification for Ready-Mixed Concrete”. Admixtures to enhance strength and workability will be permitted if the Contractor

proposes their use, subject to the approval of the City Engineer. All admixtures used shall meet the requirements of ASTM C 494. Water reducing admixtures may be used to increase the specified slump up to 6 inches with an approved mid-range water reducer or up to 8 inches with an approved type F or G high range water reducer. A mid-range water reducer is classified as a water reducer that reduces the mix water a minimum of 8% when compared to a control mix with no admixtures. Aggregate for cement finish, whether integral or separate topping, shall be clean washed and so graded that no more than five percent will pass through a 10-mesh sieve and no more than fifteen percent will pass a 50-mesh sieve.

101-20.03 MIXING AND PROPORTIONING CONCRETE Concrete shall be produced from a facility that meets the requirements of the National Ready Mixed Concrete Association (NRMCA) Quality Control Manual Section 3 Checklist. Proof of meeting these requirements shall be provided to the Engineer.

If “Ready-Mixed” concrete is used, the mixing and transportation operations shall conform to ASTM C-94. The requirements of Section 11.7 of C-94 shall be followed except; a maximum of 1-½ gallons of water per cubic yard shall be allowed to be added to bring the slump within the required limits.

If dry batched on the job site, the batching plant operations shall be performed in such a manner as to prevent loss, segregation, or contamination of the ingredients. If job proportioned and mixed, the aggregate shall be stockpiled separately and handled in such a manner as to prevent the inclusion of any foreign materials. Cement shall be stored in a watertight building with the floor raised off the ground. Except for emergency hand mixing under approved conditions, all concrete shall be machine-mixed in an approved type mixer for a minimum period of 1.5 minutes in a drum rotating at a peripheral speed of about 200 feet per minute.

Aggregates shall be proportioned by weight unless the Engineer approves a satisfactory volumetric method of measurement. The use of fractional sacks of cement will not be permitted unless the cement is proportioned by weight. The technician proportioning the mix shall use the absolute volume method described in ACI’s Committee 211 “Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete (ACI 211.1)”. The technician shall perform all services necessary for the design of mix and redesign where changes are made in the aggregates or in the plasticity or workability of the concrete. An individual meeting the requirements of MDOT QC/QA Concrete Technician Class 3 or equivalent shall design all concrete mixes.

Sampling and testing fresh concrete shall comply with the requirements listed in Section 16 of C-94. All technicians testing concrete in the field shall be certified as an ACI Concrete Field Testing Technician Grade 1.

The testing laboratory shall submit a report on each strength test. These reports shall show all of the data customarily listed by the laboratory in reporting on such strength tests. One (1) copy of these reports shall be given to the City Engineer

and one (1) copy to the ready-mix producer. All strength tests shall be the average of at least two cylinders.

102 CONSTRUCTION

102-10.01 FORMS Forms for concrete work shall be so constructed that the finished concrete will conform to the shapes, lines, grades, and dimensions indicated on the drawings. Materials used in these forms for exposed surfaces shall be dressed to a uniform thickness and shall be free of defects. Joints in forms shall be horizontal or vertical, unless otherwise specified. Lumber once used in forms, or used lumber, shall be cleaned and satisfactorily reconditioned. Where concrete surfaces are exposed on the exterior or interior of walls or other surfaces are to be plastered, the use of large surface form material such as 3/4" plywood or Masonite concrete form boards will be required. Undersides of exposed concrete slabs shall be a true plane.

Forms shall be sufficiently tight to prevent the leakage of mortar. They shall be properly shored, braced, and otherwise supported so as to maintain the desired position and shape during and after placing concrete. Exposed concrete shall have form marks rubbed down, having a smooth surface and finished as hereinafter specified.

Internal metal ties shall be so arranged that when the forms are removed, no metal shall be within one inch of any surface. Reinforcing steel shall have a minimum concrete cover as specified in Section 7.7 of ACI 318 "Building Code Requirements for Structural Concrete."

Bottoms of earth forms for beams shall be level; the sides shall be even and clean, and unless otherwise shown, shall be vertical.

The inside of forms shall be coated with a non-staining mineral oil or other approved material. Oil shall be applied before the reinforcement is placed.

A one-inch chamfer strip shall be placed at all exterior exposed corners and where shown on plans.

Temporary openings shall be provided at the base of column and wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

The removal of forms shall be subject to the Engineer's approval and shall not be started until the concrete has attained the necessary strength to support its own weight and any construction live loads.

102-10.02 DEPOSITING CONCRETE Concrete delivered in cold weather shall have the minimum temperature specified in Section 11.8 of C-94.

When the Contractor proposes to place concrete during seasons when there is a probability of ambient temperatures lower than 40°F, the Contractor shall have available on the project the approved facilities necessary to enclose uncured concrete and to keep the temperature of the air inside the enclosure within the ranges and for the minimum periods specified herein.

When there are indications of temperatures of less than 40°F during the first four days after placement of the concrete, the concrete shall be protected from cold temperatures by maintaining a temperature between 50°F and 100°F for at least four days after placement and between 40°F and 100°F for at least three additional days. The Contractor shall use such heating equipment such as stoves, salamanders, or steam equipment as deemed necessary to protect the concrete. When dry heat is used, means of maintaining atmospheric moisture shall be provided.

Hardened concrete and foreign materials shall be removed from the inner surfaces of mixing and conveying equipment before concrete is mixed. Before depositing concrete, forms shall be thoroughly wetted and all debris removed.

Water shall be removed from the space to be occupied by concrete, and any continuous flow of water shall be diverted to a sump or removed by pumping. Concrete shall be deposited in the forms as rapidly as practicable to its final position and in such a manner as to prevent segregation.

Concrete during and immediately after depositing shall be thoroughly compacted by means of suitable tools, the use of approved type mechanical vibration is recommended.

No concrete shall be deposited with a free fall of more than 5'-0". The engineer shall approve the use of a tremie or other mechanisms for conveying concrete to point of deposit. Proper openings shall be constructed in high wall forms for pouring concrete.

Concrete shall be deposited continuously or in layers of such thickness that no concrete will be deposited against concrete which has hardened. If a section cannot be placed continuously, construction joints may be located at points as provided for in the drawings or approved by the Engineer. Before depositing new concrete against old, the forms shall be re-tightened, the hardened surfaces cleaned and covered with a coating of neat cement grout. Contractors shall provide a slump test and stress test for each 500 cubic feet of concrete poured in accordance with NCI standards. (At least one required).

102-10.03 FINISHING AND CURING SLABS All slabs will receive either wood float or steel trowel finish as shown on plans. Immediately after final troweling, all concrete floors and roof slabs of building shall be cured with an approved curing compound meeting the requirements of ASTM C -1315 applied in accordance with the manufacturer's recommendation. The engineer shall approve the use of curing compounds when used on concrete to receive flooring and other products. No compound shall be placed on construction joints and dowels. The engineer shall approve other methods of curing.

102-10.04 WALL FINISHING All forms on exposed surfaces to be rubbed shall be removed within 48 hours. Soft forms shall remain in place until curing time has elapsed. All form ties shall be cut back into wall 1" and pointed and patched.

When the pointing has set sufficiently to permit, all exposed wall surfaces shall be wet with a brush and given a first surface rubbing with a No. 16 Carborundum

Stone or an abrasive of equal quality. The rubbing shall be continued sufficiently to bring a smooth dense surface without pits or irregularities. The use of cement to form a surface paste will not be permitted. The material which has been ground to a paste in this process shall be carefully spread or brushed uniformly over the surface and allowed to take a reset.

102 -10.05 USE SPECIFICATIONS Following is a schedule of the locations and uses for which concrete, its various surfacing and finishing treatments, cast-in anchorage, various accessories, and protective covering materials and methods.

Aggregate Sizes: The nominal maximum size of coarse aggregate shall be as specified in Section 3.3.2 of ACI 318.

Built-In Connections, Sleeves, etc. Contractors for other trades requiring built-in connections, sleeves, slots, chases, recesses, etc., in concrete work will be responsible for the placing of same before concrete is poured.

102-10.06 WALKS The Contractor shall install all concrete walks as indicated on plans. The sub-grade to be properly prepared, tamped, and covered with a 1" sand fill, and walks shall be full thickness of 4" minimum with a 5" for all areas with control joints over 4'-0" apart.

Walks to be well troweled and finished in a brush finish, with neatly tooled edges and joints 4' 0" apart. All surfaces are to be sloped to drain. Provide steps where required. Provide 1/2" isolation joints where joining fixed objects and other structures.

102-10.07 CONSTRUCTION JOINTS AND WATERPROOFING In

waterproofing, where shown on plans, over the sand fill under floor slabs, lay one layer, .022, "Visqueen" manufactured by Visking Manufacturing Company, or equal, lap material 6" at all points. All punctures and torn places shall be patched before placing concrete.

Joints that are indicated on the plans shall be so made and located as to least impair the strength of the structure. Where a joint is to be made, the surface of the concrete shall be thoroughly cleaned. In addition to the foregoing, vertical joints shall be thoroughly wetted and sloshed with a new coat of neat cement grout immediately before placing of new concrete.

At least two hours must lapse after depositing concrete in the columns or walls, and before depositing in the beams, girders, or slabs supported thereon. Beams, girders, brackets, column capitals, and haunches shall be considered as part of the floor system and shall be placed monolithically therewith.

All locations shown on plans and all construction joints subjected to hydrostatic head shall have rubber water stops equal to the manufacture of Williams Equipment Company.

Construction joints in floor shall be located near the middle of the spans of slabs, beams, or girders, unless a beam intersects a girder at this point, in which case the joints in the girders shall be offset a distance equal to twice the width of the beam.

In the last case, provisions shall be made for shear by use of inclined reinforcement.

103 REINFORCEMENT STEEL

103-10 GENERAL The work covered by this section includes the furnishing of all labor, materials, and equipment required for reinforcing and structural steel.

103-10.01 SHOP DRAWINGS Shop drawings shall be submitted in triplicate for the Engineer's approval and correction, and after final approval, three corrected and approved sets are to be furnished.

103-10.02 MATERIALS Reinforcing steel: Reinforcing bars shall conform to ASTM Specifications A-15 or A-16. Deformations of deformed bars shall conform to ASTM Specifications A-305.

Cold drawn wire shall conform to ASTM Specifications A-82.

Welded wire fabric shall conform to ASTM Specifications A-185.

Wall and beam reinforcement and stirrups shall conform to ASTM Specifications A-15 or A-16 for intermediate or hard grade deformed bars.

103-10.03 PLACEMENT Placement shall be accurately formed to the dimensions on the drawings. All bars shall be bent cold and shall not be straightened in a manner which will injure the metal.

Placing Reinforcement: Metal reinforcement before being placed shall be free from scale, heavy rust, and other coatings which would reduce the bond.

Reinforcement shall be accurately positioned and unless otherwise shown or specified, shall be secured against displacement by using, at intersections, annealed iron wire of not less than 18 gauge or suitable metal clips. Metal chairs, spacers, hangers, or bolsters or concrete blocks shall support the reinforcement.

Reinforcement in floors above earth shall be supported by masonry blocking of suitable height to hold the reinforcement at the proper level.

Bars shall be spaced and positioned, as shown on the drawings, reinforcement if not otherwise shown shall be placed, spliced, and located in accordance with the recommendations of the Concrete Reinforcing Steel Institute.

104 ACCESSORIES

104-10 POSITIONING ACCESSORIES Positioning accessories shall include metal spacers, chairs, ties, and such other approved devices as are necessary for proper assembling, spacing, and supporting the reinforcement in position. All such accessories shall be subject to the Engineer's approval for each condition of use. An appropriate accessory or other approved means of positioning and holding shall be used for reinforcement, bolts, anchors, and all members to be cased in concrete.

DIVISION 200 - WATER DISTRIBUTION

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DIVISION 200

DETAILED SPECIFICATIONS - WATER DISTRIBUTION SYSTEM

201 - GENERAL

201-10 DESCRIPTION

201-10.01 These specifications shall govern the furnishing and installing of water distribution lines, fittings, valves, fire hydrants, and other appurtenances. The pipe and accessories shall be installed in accordance with the requirements of these specifications at the locations and depths indicated on the plans and shall be of the classes, sizes and dimensions shown thereon.

201-10.02 The installation of pipe shall include all joints, connections to new or existing pipes, and the installation of all fittings, valves, fire hydrants, and other appurtenances. The pipe and accessories shall be of the classes, sizes and dimensions shown thereon.

201-10.03 Water main shall be of PVC, HDPE or DI manufacture as specified herein.

201-10.04 All materials, whether supplied by the Owner or the Contractor shall meet this Specification.

201-10.05 The work, materials and related activities shall be in accordance with the latest standards of the American Water Works Association, American National Standards Institute, Uni-Bell Pipe Association, Mississippi Department of Health, Mississippi Department of Environmental Quality, and any other related State or Federal standards or requirements.

202 - MATERIALS

202-10 PIPE, COUPLINGS AND ACCESSORIES

202-10.01 PVC Pipe:

All PVC pipe and fittings four (4) inches and larger in diameter shall conform to the latest edition of AWWA C-900 and shall be made from Class 12454-A or B materials per the latest edition of ASTM D-1784. Pipe shall be a minimum of SDR 18 unless otherwise specified, for a working pressure rating of 150 PSI. All pipe shall conform with the outside diameter (OD) dimensions of ductile iron pipe to facilitate use of DIP fittings, standard cast iron valves and specials. All joints shall be elastomeric seals conforming to the latest edition of ASTM D-3139 with gaskets conforming to the latest edition of ASTM F-477. All pipe shall bear the seal of the National Sanitation Foundation (NSF). All jointing shall be made in accordance with the manufacturer's recommendations.

202-10.02 All PVC pipe three (3) inches and smaller in diameter shall conform to the latest edition of ASTM D-2241 and shall be made from Type 1120 material. Pipe shall be a minimum of SDR 26 unless otherwise specified, for a working

pressure of 150 PSI. All joints shall be solvent weld in accordance with the latest edition of ASTM D-2855 with the solvent cement conforming to the latest edition of ASTM D-2564. All pipe shall bear the seal of the NSF. All jointing shall be made in accordance with the manufacturer's recommendations.

202-10.03 HDPE Pipe:

HDPE pipe shall conform to ASTM D1248, D3350 and D3035. Unless otherwise specified, pipe shall be of high molecular weight distribution designated as PE 3408 with an ASTM D3350 cell classification number of 345434C. Pipe shall be designated to accommodate all expected loads with a safety factor of 2.0. All HDPE piping shall be designed with an adequate wall thickness to withstand loadings, and under no conditions shall the SDR measurement of the pipe be greater than 11. Pipe ends shall be connected using butt fusion per ASTM D2657, or using stainless steel couplings of a design approved by the Engineer. End sections shall be flared and shall meet the concrete material, steel area, and workmanship requirements for Class III or A-III pipe. Fittings shall be SDR 11 maximum unless otherwise specified. Molded fittings shall be manufactured per ASTM D2513 and installed per ASTM D3261 if fused or otherwise per manufacturer's instructions.

202-20 Ductile Cast Iron Pipe:

All pipes shall be centrifugally cast in metal or sand lined molds manufactured in accordance with the latest edition of ANSI A21.51 (AWWA C 151). Pipe shall be class 50 Ductile Cast Iron unless otherwise specified. All pipe and fittings shall be tested for minimum 150 PSI working pressure, laying condition Type 2 flat bottom trench without blocking, tamped, backfilled and under five (5) feet of cover. All pipes and fittings shall be factory-coated on the outside with coal tar enamel conforming to the latest edition of a 21.5 and lined inside with a minimum of 1/16 inch cement lining in accordance with the latest edition of ANSI A 21.4 (AWWA C-104).

202-20.01 Ductile cast iron pipe installed pursuant to these specifications shall be encased with as 8 mil thick loose polyethylene encasement in accordance with the latest edition of A 21.5 (AWWA C-105).

202-20.02 Joints for ductile cast iron pipe shall be slip-on type unless otherwise specified. All joints for fittings, valves and specials shall be mechanical joints. Slip-on pipe joint for ductile cast iron pipe shall conform to the latest edition of ANSI A 21.11 (AWWA C 111) except that the joints shall be made with a special gasket seal Super-Bel Tite as manufactured by Clow corporation or approved equal. Lubricants shall be non-toxic, odorless and tasteless and shall not support bacteria, and shall be specifically manufactured for the pipe utilized in the construction of potable water systems. Mechanical joint pipes shall conform to the latest edition of ANSI A 21.11 (AWWA C-

111).

202-20.03 All fittings shall be ductile iron and shall conform to the latest edition of AWWA specifications for ductile iron fittings. The minimum wall thickness of the fittings shall be determined consistent with trench conditions 'B' and less than five (5) feet cover.

202-20.04 All fittings shall be coal tar coated outside and cement lined inside in accordance with the latest edition of AWWA C-104 (ANSI 21-4)..

202-30 Valves:

202-30.01 Gate Valves - Shall comply with the latest edition of AWWA C-500 or AWWA C-509 as manufactured by Mueller. Gate valves, for sizes 14 inch and larger, shall be iron body, fully bronze mounted, double disc, parallel seat, non-rising stem, and shall open counter-clockwise. Gate valves for sizes 3-inch through 12-inch shall be resilient-seated for water service. All gate valves shall have a maximum working pressure of 200 PSI and be tested at 400 PSI. The thrust collar and other bearing surfaces shall be permanently lubricated with oil. The disc mechanism shall be designed so that the seating pressure is applied equally at multiple separate contact points near the outer edge of each disc by a bronze or alloy wedging mechanism. Gate valves shall be equipped with mechanical joint connections unless otherwise specified. Valves shall be installed at each intersection or change in pipe size and shall be placed such that no single case of pipe breakage shall require shutting off from service an artery, of more than 500 feet of pipe in any area unless otherwise approved. All valves shall have cast iron valve boxes.

202-30.02 Check Valves - Shall be iron body, counter-weighted non-slam, swing type with straight-away passage of full pipe area and renewable bronze seat ring with resilient faced disc. Valves shall be as manufactured by Mueller. Series A 2602-06-01 or approved equal.

202-40 Services:

Service piping shall be 200 PSI PVC Polyethylene or Type "K" copper as specified on the Proposal and shall conform to the applicable AWWA/ASTM/ANSI Standards and designed for working pressure compatible with the water mains specified above.

202-50 Fire Hydrants:

202-50.01 Fire hydrants shall be Mueller Model "Centurion". Hydrants shall be of the compression type with a 5-1/4 inch valve opening. All hydrants shall be nominal 6" size, 3-way construction with one 4-1/2" pumper nozzle and two 2-1/2" hose connections. Nozzle threads shall be National Standard unless otherwise specified. The depth of bury shall be 4 feet unless otherwise specified.

202-50.02 Hydrants shall be furnished with a sealed oil reservoir located in the bonnet so that all threaded and bearing surfaces are lubricated when the hydrant is operated. Hydrant shall be furnished with a breakable feature that will break cleanly

on impact and shall consist of two part breakable flange with a breakable stem coupling.

202- 50.03 Hydrants shall be wire brushed as needed and painted one coat of red lead paint and two coats of epoxy paint of the color specified by the Engineer.

202-50.04 The distribution and spacing of hydrants for commercial, industrial, and multifamily areas shall be determined by the Grading Schedule for Municipal Fire Protection, 1973 by Insurance Service Office, 160 Water Street, New York, New York 10038 and any future updates thereto. The spacing of fire hydrants in the residential areas shall be not more than 300 feet unless topographical conditions or lot configurations dictate a variance. All fire hydrants shall include a separate valve

202-60 Valve Boxes:

202-60.01 Valve Boxes shall be a two piece, screw type, 5 1/4 inch shaft, as manufactured by the Mueller Company, or approved equal. Contractor shall supply boxes with the correct base for all valves and in correct length for field conditions. The letter "W" or the word "WATER" shall be cast in the valve box cover.

202-60.02 Valve box castings shall be manufactured of clean, even grain, gray cast iron conforming to ASTM Designation A 48, Class 30B, Gray Iron Castings; and be smooth true to pattern, free from blow holes, projections, or other harmful defects. Coat the valve boxes with a single coat of coal tar pitch before machining, so that machined seating surfaces will be free of any coating. Machine the seating surfaces so that the cover will not rock.

202-70 Corporation Stops and Curb Stops:

Corporation stops and curb stops shall be Ford B43-232WG and Ford F 1000 respectively as manufactured by Ford Company or approved equal.

202-80 Service Clamps:

Service clamps shall be Ford 202B, double brass strap design as manufactured by Ford Corporation or approved equal. All service connections or PVC mains shall be equipped with service clamps unless otherwise noted.

202-90 Water Meters:

Water meters shall be the positive displacement type with hermetically sealed registers and shall be read in gallons. They shall be manufactured by Badger Manufacturing Company or approved equal. Meters shall be complete with stub connections. At the discretion of the Mayor and Board of Alderman an automated reading system (ie Touch Read) will be installed upon the recommendation of the Public Works Director.

202-100 Specials:

Specials shall be of the same material as the pipe material being used or as approved by the Engineer. The term specials shall include plugs, caps, and other items as needed. Specials shall conform to the applicable AWWA/ASTM/ANSI Standards and shall be designed for the working pressure of the water mains on which they are being installed.

202-110 BEDDING AND BACKFILL

202 -110.01 Native material excavated from the trench shall be used for bedding and backfill under normal circumstances where approved by the Engineer.

202-110.02 Select bedding or backfill shall be provided where called for by the Engineer. Such select bedding shall be a well graded uniform mixture of coarse concrete aggregate and coarse sand. Select backfill shall be a sand-clay material with a maximum liquid limit (LL) of 30 and a plasticity index (PI) of less than 10.

203 - EXECUTION

203-10 EXCAVATION

203-10.01 The Contractor shall perform all excavation of every description and of whatever substances encountered to the depth specified in the Plans or as directed by the Engineer. The bottom of all trenches shall be carefully shaped, graded and aligned in accordance with the instructions of the Engineer and to his complete satisfaction before any pipe is placed. All trenches shall be excavated to a depth to maintain minimum cover over the installed pipe of at least 36" for pipe installed under ordinary conditions. The Contractor may reduce or increase the depth of bury at fire hydrant locations to avoid undesirable fire hydrant setting with the approval of the Engineer. Minimum cover over the installed pipe shall be 42" under existing creeks or ditches, or as directed by the Engineer.

203-10.02 Care should be taken in shaping and grading the ditch bottom to assure that the barrel of the pipe rests in uniform and continuous contact with the supporting ground over its entire length and that the bells or joints are entirely free from the bottom of the trench.

203-10.03 In the event it is necessary to place fill in the bottom of the ditch to obtain such uniform contact, it shall be made with approved material and thoroughly compacted in a manner satisfactory to the Engineer. Holes of ample size shall be cut under and around all bells and joints to provide adequate room for making joints. A tolerance of 8 inches from the established grade may be permitted, when approved by the Engineer, if excessive breaks in alignment at the joints prevent proper installation of the pipe.

203-10.04 When rock is encountered, the Contractor shall excavate to a depth at least 4 inches below the required grade and backfill to grade with 4 inches of select bedding.

203-10.05 If the established grade conflicts with other utilities, the water line grade shall be changed to avoid the conflict in a manner acceptable to the Engineer.

203-20 SHEETING AND BRACING

203-20.01 The Contractor shall furnish and place to the satisfaction of the Engineer, such sheeting and bracing as may be required to support the sides of the trench and to protect the workmen and pipe or adjacent structures from injury by the sloughing or caving of the trenches. The sheeting and bracing may be removed as the trench is backfilled, or may be left in place when necessary to prevent damage.

203-20.02 In the event sheeting or bracing is left in place, it shall not exceed nearer than 1 foot to the surface of the ground. In no case will extra compensation be allowed for furnishing, placing, or removing any sheeting and bracing. The cost of this work shall be included in the unit price bid for installing the pipe.

03-30 PIPE LAYING

203-30.01 General: PVC pipe shall be installed in accordance with the latest edition of ASTM D-2321 assuming the use of Class IV native material or better. Ductile iron pipe shall be installed in accordance with the latest edition of AWWA C- 151 using Type 2 bedding and native material. Select bedding or backfill for PVC or DIP water main shall be provided where called for by the Engineer in accordance with the Contract Documents.

203-30.02 Pipe, appurtenances, and fittings shall be laid to the line and grade established on the Plans and as directed by the Engineer. Extra depth shall not be measured unless noted on the Proposal Form.

203-30.03 The inside of the bells and the outside of the spigots shall be thoroughly cleaned before they are placed. The inside of all pipe shall be thoroughly swabbed to ensure that the pipe is clean and free of obstructions and foreign matter until the work is completed.

203 -30.04 Where pipe laying ceases at the end of the day or for any cause, the end of the pipe shall be securely closed in order to prevent the entrance of water, mud or any other objectionable matter.

203-30.05 Pipe shall not be lain when water is in the trench.

203-30.06 Thrust Blocking shall be installed at locations shown on the Plans and as otherwise directed by the Engineer.

203.30.07 A 12-gage solid coated copper tracer wire shall be installed parallel with all water mains.

203.30.08 Contractor shall place magnetic warning tape approximately 12 to 18 inches below grade in all pressure pipe trenches. This tape shall read "CAUTION – BURIED WATER LINE" and shall be 3 inches wide, green background with black lettering.

203-40 MAKING JOINTS

203-40.01 All joints shall be constructed in accordance with the manufacturer's recommendations using the jointing materials, specials and lubricants specified by the manufacturer and approved by the Engineer.

203-50 SETTING FITTINGS, VALVES, HYDRANTS AND SPECIALS

203-50.01 All fittings, valves, valve boxes, hydrants and other appurtenances shall be set at the location indicated on the Plans or as directed by the Engineer. Omission of any of these items shall be corrected by the Contractor without extra cost to the Owner. The addition of any of these items not shown on the plans and requested by the Owner or Engineer which are installed without the expressed consent and agreement of the Engineer shall not be allowed for payment but shall be considered as absorbed costs to the Contractor. In addition, any fittings or specials installed by the Contractor purely for his convenience shall not be allowed for payment unless specifically approved by the Engineer. Valves and fittings shall be jointed to pipe as recommended by manufactures.

203-50.02 All valves, including by-pass valves, shall be provided with a valve box. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the operating nut with the cover flush with the pavement surface or such other level as directed. Valve box slabs or marker posts shall be provided where specified on the Drawings or as directed by the Engineer as an absorbed cost to the Contractor.

203-50.03 Hydrants shall be located as shown on the plans and in a manner that will provide complete accessibility and will prevent damage from vehicles. All hydrants shall stand plumb and shall have their pumper connections at right angles to the curb line. The Center of the streamer nozzle shall be 18" above top of finished ground or top of curb where applicable. Where necessary, hydrant extension shall be furnished at no additional cost to the Owner, to meet this requirement.

203-50.04 Each fire hydrant shall set truly vertical and securely braced with concrete or stone blocks until it is self-standing. It shall be set on a stone or concrete slab not less than four (4) inches thick and not less than one square foot of surface area placed on well compacted soil surrounded by a minimum of seven (7) cubic feet of sound broken stone or clean gravel to permit free draining of the hydrant. The gravel or stone shall reach from the bottom of the trench to at least six (6) inches above the waste opening of the hydrant.

203-50.05 All hydrants, valves and fittings shall be anchored with steel all-thread rods (3/4" minimum) as indicated on the Plans or with anchor couplings approved by

the Engineer.

203-60 SERVICE ASSEMBLIES AND SERVICE LINE INSTALLATION

203- 60.01 Assemblies shall consist of a corporation stop, service clamp, curb stop and other appurtenances needed to complete the assembly in accordance with the Contract Drawings. They shall be installed in a good and workmanlike manner in the places designated on the Plans or as directed by the Engineer.

203-60.02 Meter boxes, meters and service line shall be as specified herein and will be measured and paid for separately as detailed herein.

203-70 CONNECTION TO EXISTING MAINS

203-70.01 All connections to existing water mains shall be made by the utilizing of “hot taps” unless prior approval by the City and the Engineer.

203-70.02 Where indicated on the Plans, cut-ins must be made by the Contractor in order to connect the new main with existing water mains. The Contractor shall furnish all labor and materials and service required for the excavating, cutting the existing mains, removal and relocation of sections of old pipe, de-watering the trench, connection the new main with the old and the setting of necessary fittings, specials and valves as shown on the Plans.

203-70.03 The Contractor shall provide temporary blocking and bracing properly placed to prevent movement or blowing off of any pipe, valves or fittings due to water pressure on the main. All connections shall be made in a most expeditious and workmanlike manner to cause the least inconvenience to water customers and to traffic, and shall be made at night unless otherwise approved by the Engineer.

203-70.04 Any time that the interruption of water service in the existing system is necessary because of operations under this Contract, the Contractor shall notify the Owner at least 48 hours in advance. Interruptions of water service shall not extend over night or through the weekend unless approved by the Owner and the Engineer.

203-80 BACKFILLING TRENCHES

203-80.01 Backfilling shall be carefully performed and the original surface restored, to the full satisfaction of the Engineer. The trenches shall be backfilled with fine, loose earth, free from large clods or stones, carefully rammed until enough has been placed to provide a cover of not less than 1 foot above pipe. The remainder of the backfill material in unpaved areas shall be placed in the trenches, and any excess materials shall be windrowed over the trench. As settlement occurs, trenches shall be refilled, smoothed off, and made to conform to the surface of the ground until settlement ceases.

203-80.02 Backfill in roadways drives or in areas to be paved shall be made as specified above except that fill above the pipe shall be deposited in layers not to exceed 6 inches. Such fill shall be compacted with mechanical tampers so that the

compacted soil shall have a density of at least that of the undisturbed adjacent ground or 95% maximum optimum moisture density. Backfill material shall be crushed limestone or other approved material within the roadway prism. Disposal of surplus material shall be as directed by the Engineer.

203-90 COORDINATION WITH INTERESTED PARTIES OTHER THAN OWNER

203-90.01 The Contractor shall duly notify and coordinate all work with the City, the Board of Supervisors, the local Health Department, Mississippi State Highway Department and other interest parties. No work which affects these interested parties will commence until satisfactory coordination has been achieved.

203-100 HYDROSTATIC TESTS

203- 100.01 After the pipe is laid and the line flushed, it shall be filled with water with care being exercised, to expel all air from the pipe. During the test period all pipe, valves, fittings, and joints shall be existing carefully for defects. Any observed leaks or defective pipe shall be satisfactorily repaired or replaced, at the expense of the Contractor and the test repeated until the section tested is within the limits prescribed hereinafter. The entire distribution system or parts thereof shall be tested under hydrostatic pressure of 150 psi, for a period of 4 hours, if joints are exposed, or for an 8 hour period, if joints are covered. Repairs shall be made using approved materials and new replacement fittings, specials, or gaskets where leakages occur.

203-100.02 Leakage shall be measured by an approved calibrated meter through which all of the water required to maintain test pressure shall be pumped. All testing shall be performed in the presence of the Engineer, and the Engineer shall be notified at least 24 hours in advance of the start of the test.

203-100.03 The Contractor shall furnish the pump, pipe connections, fittings, gates, meters, and all necessary apparatus and shall furnish all labor and work required to make the tests. All costs of testing shall be borne by the Contractor and testing operations shall remain in operation until approved by the Engineer. Allowable leakage shall not exceed 10 gallons per 24 hours per inch of diameter per mile of pipe, at the specified test pressure.

203-100.04 Tests shall be completed in accordance with the latest edition of AWWA C-600 except as modified herein.

203-110 STERILIZATION OF PIPELINES

203-110.01 General: Thoroughly disinfect all water pipe on potable water lines prior to being placed in service. Follow the applicable provisions of the procedure established for the disinfection of cast iron pipe as set forth in the latest edition of AWWA C601 entitled "Disinfecting Water Mains."

203- 110.02 During the Construction: Workmen shall be required to use utmost care to see that the surface of parts of the structures, and the inside of pipes,

fittings, jointing materials, valves, and specials which come in contact with the City's water, are maintained in a sanitary condition.

Every effort shall be made to keep the inside of the pipe, fittings and valves free of all foreign matter, sticks, dirt, rock. As each joint of pipe is being laid, it shall be swabbed so that all foreign matter is removed. All fittings and exposed open ends of pipe shall be blocked or capped until the line is completed.

203-110.03 When the entire pipe line or certain selected sections thereof have been completed, tested and made ready for turning over to the Owner ready for use, the line or section of line shall be thoroughly sterilized according to the following procedure: The new pipe shall be disinfected by introducing HTH, Percloron, gas chlorine solution or a similar hypochlorite solution, through tape made by the Contractor as directed by the Engineer. The water shall be turned into the mains slowly to allow a thorough mixing of the solution which shall be brought to a strength of 50 parts per million of free, available chlorine. All valves shall then be closed and the sterilizing solution permitted to remain in the pipe line section for not less than 24 hours, after which the mains shall be flushed thoroughly until a chlorine residual not to exceed two tenths (0.2) part per million is obtained.

203-110.04 Samples shall be collected under supervision of the ENGINEER, using only approved bottles furnished by the State and will be tested by the State Health Department. The Contractor shall arrange for the collection of samples from the end of each dead-end line or from each major loop for bacteriological examination. A copy of test results shall be furnished to the Owner and the results obtained shall be deemed conclusive. If the test shows satisfactory quality of water, the line so sterilized may then be placed in service. If the sample shows unsatisfactory quality of water the process of sterilization shall be repeated until a satisfactory water sample is obtained. All materials, testing and labor required for complete sterilization of the system shall be furnished by the CONTRACTOR at no expense to the OWNER.

203-110.05 Prior to final acceptance, the Contractor shall sterilize and resterilize the water mains until two (2) consecutive samples of water are found to meet the State Health Department standards for water supplies. Less than one (1) coliform bacteria per 100 ml and no indication of confluent growth shall constitute a satisfactory sample when analyzed by the Mississippi Department of Public Health Laboratory or a laboratory certified by the Department.

203-120 CLEAN-UP

203-120.01 In areas where the water mains have been backfilled, the CONTRACTOR shall clear the right-of-way and surrounding ground, and shall dispose of all waste materials and debris resulting from his operations. He shall fill and smooth holes and ruts and shall repair all miscellaneous and unclassified ground damage done by him and shall restore the ground to such a stable and suitable condition as may be reasonably required, consistent with the condition of the ground prior to construction. Contractor shall maintain areas so that no hazard or

inconvenience to traffic results.

203-120.02 Clean- up, including grading, disposal, dress-up work and other incidentals shall be completed by the Contractor at no additional cost to the City to the extent directed by the Engineer. The Contractor shall comply with Section 303-210, Restoration of Landscaped Areas.

203-130 CLEARANCE BETWEEN WATER AND SEWER LINES

203-130.01 Where water and sewer lines run parallel to each other there shall be maintained a 10 foot horizontal clearance between the water line and the sewer line.

203-130.02 Whenever sewer lines cross water lines, the sewer line shall be a depth of not less than 18" below the water line.

203-130.03 Where these conditions cannot be maintained, DIP water main shall be used for a distance of 10 feet either side of the sewer on crossings.

203-140 OBSTRUCTIONS OF STREETS, PREMISES AND CONSTRUCTION SITES

203-140.01 General. All materials excavated shall be placed so as to interfere as little as possible with public vehicular traffic.

In general, excavated material shall be kept clear of the sidewalk except where local conditions make other arrangements undesirable. In this event, the Contractor will receive appropriate instructions from the Engineer.

Special care must be taken to give free access at all times to all fire hydrants, water valves, fire alarm boxes, Police Department and Fire Department driveways, sewer manholes, traffic signal pull boxes, traffic signal poles, traffic signal control panels and similar items.

DIVISION 300
DETAILED SPECIFICATIONS SANITARY SEWERAGE

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DIVISION 300

DETAILED SPECIFICATIONS - SEWAGE COLLECTION SYSTEM

301 General

301-10 DESCRIPTION

301-10.01 In accordance with the requirements of these specifications, the Contractor shall furnish and/or install all materials and perform all work necessary for or incidental to constructing a gravity flow sanitary sewer system complete and ready for use by the Owner. The Contractor shall notify Mississippi One Call prior to commencing any construction and during construction as necessary.

301-10.02 The work shall include the excavation, trenching and backfilling; furnishing and installing all trench sheeting and bracing; furnishing and installing all pipe, specials, services, manholes and related appurtenances; storage and protection of materials; testing, clean-up and all other operations necessary to complete the work in accordance with the detailed specifications contained herein.

301-20 CONTRACTOR'S EQUIPMENT:

The Contractor shall provide and maintain the principal equipment necessary to prosecute the work in an orderly and safe manner. The equipment shall consist of approved units designed or selected to perform and expedite all of the work and incidental items of construction.

301-30 CONFLICTS WITH OTHER UTILITIES

301-30.01 Where the location of the sewer is not clearly defined by dimensions on the Drawings or unless otherwise directed by the Engineer, the sewer shall not be laid closer horizontally than ten feet (10') to a water supply main except that where the bottom of the water pipe will be at least eighteen inches (18") above the top of the sewer pipe, horizontal spacing may be a minimum of six feet (6'). Where water lines cross over sewer lines, the above requirements will be waived if pipe segments are centered to provide maximum spacing of the joints of both water and sewer lines and a vertical separation of at least 18" (water over sewer) is maintained.

301-30.02 Where sewer construction conflicts with underground utilities which are indicated to remain in place, the Contractor shall be fully responsible for protecting these facilities and for restoring the portions of those lines which are damaged or severed as a result of his operations. Where existing lines in conflict

are indicated to be removed by others, the Contractor shall cooperate with the Owner of these utilities to the end that these conflicts may be removed prior to excavation for the sewers.

301-40 PROTECTION OF PROPERTY

301-40.01 General: Existing power lines, telephone lines, trees, shrubbery, fences, water mains, gas mains, sewers, cables, conduits, ditches, embankments and other structures in the vicinity of the work not authorized to be removed shall be supported and protected from injury by the Contractor during the construction and until completion of the work affecting them. The Contractor shall be liable for all damages done to such existing facilities and structures, as herein provided, and he shall save the Owner harmless from any liability or expense for injuries, damages or repairs to such facilities.

301-40 .02 Underground Utilities: The type, size, location and number of all known underground utilities have been shown on the Drawings; however, no guarantee is made as to the true type, size, location or number of such utilities. It shall be the responsibility of the Contractor to verify the existence and location of all underground utilities along the route of the work. The omission from, or the inclusion of utility locations on the Drawings is not to be considered as the nonexistence of or a definite location of existing underground utilities.

301-40.03 Relocation of Existing Utilities

301-40.03.01 The Contractor shall notify the Owner or Owners of the existing utilities, whether above the ground or underground; prior to proceeding with trench excavation whenever such trenching operations are within ten feet (10') of any existing utility.

301 -40.03.02 In the event that during construction it is determined that any underground utility conduit, including sewers, water mains and drainage structures, and any above ground utility facilities are required to be relocated, the Contractor shall notify the utility owner well in advance of his approach to such utility so that arrangements with the Owner or owners of the affected utility can be completed without delay of the work.

301-40.03.03 Should any such utility be damaged in the trenching operations, the Contractor shall immediately notify the owner of the utility, the Contractor shall not attempt to make repairs. Duplicate copies of any written authorization given to the Contractor to make repairs shall be filed with the Engineer and shall be so worded as to save harmless the Owner and Engineer of any responsibility whatsoever relative to the sufficiency of the repairs.

301-40.04 Vegetation: Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be

temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

301-50 RAILROADS AND HIGHWAY CROSSING

301-50.01 All work incidental to the construction of sewer lines under railroads or highways shall be done in strict compliance with the regulations prescribed by the owners of these properties and shall be done with extreme care to safeguard life and property. After the necessary permits and agreements for these crossings have been approved and executed, the Contractor shall confer with the representatives of the Railroad Company, the Mississippi Department of Transportation, or the County owning these properties and arrange schedules and the manner for constructing the work in accordance therewith. In general, the sewer pipe will be installed in steel casing or steel lined tunnels at all railroad, parkway and highway crossings.

301-50.02 Utility crossings shall be constructed in accordance with the Section "Roadway Crossings for Utility Lines" herein, where applicable.

301-60 APPLICABLE DOCUMENTS

301-60.01 The following publications form a part of this Specification and where referred to by basic designation only, are applicable to the extent indicated. Reference is to the latest edition of each unless specified otherwise.

1. American Society for Testing and Materials (ASTM):
 - a. C-76 Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - b. C-443 Joints for Circular Concrete Sewer and Culvert Pipe.
 - c. C-478 Precast Reinforced Concrete Manhole Sections.
 - d. C-700 Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
 - e. C-425 Compression Joints for Vitrified Clay.
 - f. D-2235 Solvent Cement for ABS Plastic Pipe and Fittings.
 - g. D-3034 Type PSM-PVC Sewer Pipe and Fittings.
 - h. D-3212 Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
 - i. D-2564 Solvent Cement for PVC Plastic Pipe and Fittings.
2. American Water Works Association (AWWA) :

- a. C-151 Standard for Ductile Iron Pipe, Centrifugally Cast in Metal Molds.
- b. C-111 Joints for Ductile Iron Pipe, Rubber Gasket.
- c. C-110 Gray Iron and Ductile Iron Fittings.

301-60.02 Local Building Codes: Any City, County or States Codes applying to the work.

301-60.03 MS. Standard Specifications for Road and Bridge Construction, latest edition, English units (MDOT): Sections are referenced herein.

301-70 SUBMITTALS: The Contractor shall submit testing reports, manufacturer's certifications, shop drawings, manufacturer's catalogs, specification sheets and other incidentals to the Engineer when requested.

302 - MATERIALS

302-10 GENERAL

302-10.01 The Contractor shall furnish all materials necessary for or incidental to constructing a gravity flow wastewater system. All materials shall be new and of first quality with certified tests for all pipe and pipe fittings made at the manufacturer's plant to assure conformance with these technical provisions. Two (2) certified copies of each test result shall be furnished to the Engineer.

302-10.02 The kinds and classes of materials incorporated into the work shall be designated by the Project Engineer. The Contractor shall not construe or interpret the several kinds of materials described herein as being equal in their application for the project.

302-20 WATER FOR CONSTRUCTION AND TESTING

302-20.01 The Contractor shall be responsible for all water needed in construction the work, flushing the completed system, testing and other incidental needs. All water used shall be from an approved source relatively free of pollution and shall be of a satisfactory bacteriological quality.

302-30 SEWER PIPES AND FITTINGS

302-30.01 Ductile Iron Pipe: Ductile iron pipe shall be water pipe with push-on rubber gasket joints manufactured in accordance with AWWA C-151. The AWWA Class Designation of ductile iron pipe installed by the open-cut method of construction shall be Class 50 unless otherwise specified. All ductile iron pipe and fitting shall be coated outside with a standard bituminous coating and encased with a polyethylene tube with a minimum thickness of eight (8) mils. Rubber gasket joints for slip joint ductile iron pipe shall conform to the

requirements of AWWA C-111. The pipe shall be cement mortar lined in accordance with AWWA C104; however the City reserves the right to require PROTECTO 401 ceramic epoxy lining for certain conditions.

Fittings shall conform to AWWA C-110. Jointing shall be completed in accordance with the manufacturer's specifications.

302-30.02 PVC Plastic Pipe and Fittings: PVC sewer pipe and fittings shall be solid wall in accordance with ASTM D-3034, SDR 26, or ASTM 679. Joints shall be either solvent weld conforming to ASTM D-2564 or elastomeric gasket conforming to ASTM F-477. Depth of bury for PVC sewer pipe shall not exceed manufacturer's recommendations. Jointing shall be completed in accordance with manufacturer's specifications.

302-40 MARKING SEWER PIPE:

Each pipe or fitting shall have plainly and permanently marked thereon: (1) pipe class; (2) date of manufacture; and (3) manufacturer's name or trademark. Marking shall be neatly stamped in the pipe or painted thereon with waterproof paint. Contractor shall place magnetic warning tape approximately 12 to 18 inches below grade in all pressure pipe trenches. This tape shall read "CAUTION – BURIED SEWER LINE" and shall be 3 inches wide, green background with black lettering.

302-50 EPOXY LINING FOR CONCRETE PIPE AND MANHOLES

302-50.01General - All interior and joint surfaces of each precast concrete manhole section, concrete pipe section, fitting and special located at the intersection of a force main and gravity line, as well as the first manhole in each direction from this intersection, shall be prepared, coated and cured as necessary to complete the installation of a 100% solids epoxy lining system No exterior surface coatings will be required. Before coating work is commenced, the Contractor shall submit to the Engineer the proposed coating suppliers complete materials, data sheets and application specifications specifically prepared for the particular application. Every manhole installed within the City of Byram shall also contain the Zypex additive which shall be properly mixed in each cured concrete unit at the concrete casting facilities. All surface preparation, coating applications, curing and all other coating materials and procedures shall be in full compliance with the coating supplier's specifications and specified herein and as consistent with good coating practices. All safety precautions shall be carefully observed. All coating work including plant and field corrective work shall be done under the full-time supervision and inspection of a representative of the coating supplier. The Contractor shall furnish an affidavit from the coating supplier that each pipe length, fitting or special has been coated in accordance with the Specification prior to installation.

302-50.02 Monolithic Manhole Surfacing System

1. General

- A. This specification covers work, materials, equipment and tools including specially developed application equipment as required for installation and testing of the field applied monolithic manhole surfacing system.
- B. The use of specialized application equipment combined with rigorous surface preparation requirements shall be used to apply the monolithic manhole surfacing system without the use of solvents. The equipment adds high heat and pressure to the monolithic surfacing system resulting in a high build and quick set of the completed system.
- C. Product application requirements and procedures described include surface preparation, mixing, application, material handling and storage, qualification of applicator, and application quality control.
- D. In order to be considered as an equal a product will have the minimum characteristics as measured by the applicable ASTM standards as specified in this section.

2. Quality Assurance

- A. The applicator shall initiate and enforce quality control procedures consistent with applicable ASTM and NACE standards together with the monolithic surfacing system manufacturer and the Engineer's recommendations.
- B. The applicator shall use an adequate number of skilled workmen who are thoroughly trained and experienced in the necessary crafts. These workmen shall be completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. The applicator shall use approved specialty equipment adequate in size, capacity and number sufficient to accomplish the work of this Section in a timely manner.
- D. The product shall be manufactured at a facility that is certified as meeting ISO-9002 quality management standards.
- E. Reference Standards:
 - 1. ASTM D638 C Tensile Properties of Plastics
 - 2. ASTM D790 C Flexural Properties of Un-reinforced and Reinforced Plastics
 - 3. ASTM D695 C Compressive Properties of Rigid Plastics
 - 4. ASTM D4541 C Pull-off Strength of Coatings Using a Portable Adhesion Tester
 - 5. ASTM D2584 C Volatile Matter Content

6. ASTM D2240 C Durometer Hardness, Type D
7. ASTM D543 C Water Vapor Transmission of Organic Coating Films
8. ASTM D543 C Resistance of Plastics to Chemical Reagents
9. ASTM C297 C Flatwise Tensile Strength of Sandwich Constructions
10. ASTM C The published standards of the American Society for Testing and Materials, West Conshohocken, PA
11. NACE C The published standards of National Association of Corrosion Engineers (NACE International), Houston, TX

3. Submittals

- A. Shop Drawings: The Contractor shall submit data on the monolithic surfacing system and application procedures.
- B. Qualification and Performance Responsibility of Applicator:
 1. The applicator shall apply the system and be responsible for the complete performance of the system, including materials, application, and quality control.
 2. The applicator shall provide documentation that the applicator is an approved installer and licensed by the monolithic surfacing manufacturer and specialized equipment supplier.
 - 3.

4. Deliver, Storage, and Handling

- A. Materials are to be kept dry, protected from weather, stored under cover and stored between 50° F and 100° F. Do not store near flame, heat, or strong oxidants.
- B. Protective coating materials are to be handled according to their material safety data sheets.

5. Existing Products

- A. Quick setting high strength concrete with latex or curing agent additives can't be used unless successfully tested with the coating for compatibility or approved for use by the protective coating and concrete manufacturer. Proper surface preparation procedures must be followed to ensure adequate bond strength to any surface to be coated. New cement or concrete must cure at least 30 days prior to coating.

- B. Existing coatings shall be removed or thoroughly abraded to provide an adequate surface profile for mechanical bond by the surfacing system. The applicator is to maintain strict adherence to the monolithic surfacing system manufacturer's recommendations with regard to proper surface preparation and compatibility with existing coatings.

6. Manufacturer and Equipment Supplier

Warren Environmental, Inc., Poly Spec Corp, or approved equal.

7. Repair Materials

Repair materials must be accepted and approved by the monolithic surfacing system manufacturer for compatibility with the specified monolithic surfacing system and shall only be used as determined necessary by the Engineer and applicator.

8. Monolithic Surfacing System

- A. Monolithic Surfacing System - a unique non-toxic, 100% solids, solventless epoxy resin laminar system as applied with a patent protected process and exhibiting the following characteristics.

Product type	Amine cured epoxy	
Color	White	
Solids Content (vol %)	100	
Compressive Strength	ASTM D695	12,000 psi
Flatwise Tensile Strength of		
Sandwich Constructions	ASTM C297	2,608 psi

Tensile Strength	ASTM D638	7,200 psi
Tensile Elongation	ASTM D638	2%
Flexural Strength	ASTM D790	13,000 psi
Flexural Modulus	ASTM D790	548,000 psi
Bond Strength - Concrete	ASTM D4541	900 psi

Chemical Resistance to:

Sulfuric Acid, 10%	ASTM D543	Immersion Service
Sodium Hydroxide, 20%	ASTM D543	Immersion Service

- B. The monolithic surfacing system shall be applied in the field after all other work to the manhole is complete. This will insure a monolithic coating across the joints and connections.
- C. The monolithic surfacing system shall be continuously bonded to all brick, mortar, concrete, chemical sealant, grout, pipe, and other surfaces inside the manhole and therefore shall be designed for hydrostatic loading.
- D. The finished system shall provide a minimum total thickness of 60 mils. The cured surfacing shall be monolithic with proper sealing connections to all un-surfaced areas and shall be placed and cured in three applications in conformance with the recommendations of the monolithic surfacing system manufacturer.

- E. When cured, the system shall form a continuous, tight-fitting, hard, impermeable surface that is suitable for sewer system service and chemically resistant to any chemicals, bacteria, or vapors normally found in domestic sewage.
- F. The system shall effectively seal the interior surfaces of the manhole and prevent any penetration or leakage of groundwater infiltration.
- G. The system shall be compatible with the thermal conditions of the existing sewer manhole surfaces.

9. Protective Coating Application Equipment

The protective coating application equipment shall be heated, plural component equipment specially designed for use in the spray or spincast application of the specified system and shall be approved for use by the monolithic surfacing system manufacturer.

10. Pre-Coat Inspection

- A. All structures to be coated shall be readily accessible to the applicator.
- B. Appropriate actions shall be taken to comply with local, state, and federal regulatory and other applicable agencies with regard to the environment, health, and safety.
- C. All surfaces including benches, inverts, joints, lift holes and walls shall be made smooth and suitable for application of the interior surfacing system. All benches and inverts shall be in place and complete.
- D. Active flows shall be dammed, plugged, or diverted as required to ensure that the liquid flow is maintained below the surfaces to be coated.
- E. Installation of the protective coating shall not commence until the concrete substrate has properly cured in accordance with this Section.

11. Surface Preparation

- A. The applicator shall inspect all surfaces specified to receive the monolithic surfacing system prior to surface preparation. The applicator shall notify the Engineer of any noticeable disparity in the

surfaces that may interfere with the proper preparation or application of the monolithic surfacing system.

- B. All concrete that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface. All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.
- C. Surface preparation method(s) shall be based upon the conditions of the substrate and the requirements of the monolithic surfacing system to be applied.
- D. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound concrete surface with adequate profile and porosity to provide a strong bond between the monolithic surfacing system and the substrate.
- E. The applicator shall follow all regulations for contained space entry. The first procedure upon entering each structure will be to blast all specified surfaces by low pressure water cleaning as defined by NACE Standard 5. When all loose and/or contaminated debris has been removed, the surface shall be water blasted by the use of a held wand again. The wash water shall include a dilute solution of chlorine to diminish microbiological bacteria growth and to kill any bacteria residing on or in the surface. The surface will be tested at this point to ensure that the pH is within acceptable limits (not to exceed 8.5). These tests will be performed with litmus paper on various areas within the structure. All test results will be retained for review by the Engineer.
- F. Surfaces that require additional cleaning or profiling will be prepared by abrasive blast to rough the surface sufficient to obtain and ensure adequate bonding of the system. A minimum surface profile of 8-10 mils or 10% of the total recommended coating system thickness must be achieved to assure proper adhesion. Detergent water cleaning and hot water blasting may be necessary to remove oils and grease from the concrete. Whichever methods are used, they shall be performed in a manner that provides a uniform, sound clean surface that is not excessively damaged.
- G. Active water infiltration shall be stopped by using a cementitious water plug or hydroactive grout that is compatible and suitable for topcoating with the specified monolithic surfacing system.

12. Application of Repair Materials

- A. Application of repair materials shall be made by the applicator.

- B. Repair materials shall meet the specifications of this Section. The materials shall be trowel or spray applied utilizing proper equipment on the specified surfaces.
- C. When using approved cementitious repair materials, such shall be troweled to provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating. No bugholes or honeycomb surfaces should remain after the final trowel procedure of the repair mortar.
- D. The repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds may not be used unless approved by the monolithic surfacing system manufacturer for compatibility with the specified system.
- E. Areas to be coated must be prepared after receiving a cementitious repair mortar and prior to application of the monolithic surfacing system.
- F. All surfaces shall be inspected during and after preparation and prior to application of the monolithic surfacing system. Any evidence of remaining contamination or laitance shall be removed by additional water or abrasive blast, or other approved method before proceeding with the application of the monolithic surfacing system.
- G. All surfaces shall be sufficiently smooth and even, to ensure good flow handling characteristics when complete.

13. Application of Monolithic Surfacing System

- A. Application procedures shall conform to the recommendations of the monolithic surfacing system manufacturer, including material handling, mixing, environmental controls during application, safety, and equipment.
- B. The equipment shall be specially designated to accurately ratio and apply the specified materials and shall be regularly maintained and in proper working order.
- C. The specified materials must be applied by an approved installer of the monolithic surfacing system.
- D. All specified surfaces will be lined with the monolithic surfacing system to provide a minimum total thickness of 60 mils. The cured surfacing shall be monolithic with proper sealing connections to all unsurfaced areas and shall be placed and cured in three applications in conformance with the recommendations of the monolithic surfacing system manufacturer.

- E. Specially designed spray and/or spincast application equipment shall be used to apply each coat of the system.

14. Testing and Inspection

- A. During application a wet film thickness gage, such as those available through Paul N. Gardner Company, Inc. meeting ASTM D4414 C Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a monolithic coating and uniform thickness during application.
- B. After the system has set hard to the touch it shall be inspected by the Engineer verifying the following:
 - 1. Groundwater infiltration of the system shall be zero.
 - 2. All pipe connections shall be open and clear.
 - 3. No cracks, voids, pinholes, uncured spots, dry spots, lifts, delamination, or other type defects shall be evident in the system.
- C. After a minimum of 24 hours following completion, the lining system shall be spark tested to assure a pinhole-free lining. Defects must be patched per the manufacturer's instructions. The test voltage shall be a minimum 6,000 volts. The holiday detector shall be a Tinker Razor Model AP/W or an approved equal. The applicator may enlist the services of an independent certified NACE inspector if desired.
- D. A final visual inspection shall be made by the Engineer and applicator. Any deficiencies in the finished system shall be marked and repaired according to the procedures set forth herein by the applicator.

15. Cleaning

Trash and loose debris shall not be permitted to accumulate at the project site. All items shall be regularly removed and disposed of at an approved site in accordance with applicable regulatory agencies.

302-50.02Materials - All material used in the application of the coating shall comply with the requirements specified herein and are subject to the approval of the Engineer of complete materials data sheets and application specifications. Protective coatings shall be either Porter Coatings Tarsel C-200, Amercoat Number 78, Koppers Bitumastic Number 300-M, or an approved equal used with approved epoxy structural paste adhesive, primers and thinners.

302-50.03Surface Preparation - All precast concrete units shall be thoroughly cured.

Under no circumstances shall the specified lining system be installed on "green" concrete. Surfaces to receive the specified coating system shall not be treated with any curing compounds, surface hardeners, release agents or other chemical compounds. All precast concrete section surfaces to be prepared and coated shall be essentially free of voids, cracks, inclusions or other structural defects. Any such defects shall be corrected by bagging or brushing the wet formed concrete or cement grouting the cured section. All grouting must be allowed to thoroughly cure before any coating is applied. The surfaces to be prepared and coated shall be smooth or lightly profiled. The surfaces shall not be extremely rough or deeply textured nor shall they bear exposed aggregate. All mortar fins, concrete splatter and other protrusions shall be removed by appropriate means. Prior to applying specified coatings, concrete surface shall be clean and properly prepared as specified herein and shall be dry to the extent that the surfaces to be coated are visibly dry and the concrete contains no greater than 10 percent (10%) moisture as determined by measurement with a suitable moisture meter. Surfaces to be coated shall be clean and dry. All grease, oil, dirt, salts and other foreign matter shall be removed by steam or detergent cleaning. Any such areas shall be allowed to thoroughly dry before any further surface preparation is performed. All surfaces to be coated shall be uniformly brushed sandblasted to the extent that all loose or unsound concrete and laitance are removed. All necessary precautions shall be employed to avoid excessive sandblasting equipment, air pressures and abrasive to produce a uniformly blasted concrete surface that is clean and lightly etched. All blasted surfaces shall be patched with an epoxy structural paste adhesive, if required, and have the prime coat applied within eight (8) hours and before surface contamination or moisture absorption can occur. In order to avoid damaging previously applied coatings, work shall be scheduled such that complete units are sandblasted and coated.

302-50.04Application - The surface temperature and moisture content of the precast concrete unit, air temperature and humidity and all other working conditions shall be in accordance with the coating suppliers specifications and recommendations, and thoroughly compatible with his coating materials. The coating shall be applied by airless spray method, in three (3) coats, consisting of a prime, four (4) mils minimum dry film thickness, followed by two (2) coats each with a minimum dry film thickness of eight (8) mils, for a total minimum dry film thickness of twenty (20) mils. The completed coating system shall be free of excessive runs, sags and rips, cracks, crazing, alligatoring, blisters, inclusions, excessive or deficient film thickness, voids, pinholes or other holidays, damaged areas or any other defects. Any such deficiencies shall be corrected by removal and recoating. Depending upon air circulation and relative humidity conditions, the coating system should be cured sufficiently hard to handle the minimal damage based on the surface temperature versus time schedule and shall be allowed to cure based on the surface temperature versus time schedule, all in accordance with the coating suppliers recommendations.

302-50.05Surface Testing - Film Testing and Inspection-Surface temperature shall be determined with an appropriate dial thermometer. Pipe moisture content shall be determined by an appropriate moisture meter to assure proper condition of the surface

before applying coatings. The primer and finish coats shall be inspected for continuity, pinholes, bore areas and holidays, with a nondestructive field-calibrated sparking holiday detector. Dry film thickness shall be determined with a nondestructive dry film gauge. All instruments shall be recommended by the coating supplier.

302-50.06 Touch-up and Repair - Excessive runs, sags and drips, cracks, crazing, alligatoring, blisters and inclusions shall be completely removed by suitable scraping, chipping or grinding. Loose or poorly bonded coating and improperly cured coating shall be completely removed to a sound substrate by grinding or sandblasting. Excessive film thickness shall be reduced to below 20.0 mils by grinding or sandblasting. All deficient areas shall be stripped free of all surface contamination using clean rags soaked in specified thinner and cleaned areas shall be allowed to dry. The deficient area shall then be thoroughly abraded and the abrasion shall be "feathered" out slightly beyond the perimeter of the affected area. Small areas may be abraded by hand or power tool sanding using medium grit garnet or sandpaper. Extensive areas may be abraded by uniform brush sandblasting. All necessary precautions shall be employed, including temporary shielding where required to protect adjacent coatings from damage during sandblasting operations. All abraded areas shall be thoroughly swept clean and the specified coatings applied the same day and before contamination can occur. The prepared areas shall then be primed and finish coated as specified, except that all coatings shall be "feathered" out to the edge of the abraded area. The pipe shall be visually inspected at the job site, before installation. Field touch-up and repair, as specified above, shall be made by qualified workmen under the supervision and inspection of a representative of the coating supplier.

302-60 CRYSTALLINE CONCRETE WATERPROOFING FOR CONCRETE MANHOLES

302-60.01 General - This section covers the requirements for waterproofing precast concrete manholes. All manholes within the City of Byram require this waterproofing.

- A. The concrete waterproofing admixture shall be of the cementitious crystalline type that chemically controls and permanently fixes a non-soluble crystalline structure throughout the capillary voids of the concrete.
- B. The design shall include the use of the crystalline waterproofing repair materials that generate a non-soluble crystalline formation in the concrete.
- C. Store manufacturer's sealed and labeled material containers in dry, protected environment off the ground.

References

- A. American Society for Testing and Materials (ASTM)
- B. Army Corp. of Engineers (CRD)

C. American Concrete Institute Reference 308

302-60.02 Products

A. MANUFACTURERS

1. Xypex Chemical Corporation, Richmond, B.C., Canada.
2. Equivalent materials as approved by the engineer.

B. MATERIALS

1. Xypex Admix C-1000-T containing red dye to ensure detection in the concrete.
2. Xypex Concentrate

C. MIXES

1. The dosage rate for Xypex Admix C-1000-T is 3.5% by weight of cement.

302-60.03 Application

MATERIALS PREPARATION

- A. Xypex Admix C-1000-T must be added to the concrete at the time of batching. It is recommended that the Admix powder be added first to the rock and sand and blended thoroughly for 2 - 3 minutes before adding cement and water.
- B. Blend total concrete mix using normal practices to ensure formation of homogeneous mixture.
- C. For precast concrete manufacturers this usually means adding the Xypex C-1000-T into their pan type mixers.
- D. For ready-mix batch plants the Xypex Admix C-1000-T can be evenly distributed on a plant conveyor belt carrying the rock and sand, or the dry powder Admix can be added to the truck first and then 30 - 50% of the required water for the concrete batch is dispensed along with 300 - 500 pounds of aggregate and mixed thoroughly for 2 - 3 minutes. The rest of the materials are then added to the truck and mixed for at least 5 minutes.

APPLICATION

- A. Retardation of set may occur when using Xypex Admix C-1000-T. The amount of retardation will depend upon the concrete mix design and the dosage rate of the admixture. Consult with the manufacturer regarding proper dosage rate.

B. Concrete that contains Xypex Admix C-1000-T must be cured as per "Standard for Curing Concrete" (ACI 308)C. Normal backfilling procedures may be used after concrete has cured for at least 7 days.

D. After the base and joints of the precast manhole have been grouted, apply two coats of Xypex Concentrate to all grouted surfaces at a rate of 1.5 lbs. per square yard to a properly prepared surface in accordance with manufacturer's written instructions.

302-70 CONTRACTOR'S RESPONSIBILITY

302-70.01 The Contractor shall be responsible for the condition of all excavations made by him. All slides and cave-ins shall be removed without extra compensation, at whatever time and under whatever circumstances they may occur.

302-70.02 Installation of sheeting and shoring shall be the responsibility of the Contractor. Shoring left in place by the Contractor shall not entitle the Contractor to any claim for extra compensation.

302-80 INCIDENTAL MATERIALS

302-80.01 Mortar: Portland Cement Mortar shall consist of one (1) part Portland cement complying with ASTM C- 150, Type 1, and three (3) parts mortar sand and sufficient water to mix mortar to proper consistency.

302- 80.02 Gray Iron Casting: Shall conform to the standard specifications for gray iron casting ASTM A-48, Class 25.

302-80.03 Manhole Steps: Steps for manholes shall be cast aluminum alloy meeting the requirements of the Aluminum Association (Alloy AA-514) and Federal Specification G4A.

302-80.04 Foundations: Shall be poured in place reinforced concrete as detailed, set on undisturbed earth of select bedding, where ordered by the Engineer or detailed on the drawings. Concrete shall be Class "B" 3,000 PSI as specified in the Section "Concrete" herein.

302-80.05 Precast Manhole Sections: Manholes constructed with precast units shall comply with ASTM C-478 and joints shall be preformed plastic joints. Preformed plastic joint compound shall be "Butyl-Title" as manufactured by Blue Ridge Rubber Company, Fletcher, North Carolina, "Kent-Seal" as manufactured by Hamilton Kent Manufacturing Company of Kent, Ohio; or equal. Preformed plastic joint compound shall meet Federal Specification SS-S-00219.

302-80.06 Bituminous Waterproofing: Shall be of the type and make approved by the Engineer.

302-90 MATERIALS FOR SUPPLEMENTARY WORK:

Materials for supplementary work consisting of repairs and replacement of street paving, sidewalks, driveways, curbs, grass plats and other related items shall conform to the respective Sections of these Specifications, or as specified on the Drawings.

302-100 BEDDING AND BACKFILL

302-100.01 Select bedding and backfill shall be provided where called for by the Engineer. Such select bedding shall be a well graded uniform mixture of coarse concrete aggregate and coarse sand. Select backfill shall be a sand-clay material with a maximum liquid limit (LL) of 30 and a plasticity index (PI) of less than 10.

303 - EXECUTION

303-10 SITE PREPARATION

303-10.01 The Contractor shall prepare on a timely basis all right -of-way, easements and sites indicated on the Drawings for construction of the wastewater improvements. The work shall include all clearing and grubbing, removal of structures and obstructions, and the removal of permanent surfaces and landscaping items designated to be restored upon completion of the installations.

303-10.02 Clearing and grubbing shall conform to the requirements specified elsewhere herein and shall include the removal of trees, roots, vegetation, structures and obstructions unless separate pay items are specifically provided for in the Proposal. The completion of clearing and grubbing shall leave the site free and clear, ready for trench excavation.

303-10.03 The removal of permanent surfaces and the subsequent restoration of the surfaces shall be as set forth below and in other sections herein where applicable.

303-10.04 Certain landscape items shall be preserved or replaced after construction. Care shall be taken to avoid damage to existing vegetation to remain in place.

303-20 REMOVAL OF PAVEMENT, SIDEWALKS, DRIVEWAYS AND CURBS

303-20.01 Whenever the wastewater improvements are to be located along or across an improved surface, the width of the trench shall be held as nearly as possible to the maximum width specified below. Where brick or concrete pavement, sidewalk, driveway or curbing is cut, the width of the cut shall exceed the actual width of the top of the trench by twelve inches (12") on each side or a total of two feet (2"). Exposed surfaces of Portland cement or asphaltic concrete shall be cut with a pavement saw before breaking. Care shall be taken in cutting to insure that a straight joint is sawed.

NOMINAL OF SEWER PIPE SURFACE DIAMETER (INCHES)	MAXIMUM TRENCH WIDTH (FEET)	MAXIMUM WIDTH PERMANENT CURB & GUTTER REMOVAL (FEET)
12 or less	5.00	7.00
15	5.00	7.00
18	5.00	7.00
21	6.00	8.00
24	6.00	8.00
27	7.00	9.00
30	7.00	9.00
36	7.50	9.50

303-30 REMOVAL OF LANDSCAPE VEGETATION:

Developed areas, yards, lawns, shrubbery and other decorative plantings that must be removed shall be stored and growth maintained by watering and fertilizing. The work shall be accomplished in accordance with prevailing local nursery practices with consideration given to seasonal limitations.

303-40 SELECTED STRIPPING:

In agricultural or cultivatable areas, the top twelve inches (12") of the ground shall be stripped and stockpiled for subsequent replacement after backfilling the pipe trench. The Contractor shall strip an area that will include the open limits of the trench plus the area that will be used to stockpile all suitable backfill material from the trench excavation. The stripped material shall be stockpiled in an area that will not hinder or endanger the construction process. The Project Engineer shall approve the location and manner of stockpiling.

303-50 EXCAVATION AND TRENCHING

303-50.01 All excavation of every description and of whatever substances encountered shall be performed to the depths indicated on the Plans or as otherwise specified. Excavation shall be done by open cut from the surface except when tunneling or boring is specified or directed in writing by the Engineer. Trench width shall be kept as narrow as practical to provide a safe working area and to minimize excavation.

303-50.02 During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill shall be removed and wasted as directed by the Engineer. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations. Any water accumulating therein shall be removed by pumping or by other approved methods. Temporary sheeting and shoring shall be used where necessary for the protection of the work and for the safety of the personnel.

303-50.03 During excavation, sand material shall be either separately or selectively stockpiled for use as pipe bedding and pipe backfill material to the top of the pipe. Sand material shall be handled and stockpiled in such a manner to prevent mixing with clayed material when re-handled for backfilling.

303-50.04 Excavation for manholes shall be sufficient to permit the carrying out of the construction as required.

303-50.05 Trenches for sewer pipe and other appurtenances shall be of only such width as necessary for proper laying of the pipe. The net width of the trench at and below the top of the pipe shall be at least the pipe O.D. plus twenty-four inches. The width of the trench above this level may be as wide as necessary for sheeting, bracing, or back slope and for proper performance of the work.

303-50.06 The side of the trench shall be as nearly vertical as possible. The bottom of the trench shall be carefully graded, formed and aligned according to the directions furnished by the Engineer and to his full satisfaction before sewers are laid thereon. The bottom of the trench shall be hollowed under each pipe joint to conform to the shape of the pipe, and holes shall be cut for the bells, so as to allow the body of the pipe a uniform contact and support throughout its entire length.

303- 50.07 The Contractor shall leave a berm of at least two feet in width on each side of the trench between the trench and the excavated earth, to allow the free passage of the Engineer and Inspector and to permit the City Public Works Inspector to perform his work in an expeditious and satisfactory manner.

303 -50.08 No more than three hundred (300) feet of the trench shall be opened at any time in advance of the completed sewer, nor shall more than one hundred (100) feet be left unfilled except by permission from the City Engineer. In special cases the City Engineer may change the distance to which the trench may be opened by notifying the Contractor in writing.

303-60 TUNNELING OR BORING:

Tunneling will be permitted only where indicated on the plans or by special permission of the Engineer.

303-70 SHEETING, SHORING AND BRACING

303-70.01 Sheeting, shoring, and bracing shall be furnished, placed and maintained by the Contractor as may be required to support the sides of the excavation. The Contractor shall be fully responsible for the sufficiency of such supports to prevent any movement which can in any way injure or delay the work or endanger or cause damage to adjacent pavements, buildings or other structures, or create undue hazards to workmen. Where in the opinion of the Project Engineer, damage is likely to result from withdrawing sheeting; the sheeting shall be left in place.

303-70.02 All sheeting, shoring and bracing which are not ordered by the Project Engineer to be left in place shall be removed in such manner as not to endanger the constructed sewer or other structures, utilities or property. All voids left or caused by the withdrawal of sheeting shall be immediately refilled with sand by ramming with tools specifically adapted to the purpose, by watering, or otherwise as may be directed.

303-80 EXCAVATED MATERIAL

303-80.01 Excavated material from trench and structure excavation suitable for backfill shall be placed compactly on the sides of the excavation and deposited so as not to endanger the work and be of as little convenience as possible to the public travel and abutting property, and so that free access may be had at all times to fire hydrants and water valves in the vicinity of the work. Any material encountered in the excavation which, in the opinion of the Project Engineer, is of such unsuitability for use in the work, shall be removed and wasted as directed and not stockpiled along the side of the excavation.

303-80.02 The disposal of all surplus and unsuitable excavation shall be the responsibility of the Contractor at his own expense. The surplus and unsuitable material not to be used in the construction of the project shall not be left on the right-of-way or easement of the project, adjacent thereto, except by written permission of the property owner.

303-90 DEWATERING

303-90.01 The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed therein is complete to the extent that no damage from hydrostatic pressure, flotation or other cause will result. The

normal water table shall be restored to its natural level in such a manner not to disturb the pipe and its foundation.

303-90.02 All excavations for concrete structures or trenches which extend down to or below static ground water shall be dewatered by lowering and keeping the ground water level beneath such excavations eighteen inches (18") or more below the bottom of the excavation; except where the pipe is laid in an impervious strata, the lower trench section shall be maintained in a dry condition for bedding. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench.

303-90.03 Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.

303-90.04 The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes.

All such pipes or conduits shall be left clean and free of sediment.

303-100 STEEL SHEET PILING

303-100.01 Steel sheet piling shall be driven at all locations indicated on the Drawings. Piling may be new or used and shall be in such condition that it can be interlocked and driven satisfactorily.

303-100.02 The Contractor shall be responsible for adequately bracing the units against lateral forces at all times. Piling shall be driven before final adjacent excavations are made.

303-100.03 Pile driving equipment used shall be maintained in first class condition and shall operate efficiently at all times in the space provided.

All equipment shall be subject to the approval of the Project Engineer.

303-100.04 No separate payment will be made for this item.

303-110 PIPE PLACEMENT

303-110.01 General: Unless otherwise noted on the Plans or as directed by the Engineer, the bed for the pipe shall be so shaped that at least the lower quarter of the pipe shall be in continuous contact with the bottom of the trench.

1. When bell and spigot pipes or pipe couplings are used, spaces shall be cut to accommodate the bells or couplings. These spaces shall be deep enough to ensure that the bells or couplings do not bear the load of the pipes. When the pipes are laid, the barrel of each section of pipe shall be in contact with the quadrant shaped bedding throughout its full length, exclusive of the bell or coupling, to support the entire load of the pipe. All adjustments to line and grade shall be made by scraping away or filling in and compacting the earth under the body of the pipe and not by wedging or blocking up the pipe. Pipe shall not be laid on frozen ground.

2. Before any pipe is laid in the trench, the section in which pipe is to be placed must be dry and must be kept dry while joints are completed. All pipes, prior to being lowered into the trench, shall be thoroughly inspected so that when jointed in the trench, there shall be no shoulders or unevenness along the lower half of the pipe. The faces of all spigot ends and of all shoulders in the hubs or sockets shall be true. All abnormal enlargements on these faces shall be cut away before the pipe is lowered into the trench.
3. The pipe shall be laid upstream, without breaks and with the bell end up grade. Whenever the work ceases for any reason, the unfinished end of the pipe line shall be securely closed with a tight-fitted plug or cover. All pipe shall be placed and maintained in such a manner that at the time of final acceptance of the project the completed lines will be true to the established alignment and flow line grades.
4. Construction shall begin at the lowest point, or elevation, and the pipe shall be laid continuously upstream without omitting sections or reaches.

303-110.02 Pipe installation shall conform to the following specifications unless otherwise directed in writing by the Project Engineer or specified herein:

1. RCP Pipe - Comply with Concrete Pipe Design Manual, Class "B" trench, backfill carefully compacted to one (1') foot above top of pipe.
2. DI Pipe - Comply with AWWA C-151, Type 3 trench, backfill carefully compacted to one (1') foot above top of pipe.
3. VC Pipe - Comply with ASTM C-12, Type "C" trench, backfill carefully compacted to one (1') foot above top of pipe.
4. PVC Pipe - Comply with ASTM D-2321, backfill to one (1) foot above top of pipe compacted to 85% Proctor Density with Class III or better material.

303-120 PIPE BEDDING:

The pipe shall be bedded in compacted select granular material placed on a flat trench bottom or on a prepared trench bottom unless otherwise specified. The bedding material shall be sand or other suitable material approved by the Engineer, stockpiled during the trenching operation or hauled in from off-site. Where used, the granular bedding shall have a thickness of one-eighth (1/8) the outside pipe diameter or a minimum of four inches (4") under the barrel and shall extend one-sixth (1/6) of the outside diameter up the pipe barrel at the sides.

303-130 JOINTING DISSIMILAR PIPES:

Where suitable adaptor couplings are not available for connecting dissimilar pipes,

the jointing shall be accomplished with a concrete encasement as specified on the Plans.

303-140 ALIGNMENT

303-140.01 The Contractor shall utilize a commercial grade laser beam specifically manufactured to aid in maintaining grade and alignment of pipelines during installation. The primary unit shall be mounted on a heavy duty base and firmly anchored in the downstream manhole of the reach under construction. The maximum distance shall not exceed four hundred feet (400') per set-up unless Engineer approved.

303-140.02 Each joint of pipe will be installed using an approved target to align the pipe with the projected laser beam. The methods and procedures shall be in strict accord with the manufacturer's recommendations and instructions. Proper ventilation shall be maintained at all times. Care shall be exercised in order to prevent bumping or misalignment of the projected beam.

303-150 MANHOLE CONSTRUCTION

303-150.01 General: Manholes shall be constructed of precast concrete sections, unless otherwise specified.

303-150.02 The construction shall also include the necessary frames, covers, castings, fittings, steps and connections; all installed or constructed in accordance with these Specifications and conforming to all requirements, details, lines, grades and dimensions shown on the Plans or established by the Engineer.

303-150.03 Pipe sections connecting to manholes shall not be longer than four feet (4') so that a joint is provided in each line within four feet (4') of the inside face of each manhole.

303-150.04 Steps for manholes shall be coated corrosion resistant PS2-PF steps as manufactured by M. A. Industries incorporated of Peachtree City, Georgia or Oliver Tare and Rubber Company of Oakland California, rubber encased "Surefoot" manhole steps; or an approved equal.

305-150.05 Flexible pipe-to-manhole connectors shall be provided. The connectors shall be EPDM or polyisoprene rubber. The connectors shall be Kor-N-Seal by NPC or an approved equal.

303-160 PIPE CONNECTIONS TO MANHOLES

303-160.01 General: When the Plans indicate connections to existing manholes, these connections shall be watertight and all work performed in an acceptable manner.

303-160.02 The size of the opening cut in the existing manhole wall shall be restricted to a nominal diameter sufficient only to insert the sewer pipe. After insertion of the pipe, the void between the outside of the pipe and the

manhole wall shall be packed with a non-shrink grout.

303-170 BACKFILLING

303-170 .01 General: All trenches and excavation shall be backfilled with select material and compacted until it covers the pipe at least one foot (1') promptly after the pipe is laid. This backfill shall be brought up and tampered equally and thoroughly along each side of the pipe in such a manner as to avoid displacement of or damage to the pipe. The select material shall be thoroughly compacted as specified herein.

303-170.02 Select Bedding Material: Select granular material for bedding pipe shall be as specified herein. Select bedding shall be considered as material hauled in from off-site. Bedding material from on-site which is used meeting this specification shall not be measured or paid for separately as select bedding. All testing costs required by the Project Engineer to verify that off-site material meets this Specification shall be borne by the Contractor.

303-170 .03 Select Backfill Material: Select material for backfilling pipe trenches shall be as specified herein. Backfill material from on-site which is used meeting this specification shall not be measured or paid for separately. All testing costs required by the Engineer associated with verifying that on-site or off-site select material meets this specification shall be borne by the Contractor. Select backfill shall be considered as material hauled in from off-site.

303-170.04 Tamping: The backfill shall be placed in equal thickness lifts, each lift being thoroughly compacted to the density specified. Each lift of the backfill material shall have proper moisture content to permit compaction to this density.

1. In areas where street paving, sidewalks, driveways and other restoration work is required, the backfill above the one (1) foot cover level shall be completed to the sub-grade level or as directed and maintained in such a manner to eliminate voids and future settlement. Special compaction procedures involving 96% density on 6" lifts shall be required by the Engineer at such locations and at other locations shown on the plans.
2. In open fields or undeveloped areas, the backfill above the one (1) foot cover level may be placed in twelve inch (12") layers and compacted to a density of not less than that of the surrounding earth. The top of the filled trench shall be mounded slightly above the natural ground to allow for settlement.
3. Cultivable areas shall be restored by the replacement of the stockpiled topsoil stripping to a depth of at least twelve inches (12").

303-170.05 Jetting: This method of backfill shall only be used when

approved by the Project Engineer.

303-180 TEMPORARY SURFACES OVER TRENCHES

303-180.01 Whenever the wastewater improvements are constructed under traveled roadways, driveways, sidewalks or other traveled surfaces, a temporary surface shall be placed over the top of the trench as soon as possible after placement and compaction of the backfill has been satisfactorily completed. The temporary surface shall consist of a minimum of six inches (6") of crushed limestone.

303-180.02 The top of the temporary surface shall be smooth and meet the grade of the adjacent undisturbed surface. The temporary surface shall be maintained at the Contractor's expense until final restoration of the street surface is completed as specified. No permanent restoration of street surface shall be initiated until authorized by the Engineer. The temporary surfacing shall be required over the entire width of the trench. Any width in excess of the specified width shall not be used in computing payment quantities.

303-190 REPLACEMENT OF PERMANENT SURFACES

303-190.01 General: The Contractor shall restore all permanent type pavements, sidewalks, driveways, curbs, gutters, shrubbery, fences, poles and other property and surface structures removed or disturbed during or as a result of construction operations to a condition which is equal in appearance and quality to the condition that existed before the work began. The surface of all improvements shall be constructed of the same material and match in appearance the surface of the improvement which was removed. Where select granular trench backfill is used, the restoration shall be made as soon as possible after compaction of the backfill has been completed.

303-190.02 Concrete Pavement Surface: Where the existing pavement surface is Portland Cement concrete, the pavement replacement shall consist of ten inches (10") concrete pavement reinforced as indicated on the Plans and placed over six (6") inches of compacted sub- base. Concrete shall conform to the Section "Concrete" herein. Pavement joints in the replacement surface shall conform to and match the joints in the adjacent pavement area.

303-190.03 Asphalt Pavement Surface: Where the existing pavement surface is asphalt and the base consists of a material such as bituminous base course, brick, concrete, soil cement, gravel, shell, natural cement or a combination of these materials, the base replacement shall consist of six inch (6") asphaltic base course placed over eight inches (8") of compacted crushed limestone sub-base. The surface replacement shall consist of a bituminous prime coat and two inches (2") minimum thickness bituminous surface course as specified herein in the Section "Asphalt Concrete Paving", where applicable.

303-190.04 The Engineer may revise paving thickness requirements based upon local conditions.

303-200 CONCRETE SIDEWALKS, DRIVEWAYS, CURBS, CURB, AND GUTTER

303-200.01 General: Where necessary to remove and replace concrete sidewalks, driveways, curbs and curb and gutters, replacements shall be made as follows:

303-200.02 Concrete sidewalks, driveways, curbs and curb and gutters shall be replaced with concrete meeting the applicable provisions of the Section "Concrete" of these Specifications. Minimum thickness shall be four inches (4") for sidewalks and six inches (6") for driveways. Materials and construction requirements shall conform to the various Sections of these Specifications. Curb and gutter shall be formed as detailed on the Plans or directed by the Project Engineer. Sidewalks shall be finished to match existing adjacent sidewalk surfaces, unless otherwise specified or directed by the Project Engineer.

303-210 RESTORATION OF LANDSCAPE AREAS

303-210.01 All sod, shrubbery, decorative planting, fences, retaining walls, and other landscape items shall be replanted, replaced or restored in the manner removed.

303-210.02 Should new construction be required to replace damaged or unsalvageable items, then the Contractor shall furnish all labor, materials, equipment, tools, and incidentals set forth in the applicable Sections of these Specifications.

303-220 MAINTENANCE OF SITE:

The Contractor shall take such measure necessary to prevent, control and correct any dust nuisance or muddy conditions developing on roadways as a result of his operation. Direct payment for maintenance of the site shall not be provided as such but shall be considered a subsidiary obligation of the Contractor.

303-230 TESTS

303-230 .01 General: Before any backfill is placed, the sewer line shall be checked by the Project Engineer for line, grade and workmanship. Before acceptance, each section of the line between manholes or such other length as determined by the Engineer to be suitable, shall be thoroughly inspected and any defects in workmanship shall be immediately corrected.

303-230.02 Requirements: The Contractor shall conduct either an exfiltration or infiltration test of each reach of sewer between manholes. An infiltration test

will be required where the crown of the entire reach of sewer being tested lies three feet (3') or more under the existing water table. An exfiltration test shall be required for all other conditions.

303-230.03 Exfiltration:

1. Exfiltration tests will be required on sewer lines which are above the present ground water level in reaches selected by the Engineer. Exfiltration tests shall be conducted by blocking off all manhole openings except those connecting with the reach being tested, filling the line and measuring the water required to maintain a constant level in the manholes.
2. The total exfiltration shall not exceed two hundred (200) gallons per inch of nominal diameter per mile of pipe per day for each reach tested. For purposes of determining maximum allowable leakage, exfiltration tests shall be maintained on each for at least two (2) hours and as much longer as necessary, in the opinion of the Engineer to locate all leaks.
3. The Contractor shall provide, at his own expense, all necessary piping between the reach to be tested and the source of water supply together with equipment and materials required for the tests. The methods used and the time of conducting exfiltration tests shall be acceptable to the Engineer.
4. If the leakage in any reach exceeds that allowable maximum, the reach shall be retested after the leaks are repaired.

303-230.04 Infiltration:

1. The allowable infiltration rate shall not exceed two hundred (200) gallons per inch of nominal diameter per mile of sewer per day. For purposes of determining maximum allowable infiltration, manholes shall be considered sections of equivalent diameter pipe.
2. If the infiltration rate in any reach exceeds the allowable maximum, the reach shall be retested after the leaks are repaired. A reach is defined as the distance between any two (2) manholes.
3. The Contractor shall be required to repair all visible leaks although both the infiltration and exfiltration requirements are met.
4. The Contractor shall provide, at his own expense, all necessary equipment, materials and personnel required for the tests. The methods used and the time of conducting infiltration tests shall be acceptable to the Engineer.

303- 230.05 Deflection Tests: After installation, the entire length of PVC solid wall and closed profile pipe shall be checked for deflection by use of a "go-no-go" mandrel.

The mandrel shall be constructed of one-half inch (1/2") thick angle iron or number 4 steel bars (ASTM A-15) welded to steel pipe to measure a five percent (5%) deflection. The Project Engineer must approve the mandrel design.

The average inside diameter of the pipe shall be used in calculating the five percent (5%) deflection.

The line shall be flushed to clean any mud or debris which would hinder the mandrel passage.

The mandrel shall be pulled by hand through the pipe after backfill and trench settlement has occurred.

The system will be subject to a mandrel check at the eleven (11) month warranty inspection.

If any irregularities or obstructions are encountered they shall be corrected by the Contractor at no expense to the Owner and the repaired section of the line again checked for excessive deflection.

303-230.06 Air Testing:

1. In lieu of the exfiltration test specified the Contractor may at his option, complete an air test in accordance with the following specifications. The air test shall in no case replace the infiltration test where ground water is present.

2. Procedure: The sewer line to be tested shall be tested between manholes. The line shall be sealed at both ends. The seal at one end shall have an orifice through which to pass air into the pipe. An air supply shall be connected to the orifice at one end of the line. The air supply line will contain an on-off gas valve and a pressure gauge having a range of 0 to 15 psi. The gauge shall have minimum divisions of .10 psi and shall have an accuracy of $\pm .04$ psi. Pressuring equipment should include a regulator or relief valve to avoid over pressuring and damaging an otherwise acceptable line.

3. The pipe line under test shall be pressurized to 4 PSIG. The line will be allowed to stabilize between 4 PSIG and 3.5 PSIG for a period of no less than 5 minutes. If necessary, air should be added to the line to maintain the pressure above 3.5 PSIG. After stabilization period, the gas valve shall be closed. When the line pressure drops to 3.5 PSIG, commence timing with a stop watch. The stop watch should be allowed to run until such time as line pressure drops to 2.5 PSIG. Then the watch should be stopped and time lapse compared with the allowable time lapse in **Table 1** at the end of this Section, and for the pipe size and leakage allowance specified by the Engineer. If the time lapse is greater than that specified, the section undergoing testing shall have passed, and the test may be discontinued at that time. If the time lapse is less than that specified, the line has not

passed the test and the Contractor will be required to find the leaks, repair them and retest until the section passes, at his own expense.

Table I
Line Pressure Air Test Using Low-Pressure Air
Specification Time Required for a 1.0 PSIG Pressure Drop for Size and
Length of Pipe Indicated

Pipe Diameter (in)	Minimum Time (min)	Length for Min. Time (ft)	Time for Longer Length (sec)	Specification Time for Length (L) Shown, Min.'s							
				100'	150'	200'	250'	300'	350'	400'	450'
4	3:46	597	.380L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
24	22:40	99	13.674L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

303-230.07 Manhole Vacuum Testing:

1. Vacuum testing of all completed manholes shall be conducted by methods and equipment which have been reviewed by the Project Engineer.
2. Vacuum tests shall be performed with a circular vacuum manhole tester and the acceptability of the manhole will be determined by the amount of vacuum loss over a specified period of time.
3. The vacuum pump shall have the following CFM capacity:

<u>Inches of Mercury</u>	<u>CFM</u>
0" Hg.	28 CFM
10" Hg.	18 CFM
15" Hg.	12 CFM
20" Hg.	8 CFM

4. Plug all manhole inverts with pipeline plugs placed at least 6 inches

beyond the wall to prevent temporary sealing of inverts.

5. Follow all local, state, and federal regulations and safety precautions concerning entry of confined spaces. Follow all manufacturers' recommendations and warnings for proper and safe installation of plugs and operation of a vacuum testing equipment.

6. Evacuate the manhole to 10 inches mercury vacuum (0.3 bar). Monitor vacuum for the specified time period in accordance with ASTM C924. If the vacuum does not drop in excess of 1 inch of mercury, the manhole is considered to pass the test.

7. If a manhole does not pass, Contractor shall identify leak, repair leak, and repeat test until manholes passes.

303-230.08 Hydrostatic Pressure Testing-Force Main Pipe

Force main sewer pipe shall be tested by means of being subjected to a hydrostatic pressure of 150 psi after the pipe has been laid and partially backfilled. The duration of each pressure test shall be at least two (2) hours. Pressure shall not vary by more than ± 5 psi for the duration of the test.

Each valved section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point on the line or section under test and corrected to the elevation of the test gauge, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The Contractor shall furnish all necessary assistance for conducting the test.

Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so that the air can be expelled as the line is filled with water. After all air has been expelled, the corporation cocks shall be closed and the test pressure applied.

All exposed pipe, fittings, valves and joints shall be carefully examined during the open trench test. Any cracked or defective pipe, fittings, or valves discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material and the test shall be repeated until satisfactory to the Engineer.

A leakage test shall be conducted by the Contractor after the pressure test has been satisfactorily completed. The duration of each leakage test shall be twelve (12) hours, and during the test, the main shall be subjected to a pressure of 150 psi.

Leakage shall be defined as the quantity of water that must be supplied in the newly laid pipe, or any valved section thereof, to maintain the specified leakage

test pressure, within 5 psi, after the air in the pipe has been expelled and pipe has been filled with water.

No pipe installation will be accepted if the leakage is greater than that determined by the formula:

$$L = \frac{(S)(D)(P)^{1/2}}{133,200}$$

where L is the allowable leakage in gallons per hour; S is the length of pipe tested in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test in psi gauge. If any test of pipe laid discloses leakage greater than that specified, the Contractor shall at his own expense locate and repair the defective joints until the leakage is within the specified allowance. All visible leaks shall be repaired regardless of the amount of leakage.

303-240 FLUSHING

303 -240.01 The completed gravity flow system shall be free of all mud, siltation and other foreign matter deposited or collected during construction. Flushing shall commence at the upstream end of the completed system and continue downstream manhole to manhole. Only water from an approved source will be permitted.

303-240.02 Water used in flushing will not be permitted to enter into the existing system but shall be disposed of in a manner acceptable to the Project Engineer.

303-240.03 Flushing shall be accomplished prior to testing should the collected matter be sufficient in quantity to obstruct or affect the testing. Flushing will not be required in those sectors of the installed pipes and manholes where the exfiltration test has adequately cleaned the mains.

303-250 CLEAN-UP

303-250.01 After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. Surplus dirt shall be removed from the site or deposited at the locations and in the manner directed by the Engineer.

303-250.02 After all work is completed; the Contractor shall remove all tools and other equipment used by him, leaving the entire site free, clear and in good condition.

303-260 SERVICE LINES AND CONNECTIONS

303-260.01 Sewer services in laterals shall be installed at points indicated on the detailed plans and at other points as the Project Engineer may designate during the progress of construction. Service lines and connections shall conform to the detailed drawings in the plans.

303-260.02 All sewer service shall be laid on a uniform grade from the main to the proper location at each lot (see typical service connection). The minimum depth of cover of the service line at the property or easement line shall be three (3) feet unless otherwise shown on the plans or directed by the Engineer. The ends of the service shall be plugged and permanently marked with a metal t-post.

303-260.03 Service lines and fittings shall be six (6) inch diameter for all occupancies.

303-270 OBSTRUCTION OF STREETS, PREMISES AND CONSTRUCTION SITES

303-270.01 The contractor shall refer to Section 203-140 and comply with the section as noted.

DIVISION 400
PAVING & DRAINAGE

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DIVISION 400

DETAILED SPECIFICATIONS - PAVING AND DRAINAGE

401 CLEARING AND GRUBBING

401-10 DESCRIPTION This work shall consist of clearing, grubbing, removing and disposing of all things Within the limits of the right-of -way, easement areas, borrow and material pits, ditch inlets and outlets, channel changes, or any property or easement acquired by the Owner for the construction of the project, except such things as are designated to remain or be removed in accordance with other provisions of the contract. This work shall also include the preservation from injury, or defacement, of all vegetation, objects or materials designated to be salvaged or to remain and shall also include removal and disposal of obstructions and salvageable material encountered, when such removal and disposal is not otherwise provided in the contract.

401-20 CONSTRUCTION METHODS - CLEARING AND GRUBBING

All surface objects and all trees, stumps, roots and other protruding or underground obstructions, not designated to remain, shall be cleared and/or grubbed (including mowing as required); except undisturbed stumps and roots and non-perishable solid objects which will be a minimum of three (3) feet below the bottom of the subgrade or slope of embankments.

The Project Engineer may permit ground stumps to remain outside of the construction limits or in the area to be rounded at the top of cut back slopes provided they are cut off flush with or below the surface of the final ground line.

Stump holes and other holes from which obstructions are removed, except in areas to be excavated, shall be backfilled with suitable material and thoroughly compacted as specified.

All operations shall be conducted in such a manner as to prevent injury to anything that is to remain on the right-of-way, or damage to adjacent property.

If perishable material is burned, it shall be done under the constant care of competent watchmen at such times and in such manner that surrounding vegetation, or other adjacent property, or anything designated to remain on the right-of-way will not be jeopardized. Burning shall be done in accordance with applicable laws and ordinances.

Materials and debris which are not burned shall be removed from the right-of-way and disposed of out of sight at locations obtained by the contractor as evidenced by two signed copies of a release from the property owner for the servitude of his lands.

It shall be the responsibility of the contractor to inform himself as to any prior agreements regarding merchantable timber prior to submitting his bid.

402 GENERAL GRADING

Permission for grading can be acquired only by one of the following:

1. Approved set of construction drawings for development, shopping center, subdivision or additions.
2. Approved Land Disturbance Application and Plan.

Grading and centerline gradients shall be in accordance with the construction plans and profiles approved by the director of planning and development. No grading shall be initiated prior to approval of the construction plans by the city except as otherwise permitted through acquisition of a land disturbance permit for the specific purposes granted.

Areas to be graded by cutting or filling shall be rough graded to within 0.2 of a foot of the accepted elevation after necessary allowance has been made for the thickness of topsoil, paved areas and other installations. Grading activities shall be completed so as to minimize erosion and siltation, and to avoid the obstruction of natural drainage courses.

Final cross-sections and profiles of streets and other installations shall conform to grades approved by the city engineer. Elevations shall be based on mean sea level datum (U.S. Geological Survey).

All timber, logs, trees, brush, vegetative matter and other rubbish shall be removed or otherwise disposed of in accordance with applicable Clean Air Act rules and regulations to leave disturbed areas with a neat and finished appearance. No burning shall be undertaken without prior approval of the fire department.

After grading has been completed and approved and before any base is applied, all underground work (water mains, gas main, sewer mains, etc.) and all service connections shall be completely installed and approved throughout the length of the road. Any utilities installed after the base is applied shall be cored or jacked (open cut trenches will not be allowed). In business sections where there are no grass plots, utility mains shall be installed under the sidewalks where possible.

403 STREET DEVELOPMENT

403-10 General. All streets shall be constructed with a standard 24-inch-wide combination vertical curb and gutter or a Type 2 six-inch mountable curb and gutter. Streets designed without curb and gutter will not be allowed unless written approval has been granted by the city. All approved curb shall be the same throughout the development, unless otherwise approved by the board of aldermen.

The typical cross-section for streets shall conform to minimum standards as follows:

TABLE INSET:

Type of Street	Pavement Width In Feet Back of Curb to Back of Curb
Arterial highway	Variable
Industrial collector	42
Commercial	33
Residential, collector	33
Residential, minor or local	29
Cul-de-sacs and dead end*	27

*Not to exceed 600 feet unless special conditions warrant as determined by the city engineer.

Street pavement designs shall be based on consideration of the anticipated traffic volumes by weight, subgrade soil, surface drainage, ground water and climatic condition. The pavement thickness shall be a function of the load supporting value of the subgrade soil beneath the pavement and the load distribution characteristics of the proposed pavement structure.

See Section 413 for minimum pavement requirements.

Lime treated subgrade:

- a. Fine grained soils (ML and CL) shall be lime treated with a minimum of 6% by weight.
- b. Sandy soils (SM and SM-SC) having PI less than 7 will not be required to be lime treated. A minimum of two (2) tests will be required to verify the PI and in [no] case shall a single test represent more than 1,000 feet of subgrade.

Subgrade compaction:

- a. All subgrades shall be compacted at 96% standard proctor density before the asphalt base course.
- Streets shall be designed with a two percent cross slope.

All street improvements including base, sub-base, curb and gutter and appurtenances shall be constructed in accordance with approved plans and specifications. Unless the developer provides detailed specifications the current edition of the Standard Specifications for State Aid Road and Bridge Construction (English Edition) shall govern.

The final street surface course required pursuant to this section shall be placed no sooner than one year from the date of approval of the final plat, or until such time as structures have been completed on 85 percent of the lots in the subdivision. In no event shall the date of application of the final street surface course be more than three years from the date of approval of the final plat.

404 SUBGRADE PREPARATION

404-10 DESCRIPTION The sub-grade is designated as that part of the roadbed consisting of the design soils upon which the base structure or a surface course is to be placed and its finished construction shall conform to the provisions herein and such special preparation as may be required for the particular base structure or surface course to be constructed. The sub-grade preparation shall consist of the construction and compaction of the sub-grade in accordance with these specifications.

404-20 SUBGRADE PREPARATION The sub-grade shall be constructed as indicated above and in reasonably close conformity with the lines, grades and typical section for the particular type of base structure, or surface course as shown on the plans or established by the engineer. No base structure or surface course shall be placed on the sub-grade until same has been checked and approved by the engineer.

Site Preparation. As an initial step of site preparation, trees located within the pavement area shall be removed, including stumps and roots. Stripping shall be performed to a sufficient depth throughout the construction area to remove organic -laden sacrificial soils, vegetation, debris, brush and roots. Excavation shall be performed to remove weak soils. The lateral and vertical extent of excavation required to remove weak soils must be determined in the field during earthwork construction. Excavation to remove weak soils shall extend laterally not less than 3 ft beyond pavement edges. Temporary construction excavation slopes shall not be steeper than 1H: 1V.

404-30 Bridging. Bridging over weak soils can be allowed. Excavation shall be performed to a sufficient depth to allow placement of an adequate bridging lift and not less than 3 ft of compacted select fill materials to directly underlie the pavement structure. Bridging materials shall consist of either clean sands (SP) or slightly silty sands (SP-SM) with less than 10 percent fines passing the No. 200 sieve. The bridging lift shall not be more than 18 in. thick. The bridging materials shall be spread and compacted by repeated passes of a dozer not larger than a D4. A geotextile can be utilized beneath the bridging materials to initiate compaction with stability. That the geotextile utilized for this purpose shall be Type V geotextile as specified in the Mississippi Standard Specifications for Road and Bridge Construction (2004 Edition).

404-40 Undercutting. Undercutting shall be performed to remove expansive clays (CH) as required to allow for the placement of compacted select low permeability soils to create a nonexpansive soil buffer that shall extend not less than 3 ft below the subgrade level for pavements. Undercutting will be needed within areas where existing on-site silty clays (CL), silts (ML) and sandy clays (CL) by themselves or in combination with select fill do not provide the

recommended buffer thickness. The lateral extent of undercutting required to remove expansive clays (CH) must be determined in the field during earthwork construction. Undercutting shall extend laterally not less than 3 ft beyond pavement edges. Temporary undercut excavation slopes shall not be steeper than 1H: 1V.

404-50 Scarification and Compaction. The soils exposed after stripping, excavation and undercutting shall be scarified to a minimum depth of 6 in. and compacted to not less than **96 percent of standard Proctor maximum dry density (ASTM D 698)** with stability present. The exposed soils shall be proof-rolled to demonstrate stability. Stability is defined as the absence of significant pumping or yielding of soils during compaction or proof-rolling. If stability is not evident in some areas, either additional excavation or treatment of the in situ soils with an admixture, or a combination of these approaches, will be required to achieve stable conditions. Scarification/compaction and/or proof-rolling of the in situ soils is not required in areas where bridging is to be conducted.

404-60 Pumping Soils. On-site natural silty clays (CL), clayey silts (ML) and silts (ML) exposed after stripping and excavation are susceptible to pumping under wet conditions. The construction techniques and types of equipment utilized and site drainage provided during construction will have a great effect on the performance of these soils throughout the project. The routing of heavy rubber-tired equipment shall be controlled to minimize, as much as possible, traffic over the site. All traffic shall be discouraged during periods of inclement weather. If pumping is initiated in subgrade soils (CL or ML), as a construction expedient the pumping can be counteracted by treating these materials with hydrated lime. It is estimated that about 4 to 6 percent hydrated lime by dry weight of soil will be required. The actual lime percentage needed to hydrate moisture and eliminate pumping shall be determined during construction by laboratory testing conducted on representative samples of the pumping soils. Lime treatment shall be performed in conformance with Section 307 of the Mississippi Standard Specifications for Road and Bridge Construction (1990 Edition). On-site natural soils treated with lime shall be compacted to not less than **96 percent of standard Proctor maximum dry density (ASTM D 698)**. Class C lime treatment which requires spreading the lime, mixing, compacting and finishing shall be used.

404-70 Fill Placement. Fill materials shall be placed to achieve planned grades. Excavated on-site silty clays (CL) and sandy clays (CL) that are free of organic matter can be utilized as select fill. Imported fill soils shall consist of select, non-organic and debris - free silty clays (CL) or sandy clays (CL) having a plasticity index (PI) within the range of 10 to 24 and a liquid limit less than 45, or clayey sands (SC) or silty sands (SM) with a plasticity index of 4 to 15 and a liquid limit less than 35. To be classified as silty clays (CL) or sandy clays (CL), the fill materials must have more than 50 percent fines passing the No. 200 sieve. **Sands (SC or SM) shall not be used as backfill placed in undercut areas over expansive clays (CH).** Select fill materials placed along the roadway shall be compacted from maximum 9-in. thick loose lifts to not less than **96 percent of standard Proctor maximum dry density (ASTM D 698)** at moisture contents within 3 percentage points of optimum.

404-80 Proof-rolling. Stability must be evident during compaction of each lift before any subsequent lifts of fill material are added. Stability is defined as the absence of significant pumping or yielding of soils under compaction. In addition to density requirements the final layer of fill material (finished subgrade elevation) shall be proof-rolled in the presence of a city representative with a loaded dump truck to demonstrate stability after compaction requirements have been achieved. Finished site grades shall be sloped to provide for quick runoff of storm waters.

404- 90 Lime Stabilization All subgrade soils must be treated with 6 percent hydrated lime by dry weight of soil to a minimum depth of 8 in. Lime treatment shall be performed in conformance with Section 307 of the Mississippi Standard Specifications for Road and Bridge Construction (2004 Edition). Class C lime treatment requires mixing with a pulver mixer. The lime treated subgrade soils shall be compacted to not less than **96 percent of standard Proctor Maximum dry density (ASTM D 698)** at moisture contents within 3 percentage points of optimum moisture content.

404-100 PROTECTION OF SUBGRADE All soft and yielding or other unsuitable material which will not compact readily shall be removed and disposed of as directed.

All loose rock or boulders found in the sub-grade shall be removed or broken off to a depth of not less than eight (8) inches below the elevation of the sub-grade.

The volume of such unsuitable materials described above shall be replaced with approved material and the entire sub-grade brought to lines, grades and uniform compaction. After the sub-grade has been prepared, as specified above, it shall be maintained in a smooth and compacted condition free from ruts and depressions and shall be adequately drained. In handling of materials and the operation of tools and equipment, the Contractor shall protect the sub- grade from damage. If damage occurs the sub-grade shall be reshaped, re-compacted and maintained reasonably close to line and grade until the base, surfacing or pavement is placed.

405. HOT BITUMINOUS PAVEMENT

405-10 DESCRIPTION This work shall consist of constructing one or more courses of bituminous pavement on a prepared base, pavement structure or bridge deck in accordance with the requirements of these specifications and in reasonably close conformity with lines, grades, thicknesses and typical sections shown on the plans or established by the Engineer. This work shall also include applicable preparation of the underlying base or subgrade course in accordance with the appropriate subsections.

The bituminous pavement shall be composed of mineral aggregates, filler or other materials (if required) and bituminous material mixed in a central plant and placed hot.

405-20 COMPOSITION OF MIXTURES The bituminous plant mix shall be composed of a

mixture of aggregate, mineral filler and other material (when required) and bituminous material.

The several aggregate components, including mineral filler and other materials (when required) shall be sized, uniformly graded and combined in such proportions that the resulting mixture meets the gradation requirements of the specific type of pavement shall be combined with the other components of the mixture.

The overall limits set out in Table "B" of this section encompass the extreme limits for material or combinations of materials from all possible sources and closer controls appropriate to the job materials shall be established for each specific mixture required under any contract in accordance with a job mix formula established as follows:

Prior to the proposed use of each mixture to be placed on the project, the Contractor shall make available for sampling and testing by the laboratory materials conforming to these specifications and proposed for use in the mixture and the Contractor may submit for the Engineer's approval a single job-mix formula for each group of materials submitted for the mixture.

The job-mix formula for each mixture shall establish a single definite percentage of aggregate including mineral filler and other materials (when required) passing each required sieve size a single definite percentage of bitumen to be added to the aggregate and a single definite temperature at which the mixture is to be discharged from the mixer.

The ranges of the components of the bituminous mixture set out in Table "B", shall have no bearing upon the determination of the percentage established for the job-mix formula, except that no job-mix formula will be approved or established having permissible ranges outside of the master range for the particular mixture.

The job-mix temperature shall be the lowest considered being satisfactory to obtain the desired mixture.

No mixture will be accepted for use, nor shall any mixture be placed, until the Engineer has approved a tentative job-mix formula for the particular mixture. The job-mix formula thus approved, or established from laboratory test results, shall be considered as tentative until a sufficient amount of the mixture has actually been processed through the plant, spread and compacted to determine by tests the necessity and effectiveness of corrections and adjustments to the plant operation and to spreading and compaction procedures.

Extractions shall be made on each mixture before any of the mixture is placed on the project and no mixture shall be placed which does not meet the requirements of the job-mix formula in effect (within the allowable tolerances). Sample of the actual mixture in use will be taken as many times daily as necessary, at the discretion of the Engineer.

405-30 Hot Mix Asphalt Specifications The hot mix asphalt (HMA) mixtures shall meet the

following production requirements. At least **10 days prior to the start of work** the Contractor shall submit for approval by the City Engineer a proposed job -mix formula (JMF) signed by a MDOT Certified Mixture Design Technician meeting the requirements listed as follows. The bituminous base course and asphalt surface course materials shall conform with all applicable specifications for BB-1 and SC-1 presented in the Mississippi Standard Specifications for Road and Bridge Construction (1990 Edition) plus requirements listed in the following tables.

Table B
Hot Mix Asphalt Gradations
Master Design Requirements

Sieve Size	Base Course (BB-1)	Surface Course (SC-1)
1 2 inch	100	-----
1 inch	83 – 100	-----
2 inch	56 – 95	100
3/8 inch	-----	87 - 100
No. 4	29 – 70	54 - 80
No. 8	19 – 54	32 - 63
No. 30	8 – 30	12 - 33
No. 50	4 – 20	6 - 20
No. 200	2 – 10	2 - 10

Table A
Hot Mix Asphalt Mixture Design Requirements
Marshall Compaction - 75 blows (MT-35)

Mixture Requirements	Base Course		Wearing Course	
	BB-1A	BB-1B	SC-1A	SC-1B
Stability (lbs)	1400	1400 (min)	1500	1500 (min)
Total Air Voids (%)	3.0 – 5.0	3.0-5.0	3.0 - 5.0	3.0-5.0
VMA (%)	12.0	12.0	15.0	15.0
Tensile Strength Ratio (%)	85	75	85	75
Hydrated Lime (%)	1.0	0	1.0	0
Minimum Asphalt Content (%)	4.0	4.0	4.0	4.0
Crushed Limestone Content (%)	0	0	20-30	0
Fractured Faces - + No. 4 Sieve (%) min.	70 (one face)	0	90 (two faces)	90 (two faces)
Natural Sand Content (%) max	20	20	20	20
RAP Material (%) max	30	30	15	15

The tentative job-mix formula together with its adjustments to plant operation and spreading and compaction procedure (when required) will be considered as conditionally approved until it is rejected, or the Project Engineer confirms its approval.

After the Project Engineer confirms approval of the tentative job-mix formula, the mixture furnished for the project shall conform thereto within the range of tolerances specified for the particular mixture. No change in properties or proportions of any ingredient of the mix shall be made without permission of the Project Engineer.

The approved job-mix formula for each mixture shall be in effect until modified, in writing, by the Project Engineer.

The components of the mixture will be conditionally accepted at the plant site, subject to later rejection if such materials are incorporated in a mixture or if work for any reason or cause fails to meet contract requirements.

405-40.03 BITUMINOUS MATERIALS The bituminous material used in the mixture shall be Performance Grade PG 67-22

405-50 CONSTRUCTION REQUIREMENTS

405-50.01 WEATHER LIMITATIONS Bituminous plant mix shall not be placed on any wet surface, frozen foundation, or when weather conditions otherwise prevent the proper handling or finishing of the bituminous mixture; except that when paving operations are discontinued due to rain, the mixture in transit at that time may be held in the transporting vehicles (properly protected) until the rain has ceased and the surface on which the mixture is to be spread has been swept to remove as much moisture as possible, the mixture may be placed at the Contractor's risk and subject to removal and replacement at his expense if satisfactory results are not obtained.

Hot bituminous leveling and binder courses of pavement shall be placed only when the air temperature in the shade is 40° F. or above and rising or 50° F. if falling.

Hot bituminous surface courses of pavement shall be placed only when the air temperature in the shade is 50° F. or above.

405-50.02 TACK COAT When required by the Engineer, tack coat shall be applied to the previously placed base course or road surface and between the several layers of mixture.

405-50.03 SPREADING AND FINISHING The mixture shall be placed upon a foundation which has been prepared in accordance with Section 405, except as provided under Subsection 406-40.01 and struck off to grade and elevation established. The compacted thickness of any layer shall not exceed six (6) inches.

The edge of the bituminous plant mix or pavement shall be established by a string line for a distance of not less than five hundred (500) feet ahead of spreading of the mixture, except when curb and gutter, concrete pavement or similar installations are favorable for alignment reference.

Bituminous pavers shall be used to spread the mixture to such appropriate loose depth and width as will secure the compacted thickness to the required line, grade and cross-

section.

A minimum of two pavers of the same make and type will be required when it is feasible to operate them in echelon on adjacent through traffic lanes and the amount of bituminous mixture to be placed under the contract as shown in the proposal as 20,000 tons or more. Only one (1) paver will be required when single lane construction is required or when the amount of bituminous mixture to be placed under the contract is shown in the proposal as less than 20,000 tons.

The pavers shall be operated at a constantly uniform speed and as continuously as practical except that the hopper shall not be emptied completely of the mixture, prior to dumping therein of the next load, in a continuous run.

Immediately after screening of any course and prior to roller compaction, the surface of the unrolled material shall be checked by the Contractor and inequalities adjusted. The unsupported edge of the mixture shall be sealed prior to rolling by tamping to a face having approximately the same slope as the angle of repose of the loose mixture (not to exceed an angle of 45° from vertical), except when the edge is to become part of a hot joint formed by pavers traveling in echelon. When the edge is feathered as in the case of a wedge course, it may be sealed by rolling.

Inequalities in alignment and grade along the edges shall be corrected by the addition (or removal) of mixture before the edges are rolled. All sandy accumulations and all fat spots shall be removed and replaced with fresh mixture when necessary to correct pavement irregularities.

For hot mix bituminous pavement, the mixture shall be delivered to the paver at a temperature of 225° to 350° F. The mixture shall be free of lumps and in workable condition.

Where irregularities or unavoidable obstructions make the use of a mechanical spreading and finishing equipment impractical, the mixture shall be spread, raked and luted with hand tools or other approved methods. For such areas the mixture shall be dumped, spread and screeded to give the required compacted thickness and meet all other contract requirements.

If during construction it is found that the spreading and finishing equipment in operation leaves tracks in the new course or indented areas that are not satisfactorily corrected by the scheduled operations, or if it produces other permanent blemishes, the use of such equipment shall be discontinued and other spreading and finishing equipment which produces satisfactory work shall be provided by the Contractor.

405-50.04 COMPACTION After the bituminous mixture has been spread, screeded or struck off to appropriate loose depth and width and surface irregularities corrected; it

shall be thoroughly and uniformly compacted by rolling to the required lines, grades and cross-sections and to the required density.

The mixture shall be rolled while it is at the proper temperature and in proper condition and when the rolling does not cause undue displacement, cracking or shoving. To prevent adhesion of the mixture to the roller, the wheels or tires shall be kept properly moistened with water or water mixed with a small quantity of approved material. The liquid shall not be applied at an excessive rate.

The rollers shall operate at a slow but uniform speed (not to exceed three miles per hour for steel wheel rollers and not to exceed five miles per hour for pneumatic tire rollers) and the line of rolling shall not be suddenly changed or the direction of rolling suddenly reversed. Any displacement of mixture occurring as a result of the operation of the rollers (or from any other cause) shall be corrected at once by the use of rakes and addition of fresh mixture when required. Any mixture that becomes loose, broken, mixed with dirt or shows an excess (or deficiency) of bituminous material, or is in any way defective, shall be removed and replaced with fresh mixture which shall be shaped and compacted to conform with the surrounding area.

Unless otherwise specified in the contract, a minimum of one (1) breakdown roller and one (1) intermediate roller shall be provided for each bituminous paver used. In addition, one (1) finish roller shall be provided for each paving operation; however, where only a small amount of material is to be placed such that the breakdown roller can be used satisfactorily for both breakdown rolling and finish rolling, a separate finish roller will not be required.

In general, rolling shall be done in three stages as follows:

- (A) Breakdown Rolling: Breakdown (or initial) rolling shall be performed with the use of steel wheel tandem or three wheel rollers used as soon as the mixture is at the proper temperature or condition to obtain the required compaction for density. The breakdown roller shall be operated with the drive roller (or wheel) nearest to the paver except when rolling on steep slopes or super-elevated curves that require the use of the tiller wheel closer to the paver.
- (B) Intermediate Rolling: Following the breakdown rolling, intermediate rolling shall be performed with pneumatic tire rollers, as soon as practical and while the mixture is in the proper range of temperature to obtain the best compaction. The tires shall be inflated and the roller loaded with ballast (as required) to obtain the average ground contact pressure necessary to obtain proper compaction of the mixture. The intermediate rolling shall be completed while the mixture is still hot enough to perform the final rolling at the proper temperature and condition.
- (C) Finish Rolling: Finish rolling will be performed with steel wheel tandem or three wheel rollers when the mixture is at the proper temperature and condition to accomplish the required elimination of roller marks.

Each stage or rolling shall proceed in the following order:

1. Roll transverse joints.
2. Roll longitudinal joints.
3. Roll edge and progress gradually to the center parallel with the centerline of the road overlapping on successive passes by at least one-half the width of the rear wheels; however, on super-elevated curves, rolling shall progress from the lower to the upper side uniformly lapping each preceding track until the entire surface has been rolled by the rear wheels.

When paving in echelon, the breakdown roller shall leave unrolled two or three inches and the intermediate pneumatic tire rollers shall leave unrolled approximately six inches of the edge being followed by the paver placing the subsequent lane. These edges shall be rolled when the joint between the lane is rolled. When paving in single lanes, the entire width shall be rolled with steel wheel rollers except as noted below. The pneumatic tire roller shall avoid rounding of the edge that will become a part of the longitudinal joint when the adjacent lane is spread.

In sealing and compacting all unconfined edges, the Contractor shall give full consideration to all of the field conditions including, but not limited to, the weight and type of roller, the consistency and temperature of the mixture, the cross slope of the section and the pattern of rolling shall so perform the work that, when fully completed, the edges of the particular course shall not be rounded or depressed with respect to courses in the adjacent lanes, shoulders or other adjacent construction.

Along forms, curbs, headers, walls and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hand tampers, smoothing irons, mechanical tampers or a combination of such approved equipment. On depressed areas a trench roller may be used.

Rolling shall progress as uniformly as practicable and shall continue until all roller marks or other irregularities are eliminated and the required density has been obtained.

The rolling pattern may be modified when conditions warrant the modification.

405-50.05 JOINTS Joints between pavement previously placed and pavement in process of being placed shall be so formed as to insure thorough and continuous bond.

Transverse construction joints shall be formed by cutting into the previously placed mixture to expose an approximately vertical face for the full depth of the course. When a header is used to form a satisfactory vertical contact surface for new work, the cutting may be omitted. The contact surface of transverse joints shall be painted with a thin uniform coat of tack coat material before additional mixture is placed against the previously rolled material.

Longitudinal joints shall be formed by overlapping of the paver on the previously placed material for a width of at least one (1) inch and depositing a sufficient amount of mixture to form a joint that will be smooth and tight.

The mixture shall be spread in such widths that will provide for offsetting of longitudinal joints

approximately twelve (12) inches in successive layers (or courses) of pavement except that the joints in the surface course shall be placed at the edges of traffic lanes with an offset from the joint in the previously placed layer (or course) of not less than six (6) inches. In special cases on areas where irregularities (or unavoidable obstacles) make it impractical to arrange the joints as specified above the Engineer may authorize or require a modification of the arrangement of the joints.

The contact face of all longitudinal joints (except hot joints), shall be formed during construction or cut to a near vertical face (not to exceed an angle of 45° from vertical) and pointed with a thin coat of bituminous material (tack coat) before additional mixture is placed against the previously placed mixture.

405-50.06 PAVEMENT SAMPLES The Contractor shall cut samples from completed layers of pavement or base at the time and locations designated by the Engineer. Such samples of the mixtures shall be taken for the full depth of the layer and shall be of a size approved by the Engineer, but not to exceed one hundred (100) square inches. Tools used for cutting or coring of samples shall be of the revolving blade type such as saw or core drill.

Where samples have been taken, a fresh mixture shall be placed, compacted and finished by the Contractor to conform to the surrounding area. No additional compensation will be allowed for furnishing test samples and replacing the areas with new pavement.

405-50.07 DENSITY See Section 413 for Testing Requirements

405-50.08 SURFACE TOLERANCES The finished surface of the several layers of asphaltic pavement shall conform to the designated grade and cross-section within the following tolerances from grade stakes or other grade reference points set at fifty (50) foot intervals.

	<u>Leveling Course</u>	<u>Binder Course</u>	<u>Surface Course</u>
Maximum deviation from grade and cross section at any point	1/2"	3/8"	1/4"
Maximum variance at any point from a ten foot straight-edge applied to the surface parallel to the centerline	1/2"	3/8"	1/4"

(1) Resurfacing of an old pavement: The top binder course and/or surface course placed over an old pavement shall present a smooth riding surface free from depressions or low areas. The old pavement and base shall be repaired and leveled prior to beginning the placement of plan thickness of hot bituminous material. The finished surface shall be checked for maximum variance in accordance with the tolerances set out below.

(2) The placement of a hot bituminous surface on a prepared base: When the plans show a hot bituminous pavement is to be placed over a previously prepared unpaved base, the Engineer

shall be assured that the finished base surface is within reasonable tolerance to receive the planned surface thickness without excessive overrun of hot bituminous material. The unpaved granular base surface shall be smooth, firm and free from depressions or irregularities and compacted to a density of 100%, according to AASHO designation, T-191, or MT-10, Mississippi Modification.

The placing of binder, leveling or surface courses will be tested by the Engineer using a ten (10) foot straight edge at selected locations. The variations of the surface from the testing edge of the straight edge placed parallel to the center-line between any two contacts with the surface shall not exceed 1/2 inch for leveling course, 3/8 inch for binder course, or 1/4 inch for finished surface courses. All humps or depressions exceeding these tolerances shall be corrected by removing defective work and replacing it with new material as directed.

During the finishing and compacting operations of placing the pavement, it shall be the Contractor's responsibility to check the surface progress toward conformance to surface requirements.

The Contractor shall provide a competent workman whose duty it shall be to test the finished surface of the course with a ten (10) foot straight edge in the presence of the Project Engineer, or his representative, at the time and locations selected by the Engineer or his representative.

Sections or layers or course of pavement exceeding the allowable surface tolerances shall be corrected at the Contractor's expense by methods as follows:

On Leveling, or Binder Courses (1) Removal or addition of mixture as necessary on areas requiring correction to conform with surface requirements specified for the corrected layer or course, using skin patching, feather edging, wedge course construction or full course depth patching where appropriate when these types of corrections can be completed in a satisfactory manner.

(2) Superimposing additional layer(s), or course(s), finished to conform with surface requirements specified for the layer or course. Such additional layer(s) or course(s) shall be approved grade raises and extend for the full width of the pavement and for not less than the full length of the area to be corrected.

On Wearing Courses (1) Removal of sufficient mixture and the addition of sufficient satisfactory mixture to provide a minimum thickness of one (1) inch of material finished to conform to the surface requirements specified for the course. By this method, the minimum thickness of one (1) inch of additional mixture shall extend to the full width of the land placed, as determined by the pavement edges and longitudinal joints and for not less than the full length of the area to be corrected. Transverse joints at the ends of the corrected area(s) shall be perpendicular to the centerline of the lane.

(2) Superimposing additional one (1) inch (minimum thickness) layer(s), or course(s), finished to conform to the surface requirements specified for the layer(s), or course(s). Such

additional layer(s) or course(s) shall be approved grade raises and shall extend for the full length of the area to be corrected. Transverse joints at the end of the corrected layer(s) or course(s) shall be made perpendicular to the centerline of the pavement.

When the riding surface is to be accomplished by using a "Ski attached to the asphaltic spreader, the Ski shall be a sufficient length to meet the surface tolerance of 1/4 inch in ten feet as shown above.

When applying an overlay surface course to an existing pavement, the existing riding surface shall be leveled, patched and repaired so that an asphalt spreader equipped with a "Skill may be used to place the thickness of surface course material shown on the plans and in the proposal.

Thickness determinations of the courses placed will be made by the Engineer when density samples are taken and at other selected points to check or control plan requirements.

405-50.09 WIDENING OF BASE OR PAVEMENT OPERATIONS The foundation required for widening shall be formed by trenching or excavating to the required depth and constructing a smooth, firm, and compacted foundation free of loose and uncompacted material. The completed foundation shall have sufficient density and stability to withstand the placement and compaction of subsequent courses. Soft, yielding or other unsuitable material which the Engineer determines will not compact readily shall be removed and the area shall be backfilled with granular material or hot bituminous mixture as directed. Excavation for widening and undercutting, including material removed from shoulders, shall be spread along adjacent shoulders and fore-slopes and will be an absorbed item. However, when the quantity is in excess of that which may be used satisfactorily on adjacent areas, the Engineer may direct that the material be loaded, hauled to and spread uniformly on disposal areas selected by the Engineer.

Removal and disposal of old stakes, forms and other debris encountered in excavating shall be considered as incidental to and included in the contract unit prices bid for other items and no separate measurement will be made therefore. Pavement edges and surface shall be cleaned prior to final shaping and compaction of adjacent trenching and undercut areas.

Granular material required for widening shall be placed in accordance with the typical section(s) on a previously smooth, firm and unyielding foundation. Density of granular material, at the time hot mixture is placed, shall be that specified in Section 405-40.03.

Hot bituminous mixture meeting the requirements for the bituminous plant mixture designated for the superimposed pavement course shall be used to backfill the trench constructed for widening and will be included in the contract quantity for same. The bituminous mixture shall be placed in one or more layers as shown on the plans, or directed. The surface of the hot bituminous mixture shall be finished approximately in line with the slope of adjacent in-place pavement.

Trench rollers or other compaction equipment approved by the Engineer shall be used to

compact the foundation granular material and hot bituminous mixture for widening when compacting below the plane of the pavement is required.

405-50.10 PATCHING Failed areas of pavement and pavement areas not satisfactorily stabilized shall be removed as directed. Backfill required by removal of pavement and/or undercutting to remove soft, spongy or other unsuitable material, shall consist of granular material or hot bituminous mixture of the type specified for the superimposed course.

405-50.11 PRELIMINARY PATCHING AND LEVELING Where irregularities on existing base or pavement are such as to result in excessive roll down differential in subsequent pavement course(s), patching and leveling in advance of the first overall course shall be performed. Such preliminary corrections may include skin-patching, feather-edging, or wedge course(s) performed in accordance with the governing specifications. Hot bituminous plant mixture meeting the requirements for the bituminous plant mixture designated for the superimposed pavement course shall be used and will be included in the contract quantity for same.

405-50.12 PLACEMENT OF COURSES The overall leveling course shall be placed in a layer not exceeding (approximately) two and one-half inches compacted thickness. When single lane construction is required, placement of the overall leveling, binder and surface courses shall be limited to the distance covered in one and one-half days in advance of that placed in the adjacent lane.

405-50.13 PROTECTION OF PAVEMENT The pavement or base shall be protected and properly maintained until it has hardened sufficiently for use by traffic.

405-50.14 THICKNESS REQUIREMENTS It is the intent of these specifications that hot bituminous pavement courses shall be constructed as nearly in accordance with the thickness(es) indicated by the typical section(s) shown on the plans as the condition of the underlying pavement or foundation and the surface tolerances will permit. Periodic and accumulative yield tests will be made to determine practicable conformity with the intent of the contract with respect to the thickness(es) for each course and combinations of courses of material being placed. The Engineer may, at his discretion, order modifications in placement thickness where such will be advantageous in correcting existing crown or profile or to prevent unwarranted variations in planned quantities of materials used as contemplated in the contract.

406. CULVERTS AND STORM DRAINS

406-10 GENERAL This item shall consist of concrete culverts and storm drains of the type, sizes and dimensions as shown on the plans, furnished and installed at such places as designated by the Engineer, all in accordance with these specifications, and in conformance with the lines and grades as shown on the plans. This item shall include excavation,

backfilling, trench bracing as required, and all fittings required to complete the pipe lines. Drainage Pipe installed within the City of Byram shall be either Reinforced Concrete or High Density Polypropylene Smooth Lined Pipe. Polypropylene Pipe may not be installed as cross-drains under roadways.

406-20 MATERIALS

406-20.01 CONCRETE PIPE

A. General

All pipe shall be new except where stated on the Plans, or directed by the Engineer; existing pipe may be re-used. Pipe shall be of the sizes and classes as shown on the plans and in the proposal. All pipe shall be manufactured in an MDOT approved facility.

All lifting holes shall be plugged with an approved manufactured lifting hole plug and covered with Type V Geotextile Fabric.

B. Joints

Concrete pipe joints shall be constructed by applying a bituminous plastic material to the bell and spigot end of each piece of pipe prior to the joints being inserted together. Once they have been joined, all joints are to be wrapped in a Type V Geotextile Fabric, 24" minimum in width.

C. Installation

Concrete pipe installation shall be performed in accordance with the latest edition of the Mississippi Standard Specifications for Road and Bridge Construction.

The Contractor shall do such trench bracing, sheathing or shoring as necessary to perform and protect the excavation and shall remove such materials as backfill progresses. The backfill material shall be as approved by the Engineer. Great care shall be used to obtain thorough compaction under the haunches and along the sides and to the top of the pipe. Back-fill shall be placed in a loose layer, not exceeding six (6) inches in depth and succeeding layers shall not be placed until thorough compaction has been obtained. Trenches in areas to be paved shall be compacted to 98% standard Proctor density.

406-20.02 HIGH DENSITY POLYPROPYLENE PIPE

A. DESCRIPTION

This item shall govern for the furnishing and installing of all Polypropylene Smooth Lined Pipe and / or materials for constructing of culverts, side road pipes, storm sewers, stubs, and all related connections and fittings. The pipes shall be of the sizes, types, and dimensions shown on the plans, and contained in this specification. In addition, it shall

include all connections and joints to new or existing pipes, storm sewer manholes, inlets, headwalls, and other appurtenances as may be required to complete the work. For all side-drain and driveway pipes, concrete headwalls are required at each end of the pipe.

B. MATERIALS

Unless otherwise specified on the plans or herein, thermoplastic pipe and joint fittings shall conform to the following:

1. PP (polypropylene) pipe shall be an impact modified copolymer conforming to the requirements of ASTM D 4101. Joints shall be watertight and meet the requirements of ASTM D 3212 with a minimum of one gasket on the spigot meeting ASTM F 477. For diameters through 36 inch, pipe shall be corrugated exterior with smooth interior having a Manning's roughness coefficient of 0.012. For diameters 42 inch through 60 inch, pipe shall have a smooth interior and exterior surface with annular inner corrugations (triple wall). Triple wall pipe shall also have two gaskets on the spigot end meeting the requirements of ASTM F 477.

2. Minimum Pipe Stiffness (PS) at five percent deflection shall be 46 pounds/inch/inch when tested in accordance with ASTM D 2412.

C. INSTALLATION

Installation shall be in accordance with **ASTM D 2321**, "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications".

Thermoplastic pipe shall be unloaded and handled with reasonable care. Pipe shall be placed in the bed starting at the downstream end. Trenches must be excavated in such a manner as to insure that the sides will be stable under all working conditions. Trench walls shall be sloped or supported in conformance with all standards of safety. Only as much trench as can be safely maintained shall be opened. All trenches shall be backfilled as soon as practicable, but no later than the end of each working day.

D. TRENCH WIDTHS

Trench width shall be sufficient to ensure working room to properly and safely place and compact haunching and other backfill materials. Minimum trench width shall not be less than 1.25 times the pipe outside diameter plus 12 inches. (1.25 x O.D. + 12") If flowable fill is used, the trench width shall not be less than the outside diameter plus 12 inches. (O.D. + 12")

Note: On multiple pipe barrel runs the clear distance between pipes is as follows:

12"-24" Diameters: Clear span =12"

24" & Greater Diameter: Clear span = $\frac{1}{2}$ x Diameter

E. MINIMUM COVER

The minimum cover is one foot (1.5') (4"-36" Diameters) and two feet for (2.5') for larger diameter structures (60" Diameter); however, care should be taken when heavy construction equipment loads cross the pipe trench during construction. If the passage of construction equipment over an installed pipeline is necessary during project construction, compacted fill in the form of a ramp shall be constructed to a minimum elevation of three (3.0') feet over the top of the pipe. Any damaged pipe shall be replaced at the contractor's expense.

F. JOINTS

Joints shall be installed that the connection of pipe sections will form a continuous line free from irregularities in the flow line. Joints shall be watertight and must meet a 74kPa (10.8 psi) laboratory test per ASTM D3212 and utilize a bell and spigot design with a gasket meeting ASTM F477.

G. PIPE BEDDING AND BACKFILL FOR LOCATIONS WITHIN THE RIGHT-OF-WAY, STORM DRAINS, SIDE DRAINS, ETC.

Bedding shall consist of Class I material as defined per **ASTM D2321**. A minimum of 6" of bedding shall be provided prior to placement and shall be loosely compacted. Backfill material shall meet the same requirements as the bedding material and shall extend to 12" above the crown of the pipe. Backfill material shall be placed in 6 inch compacted lifts. See Table 1 for more detail.

H. PIPE BEDDING AND BACKFILL FOR LOCATIONS OUTSIDE THE RIGHT-OF-WAY

Bedding shall consist of Class I, II, or III material as defined per **ASTM D2321**. A minimum of 6" of bedding shall be provided prior to placement and shall be loosely compacted. Backfill material shall meet the same requirements as the bedding material and shall extend to 6" above the crown of the pipe. Backfill material shall be placed in 6 inch compacted lifts and compacted in accordance with the fill height table listed in Table 1.

**Table 1
Maximum Cover for ADS N-12 HP Pipe, ft/m**

Diameter in (mm)	Class I	Class II			Class III			Class IV
	Compacted	95%	90%	85%	95%	90%	85%	85%
12 (300)	39 (11.9)	27 (8.2)	20 (6.1)	15 (4.6)	21 (6.4)	16 (4.9)	14 (4.3)	13 (4.0)
15 (375)	42 (12.8)	29 (8.8)	21 (6.4)	16 (4.9)	22 (6.7)	17 (5.2)	15 (4.6)	14 (4.3)
18 (450)	36 (11.0)	25 (7.6)	18 (5.5)	13 (4.0)	19 (5.8)	14 (4.3)	13 (4.0)	12 (3.7)
24 (600)	31 (9.4)	22 (6.7)	16 (4.9)	11 (3.4)	16 (4.9)	12 (3.7)	11 (3.4)	10 (3.0)
30 (750)	30 (9.1)	22 (6.7)	16 (4.9)	12 (3.7)	16 (4.9)	12 (3.7)	11 (3.4)	10 (3.0)
36 (900)	27 (8.2)	19 (5.8)	14 (4.3)	10 (3.0)	14 (4.3)	11 (3.4)	9 (2.7)	8 (2.4)
48 (1200)	21 (6.4)	16 (4.9)	11 (3.4)	8 (2.4)	12 (3.7)	9 (2.7)	7 (2.1)	7 (2.1)
60 (1500)	31 (9.4)	22 (6.7)	15 (4.6)	10 (3.0)	16 (4.9)	11 (3.4)	10 (3.0)	7 (2.1)

I. POST INSTALLATION INSPECTION

The Contractor shall provide a mandrel test on a minimum of 20% of the pipelines installed. The sections to be tested will be selected by the Engineer. The test shall be conducted at least 60 days after the installation of the pipeline. The internal diameter of the barrel shall not be reduced by more than 5% of its nominal diameter when measured or inspected not less than 60 days following completion of installation. If the mandrel tests fail, the Contractor shall provide a Video Camera (CCTV) inspection of up to 100% of the pipelines installed as directed by the Engineer.

407. CURB AND GUTTER

407-10 GENERAL This item shall consist of concrete combined curb and gutter, header curb and turnouts and all poured on the prepared subgrade in one course and in accordance with the sections, dimensions and grades shown on the plans.

407-20 MATERIALS

407-20.01 CONCRETE Concrete for curb and gutter, header and turnouts shall comply with Section 100 of these specifications.

407-20.02 EXPANSION JOINTS Pre- molded joint material for expansion joints shall meet the requirements of one of the following AASHTO specifications: M-58, M-59 or M-90.

407-30 CONSTRUCTION METHODS The subgrade upon which these items are constructed shall be compacted to a firm and uniform density and grade. Should the alignment of these items fall along an existing side ditch, all unsuitable material shall be excavated and wasted and

the backfill shall be made of selected materials. Subgrade compaction shall reach at least 98% standard Proctor method density at optimum moisture content. Pre-molded expansion joints one-half (1/2) inch thick shall be placed at intervals not to exceed thirty (30) feet. The expansion joint material shall fill the full cross section and any protruding material shall be trimmed flush with the surface after the concrete has set. No expansion joint shall be set within the limits of driveways or alley turnouts. Concrete shall only be poured in forms of steel or wood, free from warp, sufficiently strong to prevent any lateral deflection. Templates shall be set at a maximum spacing of ten (10) feet except in driveways. The concrete shall be placed in the forms to the final depth required and shall be tamped and spaded until it is consolidated and mortar entirely covers and forms the top surface. The exposed surfaces of the concrete shall be floated smooth and the edges rounded to the radius shown on the Plans. Before the concrete is given the final finishing the surface shall be tested with a ten-foot straight edge and irregularities of more than one-quarter (1/4) inch in ten (10) feet shall be eliminated. Curing of the concrete shall be as set up in Section 100 of these specifications.

408. INLETS, CATCH BASINS, JUNCTION BOXES AND MANHOLES

408-10 GENERAL This item shall consist of storm water inlets, catch basins, junction boxes, manholes, openings and covers constructed in accordance with these specifications, and in the locations shown and in conformity with the plans. These structures shall include the connection to all existing or new drainage lines, entering or leaving the inlet, junction box or basin. The Contractor shall perform all excavation required for the structure and footing to the required line and grade.

408-20 MATERIALS

408-20.01 CONCRETE Concrete necessary for construction of these items shall be concrete complying with Section 101 of these specifications.

408-20.02 CASTINGS All castings shall be sound gray iron, true to form and dimension and shall be free from inclusions of foreign matter, blow holes and other defects rendering them unsuitable. The bearing surface shall be machine ground to prevent rocking or rattling. Castings may be selected from manufacturer's stock patterns which conform generally to the plans and with the approval of the Engineer prior to purchase. Cuts of costing proposed to be used shall be furnished to the Engineer showing designs, dimensions and weights. Inlet grates, if so shown on the plans, shall be fabricated of rod and bar stock as shown on the Plans. After fabrication, the grates shall be cleaned, sealed and painted with two (2) coats of approved bituminous base paint.

408-20.03 MORTAR Mortar shall be mixed only in quantities required for immediate use. Unless an approved mortar mixing machine is used, the sand and cement shall be

mixed dry in a tight box until the mixture assumes a uniform color, after which water shall be added as the mixing continues until the mortar attains the proper consistency.

Mortar which is not used within 45 minutes after water has been added shall be wasted. Re-tempering of mortar will not be permitted.

408-30 CONSTRUCTION METHODS The inlets, catch basins, and junction boxes shall be constructed with tops and bottoms of concrete as specified in detail under the section entitled "Concrete" of these Specifications, and shall be of the dimensions and thicknesses as shown on the Plans. The invert shall be sloped to drain. Inlet and outlet pipes shall be set flush with the wall and with a neat water tight connection. Casting frames as shown on the Plans shall be set true to line and grade and in a mortar bed. The hand tamped backfill shall be performed after the concrete has set. Covers and grates, if called for on the Plans, shall be set so as to be removable.

409. MANHOLE ADJUSTED TO GRADE

409-10 GENERAL This item shall consist of the raising or lowering of existing manholes to grades established by the Engineer.

409-20 MATERIALS – In Lieu of round concrete rings, all castings shall be raised using round High Density Polyethylene (HDPE) rings or an approved equal.

- A. The adjustment rings shall be manufactured from polyethylene plastic as identified in ASTM Designation D-1248 Standard Specification for Polyethylene Plastic Molding and Extrusion Materials.
- B. The adjustment rings shall be load tested to assure compliance with impact and loading requirements.
- C. The annular space between the rings and cone basin, the rings, and the rings and cover frame shall be sealed utilizing an approved butyl sealant.

409-30 CONSTRUCTION METHODS Top elevations of manholes to be changed shall be built up or lowered to the elevations as established by the Engineer. The complete structure shall be true in all details, in size, lines, etc., as was the original. Manhole rims and covers together with all other iron originally installed shall be re-set in the revised structure. Installation shall be per manufacture's recommendations only.

410. VALVE BOX ADJUSTED TO GRADE

410-10 GENERAL This item shall consist of raising or lowering of existing valve boxes to the grades established by the Engineer.

410-20 MATERIALS Materials for this item shall be similar or equal to those existing.

410-30 CONSTRUCTION METHODS Top elevations of valve boxes to be changed shall be built up or lowered to the elevation established by the Engineer. The completed structure shall be true in all details as was originally.

411. SEEDING

411-10 GENERAL The work in this section consists of ground preparation, fertilizing and planting designated areas in accordance with the Plans (or by direction) and these Specifications.

411-20 GROUND PREPARATION The ground preparation shall consist of obtaining a well pulverized soil to a depth of from 2" to 4" by an approved method. The surface shall be free of large clods, boulders, stumps or other objectionable material.

If wetting of soil is necessary for proper preparation, the Contractor shall furnish the water and equipment for its application.

411-30 FERTILIZER An approved commercial fertilizer of 12-24-12 mixture shall be applied at the rate prescribed on the bag.

Full strength fertilizer shall not be in contact with grass roots.

411-40 SEEDING A good stand of grass must be established by the Contractor using approved sowing methods and grass seed.

412 Testing Requirements

412-10 Subgrade - Testing requirements include, at a minimum, classification of subgrade soils, determination of Atterberg limits, percent passing No. 200 sieve, optimum moisture content, maximum dry density and in-place field moisture density. Soil classification tests and laboratory moisture-density relationship (Proctor) tests shall be conducted at the beginning of earthwork construction and for every 1000 cu yd placed. **As a minimum, one moisture/density test shall be taken per lift for each 300 ft of roadway or each 2,500 sq ft of parking area.** These quality control tests shall be run by a MDOT Certified Soil Technician. Laboratory tests shall be conducted by a certified laboratory.

412-20 Asphalt - Testing requirements include, at a minimum, determination of HMA mixture gradation, total voids, VMA, asphalt content, maximum specific gravity of the HMA mixture, Marshall stability and roadway density tests. These test samples shall be randomly taken at the HMA production plant or at the placement site during production. These quality control tests shall be run by a MDOT Certified Asphalt Technician I. **At least one quality control sample shall be obtained and tested for each 500 tons produced (minimum one per day) or at intervals determined by the City of Byram.** The Contractor shall report all quality control tests to the City on a daily basis. While the Contractor is responsible for production quality control of the HMA, the City may obtain and test HMA samples on a random basis during production.

A minimum of five (5) roadway density tests shall be conducted for each day's production. For each day's production found not to meet the density requirement of 92.0 percent of maximum density may remain in place with a reduction in payment as set in the following table.

Payment Schedule for Asphalt Compaction	
Pay Factor	Average Density % of Maximum Density
1.00	92.0 and above
0.90	91.0 - 91.9
0.75	90.0 - 90.9
*	below 90.0

Note (*) - Any day's production or portion thereof with density of less than 90.0 percent maximum density shall be removed and replaced at no additional cost to the City of Byram.

412-30 Concrete - Testing requirements include, at a minimum, **evaluating the quality of the concrete every 50 cu yd or fraction thereof of concrete placed each day.** The slump, air content and temperature of the concrete mixture shall be evaluated. Compressive strength specimens shall be molded to determine 7 and 28 day strengths. These quality control field tests shall be run by an ACI/MDOT certified field technician. Compressive strength tests shall be conducted by a certified laboratory.

**MATERIAL SUBMITTALS AND
JOB CONTROL SAMPLING AND TESTING**

LAYER	TESTS	FREQUENCY
Sub-grade	Classification	1000 C. Y.
	Proctor	1000 C. Y.
	Density	300 - 500 ft per layer
	Sub-grade Profile	200 - 500 ft intervals 3 ft depth
	Proof-rolling	Final layer
	Material Submittal	5 days prior to construction
Lime Treated Sub-grade	Proctor	1000 C. Y.
	Proof-rolling	Final layer
	Density	300 - 500 ft per layer
Granular Base	Classification	1000 C. Y.
	Proctor	1000 C. Y.
	Proof-rolling	Final layer
	Density	300 - 500 ft per layer
	Material Submittal	5 days prior to construction
Hot Mix Asphalt	Mix Tests - Extraction - Stability - Voids - Maximum Specific Gravity	1 per 500 tons (minimum 1 per day)
	Density	5 per day
	TSR	1 per 10 days of production
	Mix Design	10 days prior to construction
Concrete	Compressive Strength	50 C. Y. (minimum 1 set per day)
	Air Content	50 C. Y.
	Slump	50 C. Y.
	Temperature	50 C. Y.
	Mix Design	10 days prior to construction

413 Minimum Pavement Thickness Recommendations

Currently the Standards of Design and Specifications for Subdivisions for the City of Byram categorizes city streets according to the pavements intended purpose and expected traffic volume. The four classes of city streets, ranging from highest to lowest traffic volumes are arterial streets, collector streets, local streets, and cul-de-sacs. The primary difference in the traffic level categories is the anticipated level of heavy truck traffic and the total number of vehicles over the design life of the pavement. Cul-de-sac and local streets (light duty) are anticipated to carry a very limited amount of heavy truck traffic (i.e. moving van and garbage truck). Collector streets (medium duty) are designed to accommodate a minimal amount of daily heavy truck traffic. Arterial streets (heavy duty) are designated as principal traffic ways and are designed to accommodate moderate to heavy levels of daily heavy truck traffic.

Minimum pavement thicknesses are presented in the following tables for asphalt and concrete pavement sections for each of the city traffic level categories and commercial developments. The minimum pavement thicknesses are valid for typical soil conditions in the Byram area (CBR=5 and K=150 pci). All pavement thicknesses shall be verified for actual expected traffic volumes and loadings using appropriate design parameters for subgrade soils and pavement structure materials. Pavement sections for heavy traffic streets shall be designed according to anticipated heavy truck volumes to insure adequate structural capacity.

**TABLE 1. MINIMUM REQUIREMENTS FOR ASPHALT PAVEMENTS
ALL STREETS WITHIN THE CITY OF BYRAM**

Pavement Layer	Thickness (In.)					
	Arterial Street (Heavy Duty)		Collector Street (Medium Duty)		Local Street/Cul-De- Sac (Light Duty)	
	1	2	1	2	1	2
Asphalt Surface (1)	3	5	3	4	3	4
Bituminous Base	6	---	4	---	3	---
Crushed Limestone	---	10	---	8	---	6
Lime Treated Subgrade (2)	8	8	8	8	8	8

Notes: (1) The final 1 ½” of surface course shall be placed in compliance with Section 403.

(2) Sub-grade soil shall be treated with 6 % hydrated lime by dry weight of soil. Lime treatment shall extend at least 1 foot beyond back of curb.

**TABLE 2. RECOMMENDED MINIMUM REQUIREMENTS
FOR ASPHALT PAVEMENTS
COMMERCIAL DEVELOPMENT**

Pavement Layer	Thickness (In.)			
	Light Duty		Heavy Duty	
	1	2	1	2
Asphalt Surface	3	4	3	5
Bituminous Base	3	---	6	---
Crushed Limestone	---	6	---	10
Lime Treated Subgrade (1)	8	8	8	8

Note: (1) Sub-grade soil shall be treated with 6 % hydrated lime by dry weight of soil.

Lime treatment shall extend at least 1 foot beyond back of curb.

**TABLE 3. MINIMUM REQUIREMENTS FOR
CONCRETE PAVEMENTS**

TABLE INSET:

Traffic Category	Thickness (In.)		
	Concrete	Crushed Stone (1)	Lime Treated Subgrade (2)
Arterial Street	8.0	6.0	8.0
Collector Street	6.0	6.0	8.0
Local Street	5.0	---	8.0
Cul-de-sac	5.0	---	8.0
Light duty-commercial	5.0	---	8.0
Heavy duty-commercial	7.0	6.0	8.0

Note: (1) Sub-base material - No. 610 limestone.

(2) Sub-grade soil shall be treated with 6 percent hydrated lime by dry weight of soil.

Lime treatment shall extend at least 1 foot beyond back of curb.

(3) Concrete pavements shall not be allowed on any public streets.

**TABLE 4. CRUSHED LIMESTONE
AGGREGATE SUBBASE MATERIAL**

Crushed Stone Gradation Limits	
Sieve Size	% Passing
1 1/2"	100
1"	90 – 100
3/4"	70 – 100
2"	62 – 90
3/8"	50 – 80
#4	40 – 65
#40	12 – 26
#200	5 – 12

DIVISION 500

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DIVISION 500

DETAILED SPECIFICATIONS - ROADWAY CROSSING FOR UTILITY LINES

501 - GENERAL

501-10 DESCRIPTION

501-10.01 The work includes providing materials and equipment to install roadway or railroad crossings for water lines as herein specified and shown on drawings.

501- 10.02 All work must comply with the terms and conditions as set forth by the City.

501-10.03 Include excavation, backfill, construction of cribbing and cofferdams, dewatering, and incidental work associated with installation of the casing.

501-10.04 It must be anticipated that existing piping, cable, telephone lines and utilities shown on drawings will vary. When encountered during excavation or other work, immediately notify Owner, Engineer and applicable utility company. Cost for any required repairs must be paid by the Contractor.

501-10.05 Installer must be experienced in this type of work and be acceptable to the Engineer.

502 MATERIALS

502-10 Casing:

1. Steel casing shall be Schedule 30, Grade B, plain end steel pipe, butt welded, of the sizes specified in the Proposal. Minimum metal thickness shall be .375 inches unless otherwise specified.
2. PVC casing shall be SDR 26, Class 160, solvent welded pipe of the sizes specified on the proposal. PVC casing shall only be used as approved by the Engineer.

502-20 Grout for sealing the annular space between carrier pipe and casing at each end shall be non-shrink type.

503 - EXECUTION

503-10 CONSTRUCTION REQUIREMENTS

503-10.01 Restore the work and/or adjacent areas equal to original appearance.

503-10.02 Complete construction in accordance with the roadway or railroad crossings permits and other details shown on the plans.

503-10.03 Refer to Section 3 of these Specifications for fill and backfill requirements.

503-10.04 Where casing is to be extended along an existing line by splitting and re-welding, all welds shall be continuous, water-tight and penetrate at least 1/2 the material thickness.

DIVISION 600

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DIVISION 600

DETAILED SPECIFICATIONS - PAVEMENT REPAIRS AND EROSION CONTROL

601 - GENERAL

601-10 DESCRIPTION

601-10.01 Work under this item shall include the replacement of various types of pavements and seeding and fertilizing operations at the locations shown on the plans and as described herein. Such work shall include ground surface preparation, blading, harrowing, furnishing seed and fertilizer, watering, compacting, pavement replacement, repairing and other items as may be subsidiary to the completion of the work.

601 -10.02 Work done under this item will generally be related to, associated with and completed following the installation of streets, sidewalks, walking trails and/or water, sewer, storm sewer, or other utility improvements along or across roadways, driveways, right-of -ways, easements and other routes as may be designated by the Engineer or shown on the plans.

601-10.03 All work shall be done to the extent directed by the Engineer to the Owner's satisfaction.

602 - MATERIALS

602-10 SEED

602-10.01 All seeds shall meet the requirements of the Seed Laws of the State of Mississippi and shall be tested in accordance with the U.S.D.A. guidelines. The seed shall be delivered in bags or containers bearing seed certification tags and other identification showing percent germination and purity of the seed.

602-10.02 Bermuda seed shall be common, hulled, fresh, clean, new crop seed testing at least 95% for purity and 90% for germination.

602-10.03 Rye grass seed shall be fresh, clean, new crop seed testing at least 95% for purity and 90% for germination.

602-20 FERTILIZER

602-20.01 All fertilizer shall be an approved commercial grade containing nitrogen, phosphorus and potash and shall be delivered accompanied by identification of the brand and grade being furnished. Fertilizer may be furnished in bulk, in bags or

602-20.02 Unless otherwise specified, fertilizer shall be dry granular grade 13-13-13 (triple thirteen) containing equal parts of nitrogen, phosphorus and potash, respectively.

602-40 ASPHALT

602-40.01 All materials for asphalt paving and related work shall comply with Mississippi Standard Specification for Road and Bridge Construction, MDOT, Latest Edition, English units, including all current special provisions as follows:

1. Base course - Section 301
2. Tack coat - Section 407
3. Binder course - Section 403
4. Surface Course - Section 403

602-40.02 Asphalt materials utilized in the project shall be Type BB-1 base course, Type BC-1 binder course and Type SC-1 Type VIII surface course, as specified on the Proposal or indicated on the plans.

602-50 CONCRETE

602-50.01 All materials for concrete paving and related work shall comply with the Mississippi Standard Specifications for Road and Bridge Construction, Latest Edition, English units, as follows:

1. Fine Aggregate - Section 703.01-B (2)
2. Coarse Aggregate - Section 703, Size 467
3. Portland Cement - Section 701, Type I
4. Water - Section 714.01

602-50.02 Portland cement concrete utilized in the project shall have a minimum 28-day compressive strength and a maximum slump specified herein for the particular purposes desired.

603 - EXECUTION

603-10 SEEDING AND FERTILIZING

603-10.01 The area to be planted shall be disked and prepared to a depth of at least four (4) inches. The specified amount of fertilizer shall be applied uniformly over the surface and harrowed lightly so that it will be incorporated into the upper two (2) inches of the soil. If the soil is not moist, it shall be watered until it is in workable condition. The completed area to be planted shall present a smooth, uniform surface true to line and cross section. Planting shall follow immediately.

603-10.02 Seeding shall be completed at a rate of 10 LBS/Acre unless otherwise specified.

603-10.03 Fertilized shall be completed at a rate of 500 LBS/Acre unless otherwise specified.

603-30 ASPHALT PAVEMENT INSTALLATION

603-30.01 Asphalt pavement repairs shall be made for the length of the open cut in the drive or roadway at such widths as may be necessary to remove broken or disturbed pavement along each side of the trench.

603-30.02 Asphalt pavement shall be deposited on a prepared subgrade of in place or select materials compacted to 96% maximum density with mechanical tampers.

603 -30.03 Pavement replacement shall consist of placement of 8" crushed limestone, 6" base course and 2" surface course, which shall be finished to the grade elevation of the existing pavement.

603-30.04 Asphalt utilized in pavement repairs shall be surface course, Type SC-1 Type VIII unless otherwise approved by the Engineer.

603-40 CONCRETE PAVEMENT INSTALLATION

603-40.01 Concrete pavement repairs shall be made for the length of the open cut in the drive or roadway at such width as may be necessary to remove broken or disturbed pavement along each side of the trench.

603-40.02 Concrete pavement shall be deposited on a prepared subgrade of in-place or select materials compacted to 96% maximum density with mechanical tampers.

603- 40.03 Pavement replacement shall consist of a minimum thickness of 10" unless otherwise specified, which shall be finished to the grade elevation of the existing pavement.

603-40.04 Concrete utilized in pavement repairs shall be 3000 PSI Portland cement concrete with a maximum slump of 5 inches unless otherwise approved by the Engineer.

