STANDARD SPECIFICATIONS

FOR THE CONSTRUCTION OF

PUBLIC WORKS PROJECTS

CITY OF BIRMINGHAM

DEPARTMENT OF PLANNING, ENGINEERING AND PERMITS

BIRMINGHAM, ALABAMA

2005

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SECTION 10 - DEFINITIONS

10.1 Definitions.

a) Whenever in the specifications or in any documents or instruments in construction operations where these specifications govern the following terms (or pronouns in place of them) are used, the meaning and intent shall be interpreted as follows:

ABBREVIATIONS.

AASHTO	American Association of State Highway and Transportation Officials
ADEM	Alabama Department of Environmental Management
AIA	American Institute of Architects
ALDOT	Alabama Department of Transportation
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CRSI	Concrete Reinforcing Steel Institute
FSS	Federal Standard Specifications
MUTCD	*Manual on Uniform Traffic Control Devices Highways*
OSHA	Occupational Safety and Health Administration
SSPC-SP	Steel Structures Paint Council - Surface Preparation

ADDITIVE. A substance or agent added in small amounts to a basic ingredient of a mixture prior to mixing.

BACKFILL. Material used to replace or the act of replacing material removed during construction; may also denote material placed or the act of replacing material adjacent to structures.

BASE. The layer or layers of specified materials of designated thickness placed on a subbase or substrate to support a pavement or surface.

BINDER LAYER. The lower layer of the surface, consisting of a plant mix of graded aggregate and bituminous material.

BORROW. Suitable material from sources outside the construction limits.

CONSTRUCTION JOINT. A joint made necessary by a prolonged interruption in the placing of concrete.

CONTRACTION JOINT. A joint at the ends of a rigid slab to control the location of transverse cracking.

DETOUR. A route provided for traffic to use in lieu of a regular route.

EASEMENT. A right to use or control the property of another for designated purposes.

EMBANKMENT. A structure of soil, soil aggregate or broken rock.

EQUIPMENT. All machinery and tools, together with the necessary supplies for operation and upkeep, maintenance, and protection, and also all apparatus necessary for the proper construction and acceptable completion of the work.

EXISTING. The physical status as of the date of the *Notice to Contractors* of any structure, surface, utility, or other unit affected by a particular project.

EXPANSION JOINT. A joint located to provide for expansion of a rigid slab, without damage to itself, adjacent slabs, or structures.

GENERAL TERMS.

1. *NO DIRECT PAYMENT* and *WITHOUT ADDITIONAL COMPENSATION*. Whenever it is provided in the contract that *no direct payment shall be made* for any work subsidiary or related to any pay item, or it is stated in effect that certain provisions of work shall be *without additional compensation* it is understood in both cases that the Contractor's compensation for such work is to be included in related pay items or all pay items.

2. AVOIDANCE OF REPETITION. Whenever the terms *contemplated, required, directed, authorized, considered necessary, permitted, approved, suitable, unacceptable, designated,* or terms of like import are used in these specifications, they shall be construed to mean *to* or *by the Engineer*, unless the contract or context clearly indicates otherwise.

HIGHWAY, STREET OR ROAD. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way.

IN PLACE. A term to denote that the unit price covers compensation for the item complete in place including all cost incidental to procurement, handling, hauling and processing the item (including water) as required. The item shall be measured and paid for in the manner described in the specifications for that item.

JOINT. A designated vertical plane of separation or weakness.

LEVELING COURSE. The layer of material placed on an existing surface to eliminate irregularities prior to placing an overlaying course.

LONGITUDINAL JOINT. A joint normally placed between traffic lanes to control longitudinal cracking.

MATERIALS. Any substances specified for use in the construction of the project and its appurtenances.

ORIGINAL GROUND. The ground surface just prior to the initiation of the proposed work.

PAVEMENT STRUCTURE. The combination of subbase, base, and surface placed on a subgrade to support the traffic load and distribute it to the roadbed.

PAY ITEM (ITEM, ITEM OF WORK). A specifically described unit of work for which a price is provided in the contract.

PLANT MATERIAL. All living plants, including trees, shrubs, turf, groundcover, grasses, hedges, vines, bulbs, annuals, and the like.

PRIME COAT. An application of a low viscosity liquid bituminous material to coat and bind mineral particles preparatory to placing a base or surface course.

REINFORCEMENT. Steel embedded in concrete structures to resist tensile stresses and detrimental opening of cracks.

REPROCESSING. The renewal of an existing surface by scarifying, remixing with or without additional material, and relaying.

RESURFACE. The placing of one or more courses of asphalt plant mix on an existing surface.

RIGHT-OF-WAY. A general term denoting land, property, or interest therein, usually in a strip, acquired for or devoted to transportation purposes.

ROADBED. The graded portion of a highway prepared as a foundation for the pavement structure and shoulder. The top surface of the roadbed is the subgrade.

SIDEWALK. That portion of the roadway primarily constructed for the use of pedestrians.

SOD. A particular turf species.

STRUCTURES. Bridges, culverts, basins, inlets, retaining walls, manholes, sewers, and other features that may be encountered in the work and not otherwise classed herein.

SUBBASE. A layer or layers of specified or selected material or design thickness placed on a subgrade to support a base or rigid pavement.

SUBGRADE. The top surface of the roadbed.

SURFACE. One or more layers of a material designed to accommodate the traffic load, the top layer of which resists skidding, traffic abrasion, and the disintegrating effects of climate. The top layer is generally called the wearing layer and the lower layer the binder layer.

TACK COAT. An application of bituminous material to an existing surface to provide bond with a superimposed course.

TYPICAL SECTION. That cross-section established by the contract that represents in general the line to which the Contractor shall work in the execution of the work.

END OF SECTION

SECTION 20 - CLEARING AND GRUBBING

20.1 Description. The work specified in this section includes clearing, or clearing and grubbing, removing and disposing of all vegetation and debris, except such objects that are designated to remain within the limits designated in the contract or as required by the Engineer. This work also includes preventing injury or defacement to vegetation and objects designated to remain.

20.2 Construction Requirements.

a) General.

i) The Engineer shall stake out on the ground the areas noted in the contract to be cleared, or cleared and grubbed. Any damage to natural terrain, vegetation, trees or objects designated to remain shall be repaired, replaced or other compensation made, as determined by the Engineer, by the Contractor without additional compensation.

ii) Ornamental trees, cultivated shrubs and similar growth which occupy public rights-of-way or easements but which lie outside the limits of construction shall remain undisturbed and shall be carefully preserved and protected by the Contractor throughout all stages of the work. In the case where this type of growth exists within the limits of construction, the Contractor shall contact the property owner relative to salvaging the growth.

iii) Unless otherwise included in the contract, the removal, relocation or adjustment of existing structures and utilities required to permit orderly progress of the work shall be accomplished by others. Whenever a utility pole, pipeline, conduit, sewer, roadway or other utility is encountered and must be removed, relocated or adjusted, the Contractor shall notify the responsible local authority or owner and attempt to secure prompt action.

iv) Any blasting necessary to complete the work shall be done in accordance with Title 4, Chapter 1, Article D of the *General City Code* and any other applicable federal, state and local regulations, laws and ordinances. The Contractor shall exercise the utmost care not to endanger life and property. Any claims of damage as a result of the blasting operation shall be the Contractor's responsibility. The Contractor shall be responsible for obtaining a City of Birmingham *Blasting* permit prior to commencing with any blasting.

v) The Contractor shall be responsible for work done under this section by any subcontractor employed by him.

b) Clearing.

i) The designated areas shall be cleared of all surface objects, trees that have been identified to be removed, stumps, roots and other objectionable obstructions resting on or protruding through the surface of the original ground.

ii) Areas outside of the clearing limits shall be protected from damage.

c) Clearing and Grubbing.

i) The designated areas shall be cleared and grubbed of all trees identified to be removed, stumps, roots, buried logs, brush, grass, rubbish of any nature and other objectionable matter on or protruding through the ground surface.

ii) All holes remaining after the stump removal and grubbing operation shall be filled with acceptable material and properly compacted and shaped so as not to prevent the natural drainage of water from the area.

iii) All fill areas shall be grubbed to a depth at least one (1) foot below the natural ground surface.

iv) Areas outside of the clearing and grubbing limits shall be protected from damage.

d) Disposal of Materials.

i) The Contractor shall submit a plan providing for the disposal of materials and debris from the clearing, or clearing and grubbing, operation to the Engineer for approval prior to beginning work. The plan shall conform to all applicable federal, state and local laws, regulations and ordinances.

ii) If the Contractor elects to dispose of materials and debris outside of the project limits, he shall obtain and file with the Engineer written permission from the property owner for the use of private property for this purpose prior to beginning any work. There shall be no additional compensation for material and debris so disposed.

iii) Burning as a method of disposal of materials and debris shall be evaluated on a project-by-project basis by the Engineer. The Contractor shall comply with all federal, state and local laws, regulation and ordinances pertaining to burning.

iv) The manner and location of disposal of materials and debris shall not create an unsightly or objectionable view nor shall it create a future maintenance problem for the City of Birmingham or property owner.

20.3 Method of Measurement.

a) General. The quantities of clearing, or clearing and grubbing, as indicated by the limits shown in the contract or as ordered by the Engineer shall be cited in terms of the number of acres, or fractions thereof, of land specifically cleared, or cleared and grubbed, unless a lump-sum bid is specified in the contract.

b) Partial Payment.

i) If Bid in Acres. The number of acres or fraction thereof cleared, or cleared and grubbed, each pay period work is performed on this item shall be multiplied by the unit price bid per acre for clearing, or clearing and grubbing.

ii) If Bid Lump Sum. The estimated percentage of the total area cleared, or cleared and grubbed, each pay period shall be multiplied by the unit price bid for this item. These percentage payments shall be made each pay period work is performed on this item until the entire project has been cleared, or cleared and grubbed.

20.4 Basis of Payment.

a) Unit Price Coverage.

i) Accepted clearing and grubbing shall be paid for at the per acre price bid in the contract, unless bid lump sum, for the designated areas and such bid, whether per acre or lump sum, shall be full compensation for furnishing all materials, equipment, tools, labor and incidentals necessary to complete and maintain the work until final acceptance of the project.

ii) In case changes in location, right of way or easement areas result in changes in designated areas from those shown in the contract, a proportionate increase or decrease in payment shall be made.

b) Exclusions.

i) When no item is provided, the work under this section shall not be paid for directly but shall be

considered incidental to the overall work, the cost of which being included in other items of work.

ii) This exclusion shall not apply to the removal of trees if an item for tree removal is included in the contract.

END OF SECTION

SECTION 21 - EXCAVATION AND EMBANKMENT

21.1 Description. The work specified in this section includes the excavation, hauling, compaction and/or disposal of all material, not otherwise being removed and paid for under another item of work, which is encountered within the limits of the work, and is necessary for all construction in accordance with these specifications and in close conformity with the lines, grades, thickness and typical cross-section shown in the contract or established by the Engineer. All excavation covered in this section shall be classified either as *Unclassified Excavation*, *Borrow*, or *Rock Excavation - Pipe Trench Only*.

21.02 Materials.

a) *Unclassified Excavation* shall consist of the excavation, disposal or placement in embankments of all materials of whatever character encountered in the work including, but not limited to, soil, rock, concrete paving, streetcar tracks, cobblestone, asphalt paving, concrete, etc.

b) *Borrow* shall consist of approved material required for the construction of embankment, or for other portions of the work, in excess of the quantity of usable material available from required excavations on the project.

c) *Rock Excavation - Pipe Trench Only*.

i) Rock excavation shall include the removal of sound, solid rock which occurs in its original position within the excavation pay limits and which is of such hardness or texture that, in the opinion of the Engineer, it cannot be loosened or broken down and removed with conventional soil excavating equipment. The removal of boulders, pieces of stone and old masonry masses one cubic (1) yard or larger in volume shall be classified as *Rock Excavation - Pipe Trench Only*.

ii) The removal of hardpan, chert, clay, soft or disintegrated shale, and other like materials, and boulders less than one (1) cubic yard in volume shall not be classified as *Rock Excavation - Pipe Trench Only* although the Contractor may elect to remove such material by drilling and blasting methods.

21.03 Construction Requirements.

a) General.

i) Prior to beginning excavation and embankment operations in any area, all required clearing and grubbing of the area should have been completed in accordance with the requirements of Section 20.

ii) The excavation and embankment for the work shall be constructed and maintained so as to properly drain and have reasonably smooth and uniform surfaces. The final elevation shall be in conformity to that shown in the contract or as approved by the Engineer.

iii) The Contractor shall take adequate steps to minimize soil erosion from the job site. Special attention is directed to Section 45 of these specifications.

iv) No material shall be wasted without the permission of the Engineer.

v) The Contractor shall be responsible for disposing of excess material.

vi) Excavation operations shall be so conducted that material outside the limits of construction are not disturbed.

vii) Choice of equipment to perform the work shall be that of the Contractor. The type and number of units shall be adequate to perform the excavation and embankment operations in conformity with the contract and to obtain the required compaction. Supplemental equipment shall be furnished by the Contractor as necessary to keep the work properly shaped, without additional compensation.

viii. All hauling shall be considered a necessary and incidental part of the work. No payment shall be made for hauling on any part of the work.

b) The removal and disposal of existing improvements is considered an incidental part of the work and no additional compensation shall be allowed therefor.

c) Roadway and Drainage Excavation.

i) General. All intersecting roads, approaches, entrances and driveways shall be kept graded, completed concurrently with the roadway grading, and be passable at all times, as directed by the Engineer. During the grading operation, the area being graded shall be maintained reasonably smooth and well drained.

ii) Removal and Replacement of Topsoil. Topsoil within the construction limits shall be removed in the areas and to the depth specified by the Engineer. It shall be stockpiled in approved locations for use in the final finishing of slopes or other areas to be re-vegetated. The work of removing and stockpiling topsoil shall be measured and paid for as *Unclassified Excavation*.

iii) Selective Grading.

(1) Certain designated zones or portions of cuts which afford the more suitable soils for roadway construction shall be reserved as directed by the Engineer for use in forming the upper graded earth layer or layers for embankments or cuts, for backfilling, or for other purposes as determined by the Engineer. Should it become necessary to stockpile selected material for later use, it shall be stockpiled in a location approved by the Engineer.

(2) Selective grading shall include, but not be limited to, excavating, stockpiling, removing from the stockpile, and re-handling selected material. It shall also include the disposal of all or part of the stockpiled selected material that is not used. Selective grading as described in this paragraph shall be measured and paid for as *Unclassified Excavation*.

(3) The Contractor may, without additional compensation, elect to use material from offsite sources in lieu of using selected material as described above.

iv) Undercutting.

(1) Soils that are determined by the Engineer to be unsuitable for the intended purpose shall be undercut to the depth specified by the Engineer. The Contractor shall dispose of unsuitable material without additional compensation. The undercut areas shall then be backfilled with a suitable material, obtained from stockpiles as described in paragraph 21.03c)iii) or from borrow sources, and compacted to the density specified for embankments. Undercutting as described in this paragraph shall be measured and paid for as *Unclassified Excavation*.

(2) Material, other than stockpiled selected material as described in paragraph 21.03c)iii), used to backfill undercut areas shall be paid for in the respective unit of the material comprising the backfill (i.e., crushed stone - cy, borrow - cy, etc.).

(3) No additional compensation shall be allowed for using stockpiled selected material, as described in paragraph 21.03c)iii), from the job site as backfill.

v) Excavation of Rock.

(1) The excavation of rock from all areas, except pipe trenches, shall be considered unclassified excavation.

(2) Any blasting necessary to complete the work shall be done in accordance with Title 4, Chapter 1, Article D of the *General City Code* and any other applicable federal, state and local regulations, laws and ordinances. The Contractor shall exercise the utmost care not to endanger life and property. Any claims of damage as a result of the blasting operation shall be the Contractor's responsibility. The Contractor shall be responsible for obtaining a City of Birmingham *Blasting* permit prior to commencing with any blasting.

vi) Overbreak, including slides, shall be defined as that portion of any material displaced or loosened beyond the finished work as shown in the contract or authorized by the Engineer. The Engineer shall determine if the displacement of such material was unavoidable and his decision shall be final. All overbreak shall be graded or removed by the Contractor as directed by the Engineer; however, no separate payment shall be made for the removal and disposal of overbreak, which the Engineer determines, as avoidable. Unavoidable overbreak shall be considered unclassified excavation.

d) Borrow.

i) The Contractor shall be responsible for locating suitable borrow sources. The Contractor must have written approval from the Engineer of the borrow source prior to using any material from the source. Such approval shall not relieve the Contractor of the responsibility for the quality and quantity of the material used.

ii) The Contractor shall, without additional compensation, secure the services of a testing laboratory to perform applicable tests as to the suitability of the borrow material for the intended purpose. The Contractor shall submit to the Engineer the results of the tests made on the borrow material prior to its use in the work.

e) Embankment.

i) General.

(1) Only suitable, approved materials shall be used in the work. The Engineer shall be the sole judge as to the suitability of the materials to be used in the embankment and his decision shall be final.

(2) Operations on embankment work shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing temperatures or other unsatisfactory conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed on frozen material.

(3) Rock, broken concrete or other solid material shall not be placed in embankment areas where piles are to be driven.

ii) Formation of Embankments.

(1) Embankments shall be formed in successive horizontal layers of not more than eight (8) inches in loose depth for the full width of the cross-section. Layer placement shall begin in

the deepest portion of the fill. As placement progresses, layers shall be constructed approximately parallel to the finished grade line.

(2) Each layer shall be compacted to ninety-five (95) percent of the AASHTO T99 maximum dry density. The material in each layer shall be within plus or minus three (3) percent of the optimum moisture content, as determined from the AASHTO T99 density test, to obtain the prescribed compaction. No layer shall be covered by a successive layer until the specified density is obtained.

(3) The Contractor shall, without additional compensation, have samples taken of the proposed embankment material and tested for the required density and optimum moisture content before placement and compaction. A copy of the results of the tests shall be furnished to the Engineer prior to placement of any embankment material. During construction of the embankment, the Engineer shall test for the required compaction for each layer. Based on the results of these tests, the Contractor shall make the necessary adjustments and corrections in methods, materials or moisture content to achieve the correct embankment density.

(4) In order to achieve uniform moisture content throughout the layer, wetting or drying of the material may be required. Should the material be too wet to permit proper compaction, all work on all of the affected portions of the embankment shall be delayed until the material has dried to the required moisture content. Wetting of dry material to obtain the proper moisture content shall be done with approved equipment that shall sufficiently distribute the water.

(5) During construction of the embankment, the Contractor shall route his equipment at all times, both when loaded and empty, over the layers as they are placed and shall distribute the travel evenly over the entire width of the embankment.

(6) Stones or fragmentary rocks larger than four (4) inches in their greatest dimensions shall not be allowed in the top six (6) inches of embankment that serves as the subgrade for a roadway.

(7) When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed by the Engineer in layers not to exceed two (2) feet in thickness. Each layer shall be leveled and smoothed with suitable leveling equipment and by distribution of spalls and finer fragments of rock. These type lifts shall not be constructed above an elevation of four (4) feet below the finished grade or elevation. Density requirements shall not apply to portions of embankments constructed of materials that cannot be tested in accordance with specified methods.

(8) Embankment over, under and around structures (pipes, culverts, etc.) shall be selected embankment material placed and compacted or tamped in a manner and by methods that shall avoid unbalanced loading, cause movement or place undue strain on any structure. The Contractor shall be responsible for protecting the structures and any damage to any part of a structure due to not providing proper protection shall be cause for ordering its replacement without additional compensation.

(9) When new embankment is to be placed against an existing slope steeper than 4:1, the existing slope shall be continuously benched and the new work brought up in layers. Benching shall be of sufficient width to permit the operation of equipment but in no case less than six (6) feet. Material thus removed shall be re-compacted along with the new

embankment material.

(10) When new embankment is to be placed against an existing slope of 4:1 or flatter, the slope shall be scarified to a depth of six (6) inches to provide a bond between the new embankment and the existing surface.

21.04 Method of Measurement.

a) Measurement for all accepted unclassified excavation shall be by the cubic yard of the material in its original position computed from cross-sections by the Average-End-Area method.

b) Measurement for borrow shall be by the cubic yard of the material in place, as indicated by the cross-sections, computed from the cross-sections by the Average-End-Area method.

c) Embankment shall not be measured for payment.

d) Measurement for rock excavation shall be by the cubic yard of the material removed from pipe trenches only unless an item for rock excavation in areas other than pipe trenches is included in the contract.

21.05 Basis of Payment.

a) Unit Price Coverage.

i) Unclassified Excavation. The accepted yardage of unclassified excavation, measured as provided above, shall be paid for at the unit price bid per cubic yard, which price shall be payment in full for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item.

ii) Borrow. The accepted yardage of borrow material, measured as provided above, shall be paid for at the unit price bid per cubic yard, which price shall be payment in full for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item.

iii) Rock Excavation - Pipe Trench Only. The accepted yardage of rock excavation, measured as provided above, shall be paid at the unit price bid per cubic yard, which price shall be payment in full for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the item.

iv) Embankment. There shall be no direct payment for embankment. All of the operations required for embankment formation described previously shall be considered necessary work incidental to and for which compensation is included in the unit prices for the pay items of the materials composing the embankment.

b) Exceptions.

i) If no item for unclassified excavation or borrow appears in the contract, it shall be understood that the price for this work shall be included in the prices bid for other items of the contract.

ii) If no item for rock excavation appears in the contract and rock excavation is necessary, then rock excavation shall be paid for at a price agreed upon, in writing, by the Engineer and the Contractor.

END OF SECTION

SECTION 22 - SANITARY SEWERS

22.01 Description. The work included in these specifications shall consist of furnishing and installing sanitary sewers at the locations and to the established lines and grades shown in the contract or as designated by the Engineer.

22.02 Materials - All materials shall conform to the requirements of the Jefferson County Environmental Services Department's *Standards for Construction of Commercial and Residential Sanitary Sewer Systems*, latest edition.

22.03 Construction Requirements.

a) All construction shall conform to the requirements of the Jefferson County Environmental Services Department's *Standards for Construction of Commercial and Residential Sanitary Sewer Systems*, latest edition.

b) All streets, sidewalks, crossings, fire hydrants, water valves, fire alarm boxes and other similar public utilities shall be kept open or accessible for their intended use unless otherwise approved by the Engineer.

c) Stream, railroad, and highway crossings shall be considered as an incidental part of the work included in the unit prices for the various sizes and depths of sewers unless specific designs are shown in the contract, and unit prices for such crossings are included in the contract.

d) The removal of existing sewers, manholes and other structures as shown in the contract or as directed by the Engineer shall be considered as an incidental part of the work and no specific payment therefor shall be allowed.

22.04 Method of Measurement.

a) Asphalt binder and seal shall be measured in tons. Pay limits shall be as shown on the standard drawing.

b) Connecting risers and house service lines shall be measured in linear feet along the centerline, complete in place.

c) Concrete pavement shall be measured in square yards for the thickness specified in the contract.

d) Concrete pipe collars, as specified in the contract, shall not be paid as a separate item.

e) Concrete encasement or protection, as specified in the contract, shall be paid as *Class B Concrete* per cubic yard as shown on the details.

f) Rock excavation shall be measured along the pipe centerline within the specified horizontal limits and vertically to the bottom of the trench or bottom of rock. Depth of trench shall include the bedding under the pipe.

g) Electronic markers shall be measured per each, complete in place, for payment.

h) Foundation backfill and special stone aggregate backfill shall be measured in cubic yards according to the pay limits shown in the contract.

i) Sanitary manholes shall be measured per each for each depth division specified in the contract (i.e., 0-6, 6-8, etc.).

j) Seeding, in-kind or seasonal, shall be measured in square yards over the area actually seeded.

k) Sewer pipe. The actual accepted length of sanitary sewer pipe laid as directed for each depth division shall be measured in linear feet along the centerline of the pipe, complete in place, with no deductions for manholes, wyes or tees. Depth of sewers shall be measured from the original ground surface to the pipe invert.

l) Wyes and Tees shall be measured per each, complete in place including stoppers, for payment.

22.05 Basis of Payment

a) Unit Price Coverage.

i) Clean Up. There shall be no direct payment for clean up.

ii) Connecting Risers and House Service Lines. The accepted length of connecting risers and/or house service lines laid complete, in place, and measured as noted above shall be paid for at the unit price for *4" Laterals* per linear foot (lf) with the type of pipe specified in the contract which shall be payment in full for furnishing, hauling, excavating, foundation preparation, laying, backfilling, compacting, clean-up and for all materials, including all fittings required, equipment, tools, labor and incidentals necessary to complete the work.

iii) Concrete Pipe Collars. The cost of concrete collars shall be included in the cost of the pipe. However, concrete encasement or protection shall be paid as *Class B Concrete* per cubic yard as shown on the details.

iv) Electronic Markers. The actual number of electronic markers, measured as noted above, shall be paid for at the unit price for electronic markers which shall be payment in full for all materials, tools, labor, equipment and incidentals necessary to complete the work.

v) Foundation backfill and special stone aggregate backfill shall be paid for as *Crushed Stone Backfill* per cubic yard (cy) which shall be payment in full for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work.

vi) Manholes shall be paid as *Sanitary Manholes (depth)* per each at the depth division specified in the contract (i.e., 0-6, 6-8, etc.). The price bid for manholes shall include the frame and cover, and shall be payment in full for furnishing all material, equipment, tools, labor and incidentals necessary to complete the work. Watertight manhole covers shall be paid as *Watertight Manhole Frame and Cover (Cost Over Standard)* per each.

vii) Replacement Paving.

(1) If the material used to replace a pavement is asphalt, it shall be paid for as *Asphalt Binder* and/or *Asphalt Seal Type NS,* per ton, at the respective unit price which shall be payment in full for furnishing all material, equipment, tools, labor and incidentals necessary to replace the pavement with the specified material. Pay limits shall be as shown on the detail.

(2) If the material used to replace a pavement is concrete, the actual number of square yards, at the thickness shown on the detail or otherwise specified, shall be paid for at the respective unit price which shall be payment in full for furnishing all material, equipment, tools, labor and incidentals necessary to replace the pavement with the specified material. Pay limits shall be as shown on the detail.

viii) Rock Excavation. The accepted number of cubic yards of rock excavation shall be paid as *Rock Excavation - Pipe Trench Only* per cubic yard which shall be payment in full for furnishing all

materials, equipment, tools, labor and incidentals necessary to complete the work. Pay limits shall be as shown on the detail.

ix) Seeding shall be paid as *Seeding-In Kind* per square yard or *Seasonal Seeding* per square yard as shown in the contract which shall be payment in full for all materials, tools, labor, equipment and incidentals necessary to complete the work.

x) Sewer Pipe. The accepted length of sanitary sewer pipe laid complete in place measured as noted above shall be paid for at the respective unit price for the kinds, sizes and depths specified in the contract including the excavation and backfilling to the depth specified, which shall be payment in full for furnishing, hauling, excavating, foundation preparation, laying, backfilling, compacting, clean-up and for all materials, equipment, tools, labor and incidentals necessary to complete the work.

xi) Wyes and Tees. The accepted number of wyes and tees, including stoppers, shall be paid for at the unit price for the kinds and sizes specified in the contract which shall be payment in full for furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work. If there is no item in the contract for wyes and tees the cost of furnishing and installing them shall be included in the price bid for sewer pipe.

END OF SECTION

SECTION 23 - STORM SEWERS

23.01 Description. The work specified in this section includes furnishing and installing storm sewers at the locations and to the established lines and grades shown in the contract or as designated by the Engineer.

23.02 Materials.

a) Reinforced Concrete Pipe (RCP).

i) Reinforced concrete pipe, circular or arch, shall conform to the requirements of ASTM C76 and C506, respectively.

ii) Standard strength pipe shall be Class III, Wall B or greater.

iii) Extra strength pipe shall be Class IV or V, as shown in the contract, Wall B.

iv) The concrete used in the manufacture of the pipe shall have a compressive strength of not less than four thousand (4000) psi. The absorption shall not exceed eight and one-half percent (8½%).

v) Materials used in the manufacture of concrete pipe shall comply with the following ASTM specifications:

(1) Portland cement , Type II - C150.

(2) Aggregates - C33, except that the coarse aggregates shall be crushed limestone.

(3) Reinforcement shall consist of wire per ASTM A82 or A496, welded wire fabric per ASTM A185 or A497, or Grade 40 steel bars per ASTM A615.

vi) Concrete pipe shall be cast in lengths of not less than four (4) feet for use in storm sewers.

vii) Pipe joints shall be standard bell and spigot or tongue and groove type joints.

viii) Special Pieces. Any special pieces of pipe required, such as bends, shall be manufactured or fabricated by the pipe manufacturer and meet the requirements of ASTM 2680.

ix) Pipe Labeling Date - Each joint or pipe shall have stamped on the exterior side at the bell end the following information:

(1) Type of reinforcement.

(2) Class of pipe - wall thickness.

(3) Name of manufacturer.

(4) Date of manufacture of pipe.

b. Testing.

i) All sewer pipes and materials used in their manufacture shall be tested and approved by an approved testing laboratory prior to delivery to the site. All materials, which fail to conform to these specifications, shall be rejected.

ii) Each joint of pipe shall be stamped or marked to indicate the testing laboratory's acceptance or approval.

iii) Certified copies of the inspection and acceptance reports of the testing laboratory shall be supplied to the Engineer in duplicate prior to use of the materials.

iv) Any material, which has been damaged in transit or is otherwise unsuitable for use in the work shall be rejected and removed from the site.

v) The cost of inspecting and testing materials shall be considered an incidental part of the work and no specific payment therefor shall be allowed.

vi) Other materials shall conform to the requirements of the appropriate sections of these specifications.

23.03 Construction Requirements.

a) General.

i) All streets, sidewalks, crossings, fire hydrants, water valves, fire alarm boxes and other similar public utilities shall be kept open or accessible for their intended use unless otherwise approved by the Engineer.

ii) Stream, railroad, and highway crossings shall be considered as an incidental part of the work included in the unit prices for the various sizes of sewers unless specific designs are shown in the contract or specified in the contract and unit prices for such crossings are included in the contract.

iii) The removal of existing sewers, manholes and other structures shown in the contract or as directed by the Engineer to be removed shall be considered as an incidental part of the work and no specific payment therefor shall be allowed.

b) Site Preparation.

i) Prior to starting construction, the areas designated in the contract or by the Engineer shall be prepared in accordance with Section 20. This work shall be considered as an incidental part of the work and no specific payment shall be allowed unless an item for clearing, or clearing and grubbing, is included in the contract.

ii) Test holes shall be made, when necessary, for locating underground obstructions. Test holes shall be considered as an incidental part of the work and no specific payment shall be allowed.

c) Excavation.

i) Excavation for sewer lines shall consist of the excavation necessary for the construction of sewers and all appurtenant facilities therefor including, but not limited to, manholes, concrete saddles, sand or crushed stone cushion, and pipe protection as specified by the contract. It shall include backfilling and tamping of pipe trenches and around structures.

ii) Excavation for sewer lines shall be made in open cut unless other methods of installing sewer lines are specified in the contract. Pipe trenches shall not be excavated more than three hundred (300) feet in advance of the pipe laying. The trench shall be excavated true to established lines and grades.

iii) The width of the trench shall be as wide as deemed necessary by the Contractor to assure safe working conditions. The width of the trench for establishing pay limits shall be as shown on the standard drawing on file in the Department of Planning, Engineering and Permits. No additional compensation shall be allowed for excavation, backfilling, backfill material, etc., in the portion of the trench wider than the pay limits.

iv) When sheeting is used, the trench width for establishing pay limits shall be calculated as shown on the standard drawing on file in the Department of Planning, Engineering and Permits.

v) The bottom of the trench shall be level in cross-section and shall be cut true to the required grade of the pipe. The excavation shall extend to the bottom of the pipe bedding and/or cradle required.

vi) Bell holes for bell-and-spigot pipe shall be excavated at proper intervals so that the barrel of the pipe shall rest for its entire length on the bottom of the trench. Bell holes shall be large enough to permit proper installation of joints in the pipe. Bell holes shall not be excavated more than five (5) joints ahead of the pipe laying.

vii) Excavation for manholes and other structures shall not be greater in horizontal area than that required to allow one (1) foot of clearance between the outer surface of the structure and the walls of the adjacent excavation or of the sheeting used to protect it. If the excavation extends beyond the pay limit, the Contractor shall use the same backfill material used within the pay limit, as specified by the contract or as directed by the Engineer. However, no additional compensation shall be allowed for any excavation, backfilling, backfill material used, etc., beyond the pay limit. The bottom of the excavation shall be true to the required shape and the elevations shown in the contract. No earth backfilling shall be permitted under structures unless specifically shown in the contract. Should the Contractor excavate below the elevations shown or specified, he shall fill the void thus made with stone backfill without additional compensation.

viii) Where the excavation area shown falls under a water surface or near the banks of a flowing stream or other body of water, the Contractor may adopt and carry out any method he may deem feasible for the performance of the excavation work and for the protection of the work thereafter; provided the method and equipment to be used have received prior approval of the Engineer. In such cases, the excavation area shall be effectively protected from damage during the excavation period and until all intended construction work has been completed to the satisfaction of the Engineer.

ix) The cost of all temporary construction work necessary or incidental thereto, including the cost of installing and removing sandbags, coffer dams, sheet piling, excavation and backfill, pumping and dewatering, etc., shall be considered as an incidental part of the work and no specific payment therefor shall be allowed.

x) When soft clay or other material unsuitable for foundations are encountered which extend below the limits of the excavation, such material shall be removed and replaced with a suitable material approved by the Engineer. The removal of unsuitable material shall be measured and paid for as *Unclassified Excavation*. The material used as backfill in the undercut area shall be measured and paid for at the respective unit price bid for the material.

xi) In the case where no item is included in the contract for unclassified excavation and/or the type of backfill material used, the unit price for each of these items shall be agreed to, in writing, by the Contractor and the Engineer before any work involving these items is undertaken.

xii) Excavated material shall be placed as directed by the Engineer so as to present the least amount of inconvenience to the public. Temporary bridges or crosswalks shall be constructed where required to maintain vehicular or pedestrian traffic.

xiii) In cases where excavated material is deposited along open trenches, it shall be placed so that in the event of rain no damage shall result to the work and/or adjacent property.

xiv) All drains, gutters, culverts or storm sewer pipes encountered shall be kept open for both temporary and permanent flow. If it is necessary to close such structures, other provision for drainage shall be made which meets the requirements of these specifications. Each crossing of such structures

shall be made without additional compensation.

xv) Excavation, except as noted herein, shall be considered as an incidental part of the work and no specific payment therefor shall be allowed.

d) Rock Excavation.

i) Rock excavation shall be done in accordance with the requirements of Section 21.

ii) Where rock is encountered in the process of excavation within the excavation limits specified herein, it shall be completely uncovered and all loose material stripped over the entire area, if for a structure; and over a trench length of not less than fifty (50) feet if for a pipeline. The Engineer shall then make a detailed inspection of the exposed rock surface and shall take such measurements as necessary to determine the volume of rock excavated. The rock shall be removed from the pay-limit width of the trench, as previously described, as far as it is practical to do so, and to the depth shown on the standard drawing on file in the Department of Planning, Engineering and Permits. Rock shall be excavated to the bottom of the pipe bedding and/or cradle required. When necessary to provide sufficient working space, rock shall be excavated to an additional depth for bell holes.

iii) After the Engineer has inspected the completed excavation and has taken the necessary measurements for volume determination, the void below the established pipe grade shall be brought to proper grade by backfilling with an approved material in accordance with the applicable sections of Section 21.

iv) Modifications of these provisions for trench excavation in rock shall be permitted only at specific locations where detailed construction methods are shown in the contract.

v) Rock excavation in pipe trenches shall be measured and paid for as described in Section 21. No allowance shall be made under this item for bell hole excavation.

e) Sheeting, Shoring and Bracing.

i) It shall be the responsibility of the Contractor to determine if sheeting, shoring, or bracing is required in any excavation. It shall also be the Contractor's responsibility to ensure that all sheeting, shoring, and bracing are done in accordance with current OSHA regulations and requirements.

ii) Sheeting, shoring, and bracing shall be considered as an incidental part of the work and no specific payment therefor shall be allowed.

f) Pipe Bedding.

i) A Class C bedding of sand, gravel, crushed stone or crushed slag shall be required for all sewer pipe.

ii) Bedding materials shall be compacted in place by tamping with suitable tools and shaped to support the full length of the barrel of the pipe at the exact line and grade.

iii) The cost of providing pipe bedding shall be considered as an incidental part of the work and no specific payment therefor shall be allowed unless an item for pipe bedding is included in the contract.

g) Laying Pipe.

i) Pipe shall not be laid except in the presence of the Engineer, or his representative, and shall not be covered until approved by him. Pipe laying in finished trenches shall proceed upgrade, starting at the

outlet end with the spigot end pointing in the direction of flow. Pipe shall be fitted and matched so that a sewer with a smooth, uniform invert is formed.

ii) As the work progresses, the interior of all pipe in place shall be thoroughly cleaned. All earth, trash, rags and other foreign matter shall be removed from the interior of each new sewer line.

iii) Water shall not be allowed to stand or run in the pipe trench at any time during the construction.

iv) The Contractor shall not open up more trench at any one time than his available pumping facilities are able to dewater.

h) Joints. The method of joint construction shall be in accordance with accepted construction methods or according to the pipe manufacturer's specifications and recommendations consistent with the type of pipe joint being used. No joint shall be finished until the next two (2) joints in advance are in place. Joints that are, in the opinion of the Engineer, unacceptable shall be re-made by the Contractor without additional compensation.

i) Connections.

i) Connections shall be made to all existing sewer lines in the vicinity of the work as shown in the contract or as directed by the Engineer.

ii) Connections to existing manholes shall be made by cutting a hole in the wall of the existing manhole, inserting a length of sewer pipe, filling around the pipe with concrete or mortar and troweling the inside and outside surfaces of the joint to a neat finish. The bottom of the manhole shall be shaped to fit the invert of the sewer pipe.

iii) Connections shall be considered as an incidental part of the work and no specific payment therefor shall be allowed, except where new manholes are constructed.

j) Manholes and inlets shall be built in accordance with Section 24.

k) Encasement pipe shall be installed and paid for in accordance with Section 25 at the locations shown in the contract.

l) Tunneling. Pipe trenches may be constructed by tunneling short distances, such as under railroads. It shall be the Contractor's responsibility to ensure that tunneling is done in accordance with OSHA regulations and requirements. Unless tunneling is included in the contract, there shall be no specific payment therefor if the Contractor elects to use such methods.

m) Backfilling.

i) Trenches and excavations not located in a street or alley rights-of-way shall be backfilled with approved natural soil or, when directed by the Engineer or provided in the contract, with crushed stone backfill material. The backfilling operation shall be started immediately after the pipe work has been approved by the Engineer.

ii) The backfill material shall be carefully deposited, equally on both sides of the pipe, in uniform layers not to exceed eight (8) inches in compacted thickness and tamped with proper tools so as not to disturb the pipe. Backfill not under street or alley rights-of-way shall be compacted as directed by the Engineer.

iii) All trenches and excavations in street or alley rights-of-way shall be backfilled with ALDOT #57 crushed stone in accordance with the standard drawing on file in the Department of Planning, Engineering and Permit. The crushed stone backfill shall be compacted in accordance with Section 28. The Engineer may direct that these trenches and excavations be covered with a temporary plant

mix bituminous pavement one (1) inch thick. This temporary pavement shall be spread and rolled to accurately conform to the grade of the existing street surface. The Contractor shall be responsible for maintaining this temporary surface in a safe condition until the permanent paving is placed. The temporary surface shall be removed before the permanent pavement is placed as specified in these specifications or as shown in the contract. The cost of this temporary bituminous surface shall be measured and paid for as *Asphalt Binder*, in accordance with Section 29.

iv) All backfilling shall be done in a manner so as not to disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged, or moved from its proper line or grade during backfilling operations shall be replaced or repaired and then backfilled as specified herein, by the Contractor without additional compensation.

n) Replacing Pavements.

i) Where paved streets, sidewalks, driveways and gutters are removed within the construction limits as specified they shall be replaced in-kind at equal thickness. Sidewalks, driveways, and curb and gutter shall be removed to the nearest joint and replaced. Brick pavements shall be replaced with concrete of equal thickness unless shown otherwise in the contract. Any such pavement removed or damaged by the Contractor beyond the specified construction limits shall be replaced as specified herein by the Contractor without additional compensation. Replacement of such pavement within the construction limits shall be paid for at the respective unit price in the contract for the material used.

ii) Where unpaved street or driveway surfaces are damaged or removed, they shall be replaced with the same type of material. The cost of this work shall be considered as an incidental part of the work and no specific payment therefor shall be allowed.

iii) For excavations in and replacement of paving in streets and alleys where the pavement is less than five (5) years old, special attention is directed to Section 4-5-133 of the *General City Code.* Unless otherwise specified or required by the contract, all roadway pavement where disturbed, injured, destroyed, or removed by the Contractor or his agent, by street traffic, or otherwise, on account of the construction of the work, directly or indirectly, are to be completely restored by the Contractor in accordance with the standard drawing on file in the Department of Planning, Engineering and Permits.

o) Disposal of Materials.

i) All excavated material not used on the job shall be disposed of in accordance with Section 21.

ii) The Contractor shall, without additional compensation, remove all surplus or unused materials from the project site thus leaving the site and adjacent areas in a neat and presentable condition.

p) Restoration of Adjacent Property - Property disturbed by excavation shall be restored as near as possible to its original condition. This shall include ground preparation, placing topsoil, fertilizing the area, seeding, sodding, resetting fences, etc., as specified in the contract or as directed by the Engineer. All work necessary to accomplish this restoration shall be performed, measured, and paid for in accordance with the requirements of the applicable sections of these specifications.

23.04 Method of Measurement.

a) Storm Sewer Pipe. The actual accepted length of storm sewer laid as directed shall be measured in linear feet along the center of the line, complete in place, with no deductions for manholes.

b) Rock excavation shall be measured along the pipe centerline within the specified horizontal limits and vertically to the bottom of the trench or top of rock. Depth of trench shall include the pipe bedding under the pipe.

c) Pipe Bedding. There shall be no measurement for pipe bedding.

d) Replacement Paving. Materials used to replace pavements shall be measured using the following formula:

(Actual LENGTH installed) x (the specified WIDTH of work) x (the specified DEPTH)

e) Manholes shall be measured and paid for in accordance with Section 24.

f) Concrete pavement shall be measured in square yards for the thickness specified in the contract or shown on the detail.

23.05 Basis of Payment.

a). Unit Price Coverage.

i) Sewer Pipe. The accepted length of storm sewer, laid complete, in place, measured as noted above shall be paid for at the respective unit price for the kinds and sizes specified in the contract, including the excavation and backfilling, which shall be payment in full for furnishing, hauling, excavating, preparing the foundation, laying, backfilling, compacting, cleaning up and for all materials, equipment, tools, labor and incidentals necessary to complete the work.

ii) Rock Excavation-Pipe Trench Only. The accepted number of cubic yards of rock excavation shall be paid for in accordance with Section 21.

iii) Pipe Bedding. No separate payment for pipe bedding shall be allowed.

iv) Replacement Paving.

(1) If the material used to replace a pavement is asphalt, the actual number of tons of asphalt binder and/or seal calculated over the area measured as noted above, shall be paid for at the unit price for *Asphalt Binder* and/or *Asphalt Seal Type NS* which shall be payment in full for furnishing all material, labor, tools and equipment necessary to replace the pavement with the specified material.

(2) If the material used to replace a pavement is concrete, the actual number of square yards, of the required thickness, measured as noted above, shall be paid for at the respective unit price which shall be payment in full for furnishing all material, labor, tools and equipment necessary to replace the pavement with the specified material.

END OF SECTION

SECTION 24 - MANHOLES, CURB INLETS and YARD INLETS

24.01 Description.

a) The work specified in this section includes furnishing and installing manholes and inlets, including necessary metal frames, grates, covers, etc., in accordance with the plan details and these specifications, at the locations and to the grades shown in the contract or as directed by the Engineer.

b) The various units shall be further designated by type to distinguish shape, size, etc., as indicated by the plan details. Certain units or portions of units may be constructed of cast-in-place concrete, pre-cast concrete and/or masonry, as specified by the plan details.

24.02 Materials.

Materials shall conform to the appropriate sections of these specifications and the following:

a) Concrete and steel reinforcing for cast-in-place units, pre-cast units or parts of units not covered by other requirements shall conform to the requirements of Sections 31 and 32, respectively, of these specifications.

b) Pre-cast concrete units or portions of units shall conform to the appropriate requirements of ASTM C478 unless otherwise provided by the plan details or as approved by the Engineer.

c) Brick masonry materials shall conform to the requirements of ASTM C32, Grade MM.

d) Castings.

i) Manhole and inlet frames and covers shall be gray iron castings. The castings shall be boldly filleted at angles and the arises shall be sharp and perfect. They shall be true to pattern in form and dimension and shall be free from cracks, pits, or other defects. All frames and covers shall conform to ASTM A48 Class 30 as a minimum for gray iron castings.

ii) Manhole and inlet frames and covers for sanitary manholes, storm sewer manholes and inlets shall be of the respective design and dimensions shown on the plan details.

iii) The contact surfaces between the bearing surfaces of the frames and covers shall be machined to true flat surfaces so as to prevent rocking.

iv) All castings shall be sand blasted or otherwise effectively cleaned of scale and sand so as to present a smooth, clean and uniform surface.

e) Manhole and inlet steps shall be copolymer polypropylene (plastic) coated reinforcing steel rods with rod and pullout ratings meeting OSHA regulations and requirements. The copolymer polypropylene used in all steps shall conform to ASTM D4101-95b PP0344B33534Z02. The steel used in the steps shall be a deformed one-half (1/2) inch reinforcing rod. The steel reinforcing rods shall be Grade 60 and conform to all the requirements of ASTM A615.

f) Inlet and outlet pipe shall conform to the appropriate requirements of the section of the specifications covering the kind of pipe to which they are to connect.

24.03 Construction Requirements.

a) Excavation shall be performed in accordance with the appropriate requirements set forth under Section 23.

b) Concrete units may be either cast-in-place or pre-cast units. Construction requirements relative to the two types shall conform to the following:

i) Cast-in-place Units. Construction shall conform to the requirements of Section 31.

ii) Pre-cast Units. Lifting holes or other devices shall be incorporated into the pre-cast sections to facilitate the placement procedure.

iii) Manhole steps shall be cast in the riser sections at equal intervals not to exceed sixteen (16) inches in spacing.

iv) The manhole sections shall have "O" ring rubber gaskets meeting the requirements of ASTM C443.

v) The diameter of the manhole shall be four (4) feet or as specified in the contract. The inside diameter of the manhole at the top shall be twenty-six (26) inches.

vi) Cone sections shall be concentric with an eight (8) inch top wall thickness to accommodate brick.

vii) Base sections shall be cast with pipe holes of the specific number and dimensions necessary to incorporate the unit into the drainage system as shown in the contract. Should installation conditions require additional pipe holes for which no holes were cast, the Contractor shall make such holes as necessary, provided he performs said work in a manner approved by the Engineer. The Contractor shall repair or replace any damaged units to the satisfaction of the Engineer.

viii) Pipe connections to base units shall be made using either concrete or masonry mortar, or flexible manhole connectors meeting the requirements of ASTM 923. Flexible manhole connectors shall be installed as recommended by the manufacturer.

c) Masonry.

i) The height or depth of the manhole or inlet will vary with the location but in all cases it shall be such that it will place the top of the manhole at the finished grade of the pavement or ground surface and the invert at the elevation shown in the contract.

ii) Brick shall be laid radially with horizontal joints between one-quarter (1/4) inch to one-half (1/2) inch in thickness and with vertical joints between one-quarter (1/4) inch to one-half (1/2) inch in thickness on the inside surface of the manhole. Inside joints shall be trowel-struck flush joints to provide a smooth, clean surface. Joints shall be broken in successive layers. Each brick shall be wetted immediately before it is laid and shall be laid separately in a full and close joint of mortar on its bed, ends and side at one operation by shoving the brick into the mortar. Joints shall not be made by working mortar into the joints, grouting, or slushing-in after the brick is in place. Whenever the work is discontinued for any purpose, the unfinished brick masonry shall be racked back in courses and all mortar removed from the exposed surfaces. When the work is continued, exposed surfaces shall be cleaned and wetted before any new work is added.

iii) Approved steps shall be inserted into the walls of manholes at the intervals specified for pre-cast concrete units as the work progresses and shall be securely imbedded into the masonry.

iv) The inside wall surface shall be plastered with a layer of cement mortar one-half (1/2) inch thick from the invert to a height of two (2) feet above the top of the pipe, if practical, and the outside wall surface shall be similarly plastered to the full height.

v) After the masonry work has been completed and topped out, the cast iron frame for the cover shall be carefully set at the required elevation and properly bonded to the masonry with cement

grout.

vi) Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted so as to conform to the exact slope, crown and grade of the existing pavement.

vii) Any work that in the opinion of the Engineer has been damaged by any cause prior to or after backfilling shall be removed and rebuilt by the Contractor without additional compensation.

d) Inlet and Outlet Pipe.

i) Pipe shall be laid in accordance with the appropriate requirements of the section(s) of these specifications covering the type of pipe being used.

ii) Pipe placed in masonry for inlet and outlet connections shall extend through the walls and beyond the outside surface of the walls a sufficient distance to allow for connections and the masonry shall be carefully constructed around them so that there shall be no leakage around the outer surface of the pipe.

e) Backfilling shall be done in accordance with Section 23.

f) Cleaning. All manholes and inlets shall be cleaned of all form material, excess mortar, and all foreign matter, and shall be free from such at the time of final inspection and acceptance.

24.04 Method of Measurement.

a) Inlets shall be measured as an individual unit, including footings, bottom slab, walls, cover, lid, grating, etc., of the type, size and shape shown in the contract.

b) Storm sewer manholes shall be measured as an individual unit, including footings, bottom slab, walls, cover, lid, grating, etc., of the type, size, and shape shown in the contract.

24.05 Basis of Payment.

a) Unit Price Coverage.

i) Inlets. The accepted number of inlets measured as noted above shall be paid for at the respective unit price for each which shall be payment in full for all materials, labor, equipment and incidentals necessary to complete the work.

ii) Storm Sewer Manholes. The accepted number of manholes, measured as noted above, shall be paid for at the respective unit price for each manhole, according to type, which shall be payment in full for all materials, labor, equipment and incidentals necessary to complete the work.

END OF SECTION

SECTION 25 - ENCASEMENT PIPE

25.01 Description. The work specified in this section includes furnishing and installing an encasement pipe for sewer pipes. The installation shall include placement of the pipe at the location shown in the contract or as directed by the Engineer, and in conformity with the lines and grades established by the Engineer.

25.02 Materials. Materials furnished for use shall be as specified in the contract.

25.03 Construction Requirements.

a) General.

i) The encasement pipe may be installed by the open trench method, complying with the requirements for excavation, installation and backfilling of Section 22, or by an approved jacking, boring or tunneling procedure approved by the Engineer.

ii) The type of pipe joints used shall be at the Contractor's option provided the joint produces a smooth surface on the inside of the pipe suitable for installation of the carrier pipe.

b) Boring, Jacking or Tunneling. The Contractor shall submit to the Engineer details of the procedure proposed to be used along with a description of the equipment available to install the specified encasement pipe. The results of said procedure shall produce a neatly installed encasement pipe without damage to the existing facility and without excessive voids in the earth surrounding the encasement pipe. If there are indications that voids exist around the encasement, the Engineer shall have cause to order, or the contract may so direct, the Contractor to pump, under pressure, a concrete grout to seal the voids. Any damage to the facility caused by the installation operation shall be restored by the Contractor, without additional compensation, to the satisfaction of the Engineer.

c) Seating of Carrier Pipe. Tracks, guides or other types of supports shall be provided, as directed by the Engineer or as shown in the contract, for conveying the carrier pipe through the encasement.

d) End Treatment of Encasement Pipes. Provisions shall be made at the ends of all encasement pipes to prevent water and other foreign matter from entering the encasement. Sealing of the ends may be accomplished by products manufactured for this purpose or may be constructed of rubble masonry or concrete mortar.

25.04 Method of Measurement. The accepted number of linear feet of encasement pipe of the type installation required shall be measured along the encasement pipe centerline.

25.05 Basis of Payment. The accepted number of linear feet of encasement pipe, measured as noted above, shall be paid for at the unit price for the type installation involved, which shall be payment in full for furnishing all materials, labor, equipment, tools, permits, disposal of excess materials and incidentals necessary to complete the work, including, but not limited to, carrier rails and end treatment.

END OF SECTION

SECTION 26 - VIDEO PIPE INSPECTION

26.01 Description. The work specified in this section includes visually inspecting sewer lines internally that are eight (8) inches in diameter or larger using video equipment specifically designed for this purpose. A video recording of the sewer line inspection shall be forwarded to the Engineer.

26.02 Materials. Video recordings shall be submitted on VHS format videotapes.

26.03 Construction Requirements.

a) Cleaning. Prior to inspection, the sewer lines shall be cleaned using sewer cleaning equipment and methods approved by the Engineer.

b) Mobile Television Studio. The Contractor's mobile studio shall be large enough to allow persons other than the studio technicians to view the video monitor while the inspection is in progress. The Engineer shall have access to view the monitor at all times.

c) Equipment Operation.

i) Operation of the equipment is to be controlled from the mobile television studio by a technician skilled in the use of the type of equipment being used. The technician shall be able to control the movement of the television camera, the brilliance of the built in lighting system and the focus of the camera, by remote control.

ii) The cable or rod controlling the movement of the camera shall be attached to a footage meter that is synchronized with the stationing so that the location of the camera and point of observation are known at all times.

d) Log.

i) A written log shall be submitted to the Engineer, along with the video recording. The log shall note the location of the sewer line, location of manholes, laterals, roots, sags, obstructions, defects found in the pipe and any other pertinent information.

ii) A visual log shall be kept on the video recording by either audio or visual notation of the camera location as prescribed above.

26.04 Method of Measurement. The actual number of linear feet of sewer pipe inspected, measured along the pipe centerline including manholes.

26.05 Basis of Payment. The accepted number of linear feet of sewer inspected shall be paid for at the unit price for video pipe inspection specified in the contract and shall be payment in full for furnishing all labor, cleaning, electronic equipment, electricity, logs, VHS cassette tapes, and technicians necessary to complete the work.

END OF SECTION

SECTION 27 - SUBGRADE

27.01 Description. The work specified in this section includes the preparation of the subgrade to make it ready to receive the pavement structure. The subgrade shall be considered that portion of the roadbed on which the crushed stone base course is to be placed.

27.02 Materials. Materials furnished to construct the subgrade shall comply with the requirements of Section 21.

27.03 Construction Requirements.

a) General.

i) Grading of the subgrade shall be conducted so that berms of earth or other material do not prevent drainage of water to side ditches or gutters. Gutters, drains and ditches along the subgrade shall be maintained at all times so as to drain effectively.

ii) All boulders, brick, concrete, ledge rock or similar solid items appearing in the earth excavation shall be removed or broken off to a depth of not less than nine (9) inches below the subgrade.

iii) After all earthwork has been substantially completed and all drains have been laid the subgrade shall be brought to the lines, grades and cross-sections shown in the contract or as established by the Engineer.

iv) The Contractor shall be responsible for the establishment and correctness of any and all elevations relative to intermediate and final grades. The City of Birmingham shall not be responsible for the accuracy or maintenance of any grade elevations beyond the control points placed by the Engineer.

v) It shall be the Contractor’s responsibility to verify that the subgrade elevation is in agreement with the contract.

b) Compaction.

i) The subgrade shall be constructed so that it shall have uniform density throughout. The Contractor shall, without additional compensation, perform such plowing or scarifying as is necessary to obtain satisfactory compaction. The Engineer shall test the subgrade periodically during construction to check for the acceptable compaction. The test may consist of proofrolling the compacted subgrade using machinery of the Engineer's choice and furnished by the Contractor without additional compensation. The Engineer may test the compaction of the subgrade with a nuclear testing device. Sections of the subgrade that pump or are otherwise shown to be unsatisfactory shall be excavated to the depth specified by the Engineer. Removal of unsatisfactory material shall be measured and paid for as *Unclassified Excavation*.

ii) Areas excavated to remove unsuitable material shall be backfilled and compacted to the required elevation, in accordance with Section 21, with a material approved by the Engineer. This backfilling work shall be measured and paid for according to the type of material used. If no item for the type of material used is included in the contract, the Contractor and the Engineer shall agree, in writing, to a unit price for the material prior to its use.

iii) After compaction, all portions of the subgrade not at the established elevation shall be brought to the proper elevation by adding (or removing) and compacting sufficient material to bring the subgrade to the correct elevation.

iv) No base course, surfacing or pavement shall be placed on the subgrade until satisfactory

compaction is obtained.

c) Protection of the Subgrade. The subgrade shall be maintained free from ruts and other depressions, in a smooth and compacted condition true to the lines and grades established and in compliance with the compaction requirements until the base course, surfacing or pavement is placed. When hauling results in forming ruts or other objectionable irregularities, the Contractor shall reshape and re-compact the subgrade before any surfacing is placed.

27.04 Compensation. No measurement or direct payment shall be made for subgrade work, except as noted herein, but it shall be considered necessary work the cost of which shall be included in the unit prices of other items of work in the contract.

END OF SECTION

SECTION 28 - CRUSHED STONE BASE

28.01 Description. The work specified in this section includes the construction of crushed stone base courses complete in place on the approved roadbed.

28.02 Materials.

a) General. Crushed stone shall be from approved ledges or working strata within an approved source and shall consist of clean, tough, durable fragments, reasonably free of shale. Material suspected of containing deleterious substances shall be examined in the laboratory and shall be rejected if the amount is considered objectionable.

b) Physical Tests.

i) Crushed stone shall meet the following requirements for the respective physical tests:

(1) Percent Wear Los Angeles Test (AASHTO T96)…..……60 Max.

(2) Percent Sound, Soundness Test…….....90 Min.
(AASHTO T104 using sodium sulfate and five cycles)

(3) Gradation:

SIEVE	% PASSING BY WEIGHT
2 inch	100
1.5 inch	90-100
1 inch	75-95
0.5 inch	60-85
#4	40-65
#8	28-54
#16	19-42
#50	9-27
#200	4-18

The fraction passing the #40 sieve shall not have a plasticity index in excess of neither six (6) nor a liquid limit in excess of twenty-five (25), and contain not more than two-thirds (2/3) by weight passing the #200 sieve.

28.03 Construction Requirements.

a) General. The Engineer shall approve the roadbed before placement of any base or subbase course will be permitted. Approval shall be based on satisfactory completion of the roadbed in accordance with the requirements of Section 27.

b) Equipment. In general, it shall be the Contractor's responsibility to select and furnish the proper size and amount of equipment that shall produce, deliver to the roadbed, mix, spread, shape, and compact the base or subbase material.

c) Plant Mixing.

i) The following are mixing plant general requirements; however, any other mixing plant equipment developed that shall produce equally satisfactory results shall be acceptable for use with the approval of the Engineer.

ii) The plant shall be an approved contra-rotating twin-shaft pug-mill type central mixing plant of proven performance and adequate capacity. The plant shall be equipped to proportion accurately by volume or weight. During the mixing operation the aggregate shall be introduced into the mixer in a way that shall insure the proportion of each type of material to be used shall be in the mixture.

iii) Water shall be added to the mix in an amount that shall produce a uniform moisture content, based on dry weight of the mixture, within two (2) percentage points of optimum, as established by the required laboratory test.

d) Placing of Base Materials. Typical cross-section, thickness, and limits of the course or layer shall be shown in the contract. The operational procedure must be such that placement and processing of a layer shall not damage the underlying layer or layers. Premixed base and subbase materials shall be placed and spread by spreading equipment that shall produce uniform layers of the required cross-sections and thickness. The base course material shall be placed in not more than six (6) inch compacted layers. Any base layer shown in the contract greater than six (6) inches shall be placed and compacted in two or more layers.

e) Compaction and Watering. Each layer of base material shall be compacted at optimum moisture content with equipment capable of obtaining the desired density to the full depth. Compaction shall continue until the base is compacted to not less than one hundred percent (100%)of the maximum laboratory density as determined by ASTM D1557, Method D (AASHTO T180). Additional watering in connection with compaction shall be required to obtain required density at a uniform moisture content within two (2) percentage points of optimum as determined by the required laboratory tests.

28.04 Sampling and Testing.

a) General.

i) Before any crushed stone base material is placed on the jobsite, the Contractor shall submit samples of the proposed base material to an approved testing laboratory. Samples shall be tested for proper gradation and a laboratory compaction test shall be performed on the material in accordance with ASTM D1557, Method D (AASHTO T180). Tests shall be repeated for each five hundred (500) cubic yards of material delivered to the job site. The Contractor shall pay for these tests and furnish the results to the Engineer.

ii) The Engineer reserves the right to perform tests on any material delivered to or in place on the jobsite to determine if the specifications have been met.

iii) Any necessary sample holes or the like required to satisfactorily establish the acceptability of any base layer shall be immediately repaired by the Contractor with like material. The cost of such repairs shall be considered incidental to the work and no specific payment therefor shall be allowed.

b) Surface Requirements. The finished general surface of each base layer shall not vary more than one-half (1/2) inch in any twenty-five (25) foot section from a taut string placed parallel to the surface and the roadbed centerline one (1) foot inside the edges of the base, at the centerline, and at other points designated, nor shall it

vary more than one-half (1/2) inch from a template placed at right angles to the roadbed centerline. The template shall be of a rigid frame adjustable metal type, accurately set and at least as long as the width of base layer being checked up to twenty-four (24) feet. Additional widths may be checked by the use of string and Engineer's level. The Contractor shall furnish template, string and necessary personnel to check the surface as described and under the direction of the Engineer.

c) Gradation and Density.

i) The gradation of each layer may be checked by the Engineer to determine compliance with the specifications. Material falling outside of the specified gradation band shall be corrected to comply with the specified gradation band.

ii) The Contractor shall make compaction tests on each base layer. The Contractor shall promptly furnish the Engineer with all compaction test results. Each layer shall be brought to the required density before the next layer is placed.

d) Thickness.

i) The thickness of each layer shall be checked at intervals as determined by the Engineer. The compacted thickness of the layer shall be within plus or minus one-half (1/2) inch of the thickness specified in the contract or as directed by the Engineer. There shall be no payment for material thickness in excess of the thickness specified in the contract. The Contractor shall furnish labor and tools to check thickness as an incidental part of the work.

ii) The elevations to grade shall be the sole responsibility of the Contractor and no payment shall be made for incidental or extraneous material required to establish, hold or maintain any elevation beyond the plan dimensions.

e) Widths. The widths of each layer shall be checked at intervals as determined by the Engineer. No deviation in excess of three-tenths (3/10) of a foot less than the designated dimension for the width of the roadway shall be acceptable. There shall be no payment for material widths in excess of the widths specified in the contract. The Contractor shall furnish labor and tools to check widths as an incidental part of the work.

28.05 Maintenance of the Work.

a) Each base layer shall be maintained as provided herein without extra compensation until covered by a succeeding layer or upon substantial completion. The surface shall be kept free of ruts, ridges, and holes and substantially true to profile, grade and cross-section. Each base layer must have the required density. No layer of base shall be covered by another layer or primed until approved by the Engineer.

b) The Engineer may require the retesting of a primed layer where it is suspected that it does not have the required density and moisture content. All areas found deficient shall be corrected by the Contractor, without additional compensation, prior to the placement of the next overlying layer.

c) It shall be the Contractor's responsibility to protect the base from damage, to protect the prime from being picked up or damaged by traffic, and to promptly replace any base or prime so damaged.

28.06 Method of Measurement. Measurement by the cubic yard shall be the compacted volume in place computed from the dimensions as shown in the contract.

28.07 Basis of Payment. The unit price bid shall be full compensation for furnishing crushed stone base material, in accordance with the requirements specified, complete in place on the roadbed. It shall include all costs for procurement, operations, compaction, watering, equipment, tools, labor, testing and incidentals necessary to complete the work.

END OF SECTION

SECTION 29 - ASPHALT SEAL - TYPE NS, ASPHALT BINDER, PRIME AND TACK COAT

29.01 Description. The work specified in this section includes one or more courses of asphalt plant mix constructed in accordance with these specifications and in reasonably close conformity with the lines, grades, thickness, and cross-sections shown by the contract or as directed by the Engineer. This work includes, but is not limited to, new paving, resurfacing, patching, leveling, and widening, as indicated on the typical sections and details or as directed by the Engineer.

29.02 Materials.

a) Prime and Tack Coat. Bituminous material for prime and tack coats shall conform to the requirements of ALDOT's *Standard Specifications for Highway Construction*, latest edition.

b) Aggregates. Coarse and fine aggregates shall conform to the requirements of ALDOT's *Standard Specifications for Highway Construction*, latest edition.

c) Reclaimed Asphalt Pavement (RAP) in Asphalt Binder.

i) For the binder course only, the Contractor shall have the option to use any ratio of reclaimed asphalt pavement to new material from zero to forty percent (0% - 40%), subject to the other requirements of these specifications. The asphalt cement used in a recycled mix shall be limited to that specified by ALDOT's *Standard Specifications for Highway Construction*, latest edition. Any recycled mix utilizing more than ten percent (10%) RAP shall be designed with a viscosity in accordance with ALDOT's *Standard Specifications for Highway Construction*, latest edition.

ii) Regardless of the ratio of reclaimed asphalt pavement to new material, the mixture delivered to the roadway shall meet the gradation requirements and the asphalt cement required in the job mix formula.

iii) One hundred percent (100%) of the reclaimed asphalt pavement shall pass the two (2) inch sieve before entering the plant.

iv) The recycled asphalt concrete mixture shall be homogeneous mixture of reclaimed asphalt pavement, new fine and/or coarse aggregate, and new bituminous material and/or asphalt rejuvenator.

v) **Reclaimed asphalt pavement (RAP) shall not be used in the asphalt seal mixture**.

d) Mix Composition.

i) The aggregates shall be combined in a total blend that shall produce an acceptable job mix within the gradation limits shown in the table on the following page.

SIEVE	ASPHALT SEAL TYPE "NS" % PASSING	ASPHALT BINDER % PASSING
1 inch	-	100
3/4 inch	100	80-95
1/2 inch	95-100	-
3/8 inch	80-95	54-76
#4	54-74	40-58
#8	38-56	28-46
#30	16-36	-
#50	10-26	8-22
#100	5-12	4-10
#200	3-8	2-6

ii) Bitumen. Unless the type of bitumen is specified in the contract, the Contractor shall use asphalt cement grade AC-20, AC-30, or AC-40 as specified by AASHTO M226. The proportion of bitumen to total aggregate by weight shall be as shown above for the appropriate mix, the exact proportion being fixed by the job mix formula.

-	ASPHALT SEAL TYPE "NS"	ASPHALT BINDER
Proportion of Asphalt Cement to Total Sample By Weight, %	4.7-9.0	3.5-6.0

iii) Admixtures. Admixtures shall not be used unless directed or approved by the Engineer.

d) Job Mix Formula.

i) No asphalt plant mix for payment shall be produced until the Engineer has approved a job mix formula. The Contractor shall submit to the Engineer a job mix for each mixture to be supplied from a specific plant. The Contractor shall submit the job mix formula, in writing, to the Engineer at least fifteen (15) days prior to the start of paving operations. The job mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size, a single percentage of bitumen material to be added to the aggregate, a single percentage of any additive, and a mixing temperature range suitable for the type, grade, etc., of bitumen to be used in the mix. All test data used to develop the job mix formula shall also be submitted.

ii) Virgin bituminous mixtures shall be designed using ALDOT-307. Recycled bituminous mixtures shall be designed using ALDOT-344.

iii) All mixtures shall meet the requirements shown in the table on the following page.

TEST PROPERTY	ASPHALT SEAL	ASPHALT BINDER
Stability (minimum), pounds	1600	1400
Flow, 0.01 inches	8-18	8-18
Percent Air Voids	4	4
Percent VMA (minimum)	15	13

iv) All mixes shall be tested to determine if an anti-stripping agent is needed. All mixes shall have a tensile strength ratio (TSR) of at least 0.75 when tested in accordance with AASHTO T283 as modified by ALDOT-361.

v) The amount of anti-stripping agent, when required, shall be one-half to one percent (½% - 1%) by weight of the bitumen content for liquid agents and one-half to two percent (½% - 2%) by weight of the total aggregate for powdered agents.

vi) All mixtures furnished for use on the project shall conform to the approved job mix formula within the following ranges of tolerances:

(1) Bitumen content.....Plus or minus one-half percent (½%)

(2) Air voids.....Plus or minus one percent (1%)

(3) #4 and larger sieve requirements.....Plus or minus seven percent (7%)

(4) #8 through #100 sieve requirement.....Plus or minus four percent (4%)

(5) #200 sieve requirement.....Plus or minus two percent (2%)

vii) The initial setting of the controls for all materials shall be those amounts shown on the job mix formula. The above tolerances are provided for slight variations inherent in job control applications. The Engineer shall require the Contractor to make changes as necessary in order that the mixture shall run as close as practical to the percentage designated on the job mix formula.

viii) The job mix formula for each mixture shall be in effect for one (1) year unless the Engineer withdraws approval in writing. Should a change in sources of materials be made, a new job mix formula must be established before the new material is used. If a Contractor has current approval of a job mix from a specific plant, the Contractor may use this mix on more than one City of Birmingham project provided the materials have not changed.

ix) All testing and engineering needed to develop an acceptable job mix formula shall be considered as an incidental part of the work and no direct payment for this work shall be made to the Contractor. The laboratory and personnel used to develop the job mix formula shall meet the approval of the Engineer.

e) Preparation of Mixtures.

i) Bitumen. The bituminous material shall be heated in a manner that insures the even heating of the entire mass under efficient and positive control at all times. Any bituminous material which in the opinion of the Engineer has been damaged shall be rejected.

ii) Aggregate. All aggregates shall be dried so that the moisture content at the time of mixing is less than one-half (1/2) percent by weight. The temperature of the aggregate at the dryer shall not exceed

350° F. The aggregate, immediately after being heated, shall be screened into three (3) or more sizes and conveyed into separate bins, ready for batching and mixing with bituminous material. However, for mixes using aggregate of one-half (1/2) inch maximum size, the number of bins may be reduced to two (2).

iii) Mixing.

(1) Batch Mixing. The dried mineral aggregate shall be combined in uniform batches by weighing and conveying into the mixer the proportionate amounts of each aggregate required to meet the job mix formula. The mineral components shall be thoroughly mixed. The required quantity of bituminous material for each batch shall be measured by weight or metering device. The bituminous material shall be added and the mixing continued for a period of at least forty-five (45) seconds, or longer if necessary, to produce a homogeneous mixture. Each batch must be kept separate through the weighing and mixing operations. The mixture shall be uniform in composition, free from lumps or balls of material containing as excess quantity of asphalt, or from pockets deficient in asphalt.

(2) Continuous Mixing. The amounts of aggregate and bituminous material entering the mixer, and the rate of travel through the mixer shall be so coordinated that a uniform mixture of specified gradation and bitumen content will be produced.

iv) Recycled Mixtures. The temperature of the new aggregate shall be superheated to the point where, when combined with the reclaimed material, the specified discharge or delivery temperature is produced. However, in no case shall the temperature of the new aggregate exceed 600° F.

v) The plant shall be so designed and operated so that heat transfer shall take place in the mixing unit without damage to or vaporization of the bituminous material. For batch type plants, a minimum dry mixing cycle of fifteen (15) seconds shall be required for the new bituminous material.

f) Sampling and Inspection.

i) Production of the required gradation in the mix shall be the Contractor's responsibility.

ii) The right is reserved to take samples of aggregates from stockpiles and asphalt from storage tanks at the asphalt plant and to make further tests as needed as a basis for continued acceptance of the materials.

iii) Samples of the mixture in use shall be taken and tested as many times daily as deemed necessary to assure the specifications are met, and the mixture must be maintained uniform throughout the project within the given tolerances. Unless otherwise directed by the Engineer, composition limits (by weights) of the completed mixture shall be based upon the total mineral aggregate remaining after extraction of bitumen.

iv) When directed by the Engineer, the Contractor shall cut samples with mechanical equipment from the compacted pavement for testing. Samples not smaller than four (4) square inches or four (4) inches in diameter for the full depth of the course to be tested shall be taken at the locations directed by the Engineer.

v) The Contractor shall, without additional compensation, furnish suitable approved cutting equipment, cut samples, and immediately repair the sample holes with a similar type of material.

29.03 Construction Requirements

a) Weather and Temperature. Asphalt plant mix shall be laid only upon an approved underlying course which is dry and only when weather conditions are suitable, as determined by the Engineer. Asphalt paving shall not be placed when the air temperature is below 40^{o} F. The air temperature must be 40^{o} F and rising before the spreading operation will be allowed to start. Spreading operations shall be stopped when the air temperature is below 45^{o} F and falling.

b) Equipment.

i) In general, choice of equipment shall be left to the Contractor. It shall be the Contractor's responsibility to provide proper sized and amounts of equipment that shall produce, deliver to the roadbed, spread, and compact the plant mixed material in sufficient quantities for the continuous movement of the spreader under normal operating conditions.

ii) The Contractor shall secure approval from the Engineer of all equipment prior to its use. Any equipment found to be unsatisfactory by the Engineer shall be promptly replaced or supplemented.

iii) Trucks used for hauling asphalt plant mix shall have tight, clean, smooth metal beds that have been thinly coated with a minimum amount of paraffin oil, lime solution or other approved material to prevent the mixture from adhering to the beds. The use of gasoline, kerosene or other volatile material is prohibited. Each truck shall be equipped with a cover of canvas or other suitable material of such size as to protect the mixture from adverse conditions. When the air temperature is below 60^{o} F, or hauling time exceeds thirty (30) minutes, or threatening weather exists, no mixture shall leave the plant unless it is covered entirely and the cover securely fastened. Each truck shall have a hole in the side of the body, approximately five-sixteenths (5/16) inch in diameter and suitably located to allow for temperature measurement of the asphalt plant mix.

iv) Asphalt plant mix pavers or spreaders shall be self-contained and of sufficient size, power and stability to receive, distribute, and strike-off the asphalt plant mix material at rates and widths consistent with the specified typical sections and details.

v) Compaction equipment shall be self-propelled and capable of compacting the mixture to the required density throughout the depth of the layer while it is still in a workable condition without damage to the material. The Contractor shall be responsible for the selection of the types and number of rollers to be used.

c) Preparation of Underlying Surface.

i) The Engineer shall approve the underlying surface before the placing of a plant mix application will be allowed.

ii) Preparation for Asphalt Resurfacing.

(1) The old pavement surface shall be thoroughly cleaned of all foreign or loose material, cold-mix asphalt patches, and broken and improperly bonded asphalt surfaces as directed by the Engineer. Depressions shall be brought to grade with binder and compacted in accordance with these specifications.

(2) Existing storm and sanitary sewer manholes shall be adjusted to grade as directed by the Engineer. Payment shall be made as *Manholes Adjusted* per each. The Contractor shall contact and coordinate with other utilities any adjustment that is necessary to their appurtenances. The coordination of utility adjustments shall be considered as an incidental part of the work and the cost shall be included in the payment for asphalt plant mix.

(3) After the surface has been prepared, a bituminous tack coat shall be applied to the entire surface. Tack coat material shall be applied in an amount directed by the Engineer up to a maximum of one-tenth (1/10) of a gallon per square yard. An asphalt distributor shall be provided for use on all accessible areas. Inaccessible areas such as around manholes, etc., may be coated by other approved methods. When applying tack coat, it shall be applied to all contact surfaces of curbs, gutters, manholes and adjacent pavement edges, as directed by the Engineer.

(4) Adjacent surfaces that are not to be in contact with the mix shall be adequately protected from the tack coat spray. Any surface soiled by tack coat material shall be cleaned and restored to its previous condition without additional compensation. Tack coat shall be spread only far enough in advance to permit the construction to progress consistently, uniformly, and continuously.

(5) The application of tack coat shall be paid per gallon of material placed as directed by the Engineer.

iii) Preparation for Asphalt Paving on Stone Base.

(1) Loose material, dust, dirt, caked clay, or any foreign material shall be removed from the surface of the compacted base material.

(2) A prime coat shall be applied after the Engineer has approved the surface. The application of the prime material shall be by means of a pressure distributor of an approved type. The prime material shall have a temperature of between 80° F and 150° F and shall be applied at a rate of three-tenths (3/10) to one-half (1/2) gallon per square yard.

(3) After the prime coat has been applied, the Contractor shall keep all traffic off the road until, in the opinion of the Engineer, the prime is dry and cured. When directed by the Engineer, the Contractor shall, without additional compensation, spread the minimum necessary amount of approved clean, coarse sand over the primed area to prevent it from breaking up under traffic or to speed curing. No overlying surface shall be placed until the prime coat has been approved by the Engineer. The Contractor shall, without additional compensation, maintain the prime treatment and the surface of the base intact until it is covered by an application of a surfacing material.

(4) The application of prime coat shall be paid per gallon of material placed as directed by the Engineer.

d) Placement of Asphalt Plant Mix.

i) The mixture, when delivered to the jobsite, must have a temperature between 225° F and 350° F. The Engineer shall regulate the temperature of the mixture within these limits according to its workability and the air temperature.

ii) The mixture shall be spread in a uniform layer of such depth that, when compacted, the surface course shall have the required thickness and shall conform to the grade and surface contour required. Immediately adjacent to curbs, gutter, manholes, etc., the surface mixture shall be spread in a uniform thickness so that after compaction it shall be one-quarter (1/4) inch above the edges of such structures.

iii) Spreading operations shall be correlated with plant and hauling equipment so that the spreading operation, once begun, shall provide an uninterrupted forward movement of the spreaders.

iv) Areas inaccessible to mechanical spreading equipment shall be spread by hand without additional compensation.

v) Placing of asphalt plant mix layers shall be as continuous as possible. All joints shall be made in a careful manner so as to provide a smooth, well-bonded and sealed joint meeting the density and surface requirements. Longitudinal joints in the wearing surface shall conform to the edges of proposed traffic lanes insofar as practical. Any necessary longitudinal joints in underlying layers shall be offset so as to be at least six (6) inches from the joint in the next overlying layer. Transverse joints shall be carefully constructed and rollers shall not pass over the unprotected edge of the freshly laid mixture unless laying operations are to be discontinued. Upon resumption of the work a neat joint shall be formed by sawing back vertically into the previously laid material to expose the full depth of the layer. The fresh mixture shall be raked and tamped to provide a well bonded and sealed joint meeting the surface and density requirements.

e) Compacting.

i) As soon as the mixture has been spread and has set sufficiently to prevent undue cracking or shoving, rolling shall begin. A delay in the initial rolling shall not be tolerated. In general, the initial breakdown rolling should be performed by rolling longitudinally, beginning at the sides and proceeding toward the center of the surface. The roller shall not compact within six (6) inches of the edge of the surface where an adjacent lane is to follow while the surface is still hot. When paving abuts a previously placed lane, the longitudinal joint shall be rolled in the first pass. On superelevated curves, rolling shall begin at the low side and progress toward the high side.

ii) If any displacement occurs during rolling, it shall be corrected at once. To prevent adhesion of surface mixture to the rollers, the wheels shall be kept adequately moistened with water and a non-foaming detergent. However, an excess of water shall not be permitted.

iii) In places inaccessible to a roller, compaction shall be obtained with hand or mechanical tampers of adequate weight to produce the required density.

iv) Rolling shall continue until all roller marks are eliminated and the specified density is obtained, unless directed otherwise by the Engineer.

v) It shall be the Contractor’s responsibility to ensure that all asphalt plant mix layers are compacted in accordance with the requirements of the ALDOT's *Standard Specifications for Highway Construction*, latest edition. The Contractor shall promptly furnish the Engineer with all compaction test results. Deficiencies in the density shall be corrected while the mixture is still workable. Areas of deficient density that are not corrected shall be removed and replaced by the Contractor without additional compensation.

29.04 Surface Smoothness.

a) Wearing Surface. The finished surface of the pavement shall not vary more than one-quarter (1/4) inch from the required section measured at right angles to the pavement centerline. The finished surface of the layer shall not vary more than one-quarter (1/4) inch from a fifteen-foot straightedge and not more than three-eighths (3/8) inch from a taut string twenty-five (25) feet in length placed parallel to the centerline at points directed by the Engineer. The variance from the designated grade shall not increase or decrease more than one-half (1/2) inch in one hundred (100) feet.

b) Binder Surface. The finished surface of the layer shall not vary more than three-eighths (3/8) inch from the required section measured at right angles to the pavement centerline. The finished surface of the layer shall not vary more than one-quarter (1/4) inch from a ten-foot straightedge and not more than three-eighths (3/8) inch from a taut string twenty-five (25) feet in length placed parallel to the centerline at points directed by the Engineer.

29.05 Defective or Deficient Areas.

a) Deficiencies in surface smoothness shall be remedied to the extent practicable by rolling while the material is still workable. Otherwise, the layer shall be removed and replaced as necessary to obtain required smoothness and without additional compensation to the Contractor. Skin-patching of a surface layer to correct low areas, or heating and scraping to correct high areas, shall not be permitted. Overlays of not less than one (1) inch in thickness may be authorized by the Engineer to correct surface smoothness deficiencies provided, however, that this work shall be done without additional compensation to the Contractor.

b) All areas containing excessive or deficient amounts of bitumen, all areas showing segregation of materials, and all areas un-bonded after rolling shall be removed and replaced without additional compensation to the Contractor.

29.06 Maintenance and Protection. Sections of newly finished work shall be protected from all traffic until they become properly hardened. Maintenance shall include immediate repairs of any defects that may occur on the work. Such repairs shall be repeated as often as necessary to maintain the work in a continuously satisfactory condition. The Contractor shall be responsible for the protection of the work and protection of any traffic passing through or over the worksite. No additional compensation shall be allowed for maintenance and protection of newly finished work.

29.07 Method of Measurement.

a) The accepted quantity of asphalt binder and asphalt seal used as directed shall be measured in tons of two thousand (2000) pounds. The weight measurement shall include all components contained in the mixture.

b) The accepted quantity of prime and tack coat used as directed shall be measured in gallons.

c) Deductions in measurement shall be made for all material wasted or lost due to negligence of the Contractor or applied beyond the limits of the work.

29.08 Basis of Payment.

a) Compensation for asphalt binder and asphalt seal, measured as provided above, shall be made on a tonnage basis. The unit price per ton shall be full compensation for construction of the asphalt plant mix layers, complete in place, as indicated or directed, including all materials, testing as indicated in specifications, hauling, spreading, compacting, and incidentals required to complete the work.

b) Compensation for prime and tack coat, measured as provided above, shall be made on a volume basis. The unit price per gallon shall be full compensation for construction of the prime and tack coat, complete in place, as indicated or directed, including all materials, hauling, application, maintenance of surface, and incidentals required to complete the work.

END OF SECTION

SECTION 30 - ASPHALT MILLING

30.01 Description. The work specified in this section includes removing existing pavements by milling, in close conformity with the lines, grades, and cross-sections shown in the contract or as designated by the Engineer, for one or more of the following reasons: to lower the finished surface adjacent to existing curb, to remove excess surface material, to correct faulting, to improve surface drainage, or to improve riding characteristics.

30.02 Construction Requirements.

a) General.

i) The existing pavement shall be removed to varying depths in a manner that shall restore the pavement surface to a uniform longitudinal profile and cross-section. Removal shall be to the depth and cross slope as specified in the contract or as directed by the Engineer. If an independent grade reference is required, it shall be designated in the contract and shall be established by the Engineer.

ii) The Contractor may elect to make multiple cuts to achieve the required pavement configuration or depth of cut.

iii) Transverse faces existing at the end of a work period shall be tapered in a manner approved by the Engineer to avoid a hazard to traffic.

iv) Pavement edge drop-offs of two (2) inches or greater shall not be left at the end of the workday without proper traffic control devices in place or otherwise addressing the condition such that there is no hazard to motorists. Traffic control devices shall be in accordance with the *Manual of Uniform Traffic Control Devices* (MUTCD) latest edition. There shall be no additional compensation for providing traffic control devices or otherwise addressing the pavement edge drop-off condition such that there is no hazard to motorists.

v) Before opening the milled surface to traffic all loose material shall be removed to the greatest extent practical from the milled surface by thoroughly sweeping with a power broom or other approved equipment. The Contractor shall dispose of all material swept from the pavement without additional compensation.

vi) Pavement that cannot be removed by milling equipment because of physical or geometrical restraints shall be removed by other methods approved by the Engineer. Removal of pavement around physical or geometrical restraints, valve boxes, manhole frames, etc., shall be considered as an incidental part of the work and no additional compensation therefor shall be allowed.

vii) The Contractor shall dispose of milled material without additional compensation. The milled material shall become the property of the Contractor. The salvage value of the milled material, if any, shall be reflected in the unit price bid for this item of work.

b) Equipment.

i) The equipment for removing existing pavements shall be a commercially designed and manufactured machine capable of performing the work in a manner satisfactory to the Engineer.

ii) The machine shall be power-operated and self-propelled, and shall have sufficient power, traction, and stability to remove a thickness of pavement surface to a specified depth, and provide a uniform profile and cross slope. The machine shall be capable of accurately and automatically establishing profile grades (within plus or minus one-eighth (1/8) inch) along each edge of the machine by referencing from the existing pavement by means of a ski or matching shoe, or from

an independent grade line.

iii) The machine shall have an automatic system for controlling grade, elevation, and cross slope.

iv) The machine shall be equipped with a means to effectively control dust generated by the cutting operation.

c) Finished Surface.

i) The finished surface shall have a reasonably uniform texture.

ii) If the planed surface is to be the final surface of the pavement, the pattern shall be pre-approved by the Engineer and shall be one that provides an acceptable skid resistance. If pavement is to be constructed over the planed surface, it shall have a texture that shall provide good bonding.

iii) The Contractor shall, without additional compensation, correct any unsuitable texture or profile, as determined by the Engineer.

30.03 Method of Measurement.

a) The milling of pavement ordered and accepted shall be measured in square yards computed from surface measurements or it shall be measured in tons. If measured in tons, the planed material shall be weighed on a scale approved by the Engineer.

b) The method of measurement shall be indicated in the contract.

30.04 Basis of Payment. Accepted quantities of milling shall be paid for at the unit price bid per square yard or per ton, as specified, for milling, which shall be payment in full for milling, disposing of milled material, cleaning of the pavement; for furnishing all materials, equipment, labor, tools, and incidentals necessary to complete the work.

END OF SECTION

SECTION 31 - STRUCTURAL CONCRETE

31.01 Description. The work specified in this section includes the furnishing of Portland cement reinforced concrete structures. Structures shall include but are not limited to culverts, junction boxes, headwalls, concrete steps, retaining walls, and other items that are referenced to this section.

31.02 Materials

a) All materials shall conform to the requirements of the following referenced standards:

i) ALDOT's *Standard Specifications for Highway Construction*, latest edition

ii) City of Birmingham's *Standard Specifications for the Construction of Public Works Projects*, latest edition

iii) Coarse Aggregate. ALDOT, Section 801

iv) Fine Aggregate. ALDOT, Section 802

v) Fly Ash. ALDOT, Section 806

vi) Water. ALDOT, Section 807

vii) Air Entraining Agents. ALDOT, Section 808

viii) Retarders and Reducers. ALDOT, Section 809

ix) Cement. ALDOT, Section 815

x) Concrete Curing Agents. ALDOT, Section 830

xi) Concrete Joint Filler, Sealers & Water-Stop Material. City of Birmingham, Section 58 and ALDOT, Section 832

xii) Reinforcing Steel. City of Birmingham, Section 33

b) Special Requirements. The Contractor may be required to adjust the size of the coarse aggregate for the concrete used in heavily reinforced structures. There shall be no additional compensation for this adjustment.

c) Proportioning Materials.

i) General. The Contractor shall be responsible for the concrete meeting the minimum design strength at twenty-eight (28) days. The City of Birmingham does not endorse the concrete mix or materials used by the Contractor.

ii) Minimum Design Standards.

(1) Design Strength. Four thousand (4000) psi as per ASTM C39-86.

(2) Cement Type. I, IP, or III.

(3) Entrained Air. Three to five percent (3%-5%) (by volume).

(4) Slump. Not to exceed five (5) inches. Water reducing and/or retarding agents may be used to obtain the necessary slump.

(5) Coarse Aggregate. Shall not exceed the smaller of: maximum size of one hundred percent (100%) passing the one and one-half (1½) inch sieve and ninety-five to one hundred percent (95% - 100%) passing the one-inch (1) sieve; and:

(a) One-fifth (1/5) the dimension of non-reinforced members

(b) Three-quarters (3/4) the clear spacing between reinforcing bars

(c) One-third (1/3) the depth of slabs.

c) Admixtures. The following admixtures are acceptable:

i) Flyash/Pozzolan. Maximum of twenty percent (20%) by weight of the total of the cement/fly ash mixture. Flyash shall not be used with Type IP cement.

ii) Water Reducers and Retarders. Per manufacturer recommendations and amounts determined by ASTM C494-86.

iii) Air-entraining Agents. Amount required to produce design air content.

iv) Pumping Aids. Amount to aid in the pumping process without injuring the concrete.

v) Other. For admixtures not listed here or to be developed at a later date: Amount to be determined by appropriate ASTM or ACI standard.

d) Sampling and Inspection.

i) The City of Birmingham shall have the right to inspect and/or sample materials used for the concrete. Testing per ASTM standards shall be performed on materials as needed to assure quality control.

ii) The Contractor shall pay for these tests specified in 31.02d)i).

e) Submittals.

i) Prior to beginning work, the Contractor shall submit information about the concrete to be supplied. This information shall identify all materials used in the concrete, amounts of these materials used, and certification that these materials meet the standards identified in this section.

ii) Alternatively, the Contractor may submit a statement from the concrete supplier, designating a particular mix to be supplied if such mix is on file in the Department of Planning, Engineering and Permits. Concrete mixes on file shall contain the same information as the above paragraph and be renewed at least once annually. The design mix information shall be renewed each time there is a change in the supplier(s) of raw material(s).

f) Pre-cast Concrete Units. Units shall meet applicable ASTM or AASHTO standards.

31.03 Construction Requirements.

a) General. The Contractor shall plan the work to provide a finished product meeting all specified requirements of this section. No exceptions shall be made because of materials, weather, time, light,

manpower, equipment, or other restrictions.

b) Time Limits. Final placing of concrete shall occur no later than the time after its initial mixing that the concrete maintains the design slump and can be placed, without the addition of water to the mix. Concrete shall be placed before it takes its initial set.

c) Weather. The Contractor shall place concrete as the weather permits. Contractor shall not place concrete when weather conditions will not allow proper curing and temperature control of the concrete for at least five (5) days (ten (10) days for pozzolan-cement mixtures) after placement.

d) Temperature.

i) The temperature of the concrete shall not be less than 50^{o} F or more than 90^{o} F at the time of placement. No concrete shall be placed when the ambient air temperature is below 35^{o} F or below 40^{o} F and falling without written permission of the Engineer. If there are indications that there shall be temperatures below 40^{o} F during the first five (5) days after placement of concrete, it shall be protected from cold temperatures by keeping the surface at a temperature above 50^{o} F for the first five (5) days. Additionally, concrete shall not be placed on ground with a temperature below 35^{o} F.

ii) The Contractor shall assume all risk and added cost connected with mixing, placing and protecting concrete during cold weather. Permission given by the Engineer to place concrete during such time shall in no way relieve the Contractor of responsibility for satisfactory work. Should it be determined at any time that concrete placed under such conditions is found to be unsatisfactory, it shall be removed and replaced with satisfactory concrete by the Contractor without extra compensation.

iii) Hot Weather Operations. The Contractor shall submit in writing at the pre-construction conference his proposed plan for controlling the concrete mix temperature during hot weather operations for approval by the Engineer. When the temperature of the plastic concrete mix is above 90^{o} F but below 96^{o} F, an approved retarder shall be used in the mix. However, in no instance shall a superstructure concrete mix be placed when the temperature of the plastic concrete is above 90^{o} F.

e) Handling and Placing Concrete.

i) General. All debris and extraneous matter shall be removed from the interior of forms prior to placing of concrete. All struts, stays, and braces to be left in the concrete and other embedded items shall be non-injurious to the concrete. During each pour, concrete shall be placed in horizontal layers not to exceed twelve (12) inches in thickness. Each additional layer of concrete shall be placed and consolidated before the preceding layer has taken its initial set.

ii) Chutes or Power Belts. Chutes or power belts shall be used when concrete is to be dropped more than five (5) feet. Chutes and belts shall be constructed and operated to prevent segregation of the concrete.

iii) Pumping. Direct placement of concrete by a pumping device shall be permitted if the device pumps a continuous stream of concrete without introducing air pockets into the concrete.

iv) Consolidation. Concrete shall be consolidated during and immediately after placement by spading and mechanical vibration. Consolidation shall produce smooth surfaces and dense concrete and shall not cause segregation in the concrete. Vibration shall not be applied to formwork or steel reinforcement.

f) Construction Joints.

i) General. The Contractor shall plan his work to locate construction joints only as shown in the

contract. Construction joints may be placed at locations other than those shown in the contract in case of an emergency; however, no joints shall be allowed in areas of maximum moment or shear.

ii) Bonding. A keyway shall be placed in the concrete during finishing operations, or the concrete may be scarified after hardening to provide a suitable shear interface with the adjoining concrete pour. Fresh grout shall be applied to the construction joint immediately prior to the placement of concrete.

iii) Forms.

(1) General.

(a) Forms shall be substantial and unyielding and so designed and constructed that the finished concrete shall conform to the plan dimensions and contours within tolerances listed in other portions of these specifications or as shown in the contract. Removable forms shall be removed without damage to the concrete.

(b) Forms shall be mortar-tight. For narrow walls, columns, etc., the Engineer may require daylight and inspection holes at vertical intervals as directed. The inside of forms shall be coated with non-staining oil or other suitable material to prevent the concrete from adhering to the forms. Form oil shall not come in contact with reinforcing steel or structural steel.

(2) Falsework. All spans shall be given a temporary camber to allow for deflection, shrinkage and settlement. If adequate test cylinders have been made, falsework may be removed when the cylinders indicate that the concrete has developed a minimum compressive strength of thirty-two hundred (3200) psi, otherwise falsework shall remain in place for the following time limits:

(a) Falsework under slabs of greater than six (6) foot spans may be removed after fourteen (14) days exclusive of days when for four (4) hours or more the air temperature is below 40^{o} F.

(b) Falsework under slabs of less than six (6) foot spans may be removed after seven (7) days exclusive of days when for four (4) hours or more the air temperature is below 40^{o} F.

g). Curing Concrete.

i) The Contractor shall give careful attention to the proper curing of the concrete. All surfaces not covered by forms shall be protected by one or more of the following methods:

(1) Membrane Curing Compound. Meeting ASTM C309-86 with minimum eighteen percent (18%) solids and applied at a rate not greater than one (1) gallon per two hundred (200) square feet.

(2) Dampened Burlap. Kept in place and wetted continuously for seven (7) days.

(3) Polyethylene Film. Placed to maintain a moisture tight enclosure for seven (7) days.

(4) Wetted Sand. Non-reactive sand wetted continuously for seven (7) days.

h) Protection of Concrete. No traffic or other superimposed load, including construction equipment, shall be allowed on concrete structures until a compressive strength of four thousand (4000) psi is attained in the

concrete. The Engineer may designate a shorter time period for non-structural concrete, such as sidewalks and driveways, when such concrete reaches a compressive strength of twenty-five hundred (2500) psi unless otherwise specified in these specifications.

i) Finishing Concrete.

i) Concrete surface shall be free from all objectionable projections, depressions, holes and other appearance defects. Immediately after removal of forms all form ties shall be removed to one (1) inch below the surface of the concrete. The resulting cavities shall be filled and pointed with a mortar of sand and cement and the surface left smooth and even. The mortar used shall be one-part cement to two-parts sand by volume.

ii) This finish shall apply unless otherwise specified in another section.

j) Site Quality Control.

i) Quality control checks shall be made at the job site using the following methods. Other methods may be specified in the contract or in supplemental specifications. Quality control exercised by the Engineer does not constitute approval of the materials or construction methods used at the site to provide a concrete structure. Concrete may be rejected for failure to meet quality control standards.

ii) Concrete.

(1) Air Content. Taken as needed, at least one (1) test per eight (8) hour shift or fifty (50) cubic yards, whichever occurs first. Range is three to five percent (3% - 5%), tolerance of plus or minus one percent (1%) allowed.

(2) Cylinders. Test cylinders per ASTM C31-85 shall be taken as needed, at least one (1) set per eight (8) hour shift or fifty (50) cubic yards placed, whichever occurs first. The Contractor shall pay for the cost of cylinder tests. There shall be no additional compensation for these tests.

(3) Slump Test. Taken as needed, at least one (1) test per eight (8) hour shift or fifty (50) cubic yards placed, whichever occurs first. Maximum slump is five (5) inches, no tolerance allowed.

(4) Temperature. Taken as needed, at least one (1) test per eight (8) hour shift or fifty (50) cubic yards placed, whichever occurs first. Range is 50° F - 90° F, tolerance of plus or minus 2° F allowed.

31.04 Method of Measurement. Accepted structural concrete shall be calculated from dimensions shown on original or revised contract, as applicable.

31.05 Basis of Payment.

a) Concrete meeting all design and specification requirements shall be measured as noted herein and shall be paid for at the unit price bid per cubic yard.

b) The unit price shall be payment in full for ground preparation, finished concrete structure as shown in the contract or described in the specifications, excavation (except rock), backfill if available on the job from construction activities, and other related incidental items that are not included in the contract as pay items. Where separate items and unit prices for any of the above work or material are included in the contract, such work or material shall be paid for separately as provided.

c) Concrete failing to meet the design strength as shown from results of the ASTM C39-86 cylinder breaks shall be replaced unless the Engineer elects to retain the work. The Engineer may elect to keep the part of the work that corresponds to the failed cylinders and pay the Contractor seventy percent (70%) of the unit price for this work. The Contractor may replace this work instead of receiving partial payment.

END OF SECTION

SECTION 32 - STEEL REINFORCEMENT

32.01 Description. The work specified in this section includes furnishing and installing reinforcement steel for concrete structures in accordance with the plan details and these specifications.

32.02 Materials.

a) General.

i) All reinforcing steel shall be Grade 60 billet steel, unless otherwise stipulated in these specifications or specifically designated by the plan details.

ii) All reinforcing bars over one-quarter (1/4) inch in diameter shall have deformations as prescribed in ASTM A615.

b) Reinforcing Bars.

i) Billet steel reinforcement bars over one-quarter (1/4) inch in diameter shall meet the requirements of ASTM A615.

ii) Reinforcement bars less than one-quarter (1/4) inch in diameter shall meet the requirements of ASTM A82.

c) Reinforcing Mesh or Mats.

i) Wire for Mesh Reinforcement. Wire for mesh reinforcement shall meet the requirements of ASTM A82.

ii) Welded Steel Wire Reinforcement. Welded steel wire reinforcement shall meet the requirements of ASTM A185.

d) Use, Care, and Handling.

i) All reinforcement received on the project shall be placed in an approved storage area and shall be maintained clean, intact, and free from distortion. Reinforcement shall be free from loose or thick rust, which would impair bond of the steel with the concrete. Rust that produces only discoloration without reducing the cross-sectional area of the steel shall not be considered objectionable. Only such amounts of reinforcement shall be distributed along the construction as is needed for immediate use.

ii) The supplier of the reinforcing steel shall furnish to the Engineer three (3) copies of an itemized list of all steel included in each shipment. The list shall show the mark of the bar, bar number, grade, length, and weight of all steel for each structure requiring reinforcing steel.

iii) Bar Bending Diagrams. When bar lists and/or bending diagrams are shown in the contract, the Contractor shall verify their accuracy from the drawings. Errors found by the Contractor in the bar bending schedules and/or bar list shall be reported to the Engineer. Errors in the bar bending schedules and/or bar list shall not be cause for adjustment of unit prices.

32.03 Construction Requirements.

a) Handling and Placing Reinforcement.

i) Bending.

(1) Reinforcement shall be bent, without heating and in accordance with CRSI's *Manual of Standard Practice MSP-2-81*, accurately to the form and dimensions shown in the contract. The radius of bends shall be six (6) or more times the diameter of the bar or as shown by the plan details.

(2) Abrupt bends shall be avoided. Any reinforcement bent during shipment or handling shall be properly reshaped before being placed in the work. Bars with kinks or bends and bars appreciably reduced in cross-sectional areas shall be rejected.

ii) Cleaning. Metal reinforcement, before being placed in the work, shall be cleaned of loose mill scale and of coatings of dirt, paint, oil, grease, or any other foreign substance.

iii) Placing. All reinforcing steel shall be accurately placed and firmly held in the positions shown in the contract during the placing and hardening of the concrete.

iv) Wiring and Supporting.

(1) All reinforcement shall, at the Contractor's option, be rigidly wired or, if approved by the Engineer, spot-welded. All reinforcement steel shall be maintained at the proper distance from the forms or, in the case of layers, from each layer by means of approved stays, metal chairs, ties, hangers or other approved supports. Tie wires shall be 16-gauge minimum diameter. Metal supports shall be in accordance with CRSI's *Manual of Standard Practice MSP-2-81* for Class 3 bar supports, except that supports, which are to be in direct contact with removable forms, shall be Class 1 supports. Any pre-molded Class 1 support tips that do not provide a tight snug fit shall be rejected and removed from the work. The use of pebbles, pieces of broken concrete, stone, or brick, metal pipe, or wooden blocks as supports shall not be permitted.

(2) No construction operation shall be permitted which tends to bend or displace the reinforcement from its correct position. All reinforcement shall be placed and securely wired, spaced, and blocked before placing concrete in any section.

v) Inspection. Reinforcement in any member shall be inspected and approved by the Engineer before the placing of concrete begins. Concrete placed in violation of this provision shall be rejected, removed and replaced without additional compensation.

b) Splicing and Lapping Reinforcement.

i) Splices. All splices shall be a minimum of forty (40) bar diameters. In lapped splices, the bars shall be placed in contact and wired together in such a manner as to maintain the proper clearances.

ii) Lapping. Sheets of mesh or bar mat reinforcement shall overlap at least one (1) mesh in width.

c) Testing. It shall be the responsibility of the Contractor to verify that all reinforcing steel meets the requirements of these specifications. The Contractor shall furnish the Engineer results of tests performed on the reinforcing steel. There shall be no additional compensation for testing reinforcing steel.

32.04 Method of Measurement.

a) Theoretical Weight. The weight of steel to be paid for shall be the number of pounds, theoretical weight, of steel acceptably placed as shown in the contract or as directed by the Engineer, at those locations requiring reinforcement steel.

b) Areas and Weights Table. Areas and weights to be used in calculations for the various size bars shall be as shown in the following table:

BAR #	UNIT WEIGHT (lb/ft)	NOMINAL DIAMETER (in)	AREA (in^2)
3	0.376	0.375	0.11
4	0.668	0.500	0.20
5	1.043	0.625	0.31
6	1.502	0.750	0.44
7	2.044	0.875	0.60
8	2.670	1.000	0.79
9	3.400	1.128	1.00
10	4.303	1.270	1.27
11	5.313	1.410	1.56
14	7.650	1.693	2.25
18	13.600	2.257	4.00

c) Miscellaneous Metal Parts. No allowance shall be made for any device, material, or method, which may be used for splicing, clamping, tying, and keeping reinforcement in the proper position.

32.05 Basis of Payment. The weight of steel reinforcement, determined as noted above, shall be paid for at the unit price bid per pound for steel reinforcement, which price shall be payment in full for fabricating, furnishing, and placing all materials; and for all labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

SECTION 33 - CONCRETE STEPS INCLUDING COPING

33.01 Description. The work specified in this section includes constructing concrete steps, including coping, at the locations shown in the contract or as directed by the Engineer.

33.02 Materials. All materials, tests, proportions, methods of mixing, and ultimate compressive strength shall conform in every respect to those materials in Section 31 of these specifications. Other materials shall conform to the requirements of the appropriate sections of these specifications.

33.03 Construction Requirements.

a) General. The construction of steps shall be in accordance with the contract and Section 1009 of the *2003 International Building Code*, as amended.

b) Risers and Treads.

i) Riser heights shall be seven (7) inches maximum and four (4) inches minimum. The riser height shall be measured vertically between the leading edges of adjacent treads.

ii) Tread depths shall be eleven (11) inches minimum. The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at right angles to the tread's leading edge.

iii) Treads and risers shall be of uniform size and shape. The tolerances between the largest and smallest riser or between the largest and smallest tread shall not exceed three-eights (3/8) inch in any flight of stairs.

c) Coping. All concrete steps shall include a coping on both sides of the steps, as shown on the standard drawing on file in the Department of Planning, Engineering and Permits.

d) Concrete Work. All concrete work required to complete the stairs in accordance with the plan details and these specifications shall conform to the requirements of Section 31.

33.04 Method of Measurement. Accepted steps, complete in place, including coping, shall be measured in linear feet obtained by multiplying the width of the step, including coping, by the number of steps, as shown on the plan details.

33.05 Basis of Payment. The accepted number of linear feet of steps, including coping, shall be paid for at the unit price bid per linear feet for concrete steps, which price shall be payment in full for all excavation, coping, materials, equipment, tools, labor, and other incidentals necessary to complete the work. No separate payment shall be made for coping.

END OF SECTION

SECTION 34 - CONCRETE SIDEWALK PAVING AND CURB RAMPS

34.01 Description. The work specified in this section includes constructing sidewalks or curb ramps in one course on a prepared subgrade in accordance with these specifications. The term "subgrade" as used in this section shall mean the prepared foundation on which the sidewalk or curb ramp is constructed. Sidewalks shall be laid to a thickness of four (4) inches and to the width as shown in the contract. Curb ramps shall be laid to the dimensions as shown in the contract.

34.02 Materials.

a) Concrete. All materials, tests, proportions, methods of mixing, and ultimate compressive strength shall conform in every respect to the requirements of Section 31.

b) Joint fillers, caulking and sealants shall meet the requirements of Section 58.

c) Other materials shall conform to the requirements of the appropriate sections of these specifications.

34.03 Construction Requirements.

a) Subgrade.

i) The subgrade shall be firm, thoroughly compacted, and smoothly dressed before the concrete is laid. Subgrade shall be four (4) inches below grade for sidewalks and six (6) inches below grade for curb ramps. Sidewalks and wheelchair ramps not constructed on the original undisturbed ground surface shall have the subgrade compacted as per Section 21. Mechanical compaction equipment may be used for compacting subgrade if approved by the Engineer.

ii) Grading is to be done four (4) inches wider than the walks to be laid to permit forms to be staked down around the work. The Contractor shall, without additional compensation unless items for this work are included in the contract, perform all grading, whether it is excavation or embankment, and all clearing and grubbing. All deleterious or otherwise defective material shall be removed from the work before any concrete is laid. No specific payment shall be made for crushed stone used to level the subgrade.

b) Forms for sidewalk paving shall be of an approved section and shall have a flat surface on top of not less than one and one-half (1½) inches in width. All forms shall be straight, free from bends and warps at all times. Forms shall be cleaned thoroughly and oiled each time prior to use and before concrete is placed in contact with them. The forms shall be set so that they shall rest firmly upon the thoroughly compacted subgrade throughout their entire length. Forms shall be jointed neatly and tightly. Forms shall be staked securely to line and grade by using at least three (3) bracing pins or stakes to each ten (10) feet length of side form so that they shall resist the pressure of the concrete. Forms shall not be removed until the concrete has attained sufficient set.

c) Division plates shall be of three-sixteenths (3/16) inch steel and shall exactly conform to the cross-section of the concrete shown in the contract, except that a small lug provided with a hole for a hook shall project above the surface of the concrete to aid in removing the plate. Plates shall be cleaned and oiled each time prior to use. Division plates must be set truly vertical and must not be withdrawn until the concrete has stiffened sufficiently so that concrete shall not run in and fill the joints. For sidewalk widths up to six (6) feet, division plates shall be set to form a square block. Sidewalks wider than six (6) feet shall be laid in two (2) or more longitudinal sections.

d) Joints.

i) The edges of the joints formed when division plates are withdrawn shall be tooled with the proper edger and the joint shall be cleaned completely through the section with a long pointed trowel. The center mark forming the squares in the wider sidewalk shall also be made.

ii) Tooled joints shall be a maximum of one quarter (1/4) inch wide by three-quarter (3/4) inch deep.

iii) A construction joint one-half (1/2) inch wide the full depth of the sidewalk shall be placed every thirty (30) feet and filled with a sealant.

iv) An expansion joint one-half (1/2) inch wide shall be placed where new concrete work meets existing concrete work and existing or proposed curb. Expansion joints shall extend entirely through the concrete. Expansion joints shall be comprised of a pre-molded filler recessed one-half (1/2) inch from the surface of the sidewalk with one-half (1/2) inch of a sealant applied on top of the pre-molded filler thus completing the joint.

v) Joints may be saw cut if desired by the Contractor.

vi) All lines, joints, etc., shall be clean and straight whether tooled or saw cut.

e) Finishing.

i) General. The concrete shall be struck off flush with the top of the forms and given a true and even finish with a wooden float and brush, care being taken that none of the coarse aggregate is exposed. Concrete shall not be worked so much as to cause excessive water to come to the surface. Corners and edges shall be rounded with suitable tools. All lines and joints shall be straight, clean and clear cut with no variation in the finished surface greater than one-eighth (1/8) inch.

ii) Surface. Concrete sidewalks and curb ramps shall be sweat finished by means of a steel trowel followed by a light broom finish applied at a right angle to the centerline of the sidewalk.

iii) Concrete that is chipped, broken, cracked, spalled, has exposed aggregate, is not flush with adjacent work, has concrete spilled on it, or in any other way is determined to be unacceptable by the Engineer shall be replaced by the Contractor without additional compensation.

f) Curing.

i) Immediately after the concrete has been finished, all exposed surfaces of concrete shall be covered either with liquid membrane- forming compound, Type 1, ASTM C309, or with burlap. The entire surface shall be sealed by hand or by machine spraying thereon a uniform application of a translucent membrane curing solution that shall be applied in one or two separate applications as may be recommended by the manufacturer or as directed by the Engineer. If the solution is applied in two increments, the second application shall follow the first application within thirty (30) minutes. The curing solution shall be applied so as to result in a uniform coverage on the surface at a rate of one (1) gallon for each two hundred (200) square feet of area. In the event of removal of the coated surface by rainfall or areas cut by finishing tools subsequent to the application of the curing solution, a new application shall immediately be made at the rate specified above.

ii) In the event burlap is used, it shall be kept thoroughly wetted and shall remain until after the final set, or, in any case, a minimum of twenty-four (24) hours after placement. Burlap shall remain in place and shall be kept wet for such a period of time as the Engineer may deem necessary. The Contractor shall renew any work damaged by the weather without additional compensation.

g) Protection. The Contractor shall protect the concrete work from all damage by traffic by the use of barricades, fences, flashing yellow lights, or such other means as may be necessary, and shall provide cross-overs for pedestrians at all street crossings. Every reasonable precaution is to be taken to prevent obstructing street traffic.

h) Backfilling. After the concrete has set sufficiently, the side forms shall be removed and the spaces on both sides shall be backfilled with suitable material. This backfill shall be compacted to a level one (1) inch below the walk and left in a neat and workmanlike condition.

j) Cleaning Up. The surplus material, earth, sand, rubbish and stone, except such stones as are retained by order of the Engineer, are to be removed from the lines of the work as rapidly as the work progresses. When material is removed, the curb and gutter must be immediately swept clean by the Contractor, and when public or local inconvenience is caused by dust, the Contractor shall water any piles or surface of earth on the curb and gutter, or pavement foundations, sweeping when and where necessary or whenever required by the Engineer to do so. If the Contractor fails to clean up all surplus material, earth, sand, rubbish and stone along the line of work, day by day, as provided above, the City of Birmingham shall cause such materials to be removed and the expense of such removal deducted from the final payment. After the concrete work has been properly cured, the Contractor shall, without additional compensation, remove any material that might have been used to cover the work, and shall leave the work clean and in a condition satisfactory to the Engineer.

k) Detectable Warnings.

i) Detectable warnings shall be installed on curb ramps and other locations as determined by the Engineer where pedestrian ways blend with vehicular ways without tactile cues. Detectable warnings shall consist of a surface of truncated domes aligned in a square grid pattern and meeting the technical specifications of the *Americans with Disabilities Act Accessibility Guidelines* (ADAAG).

ii) Detectable warning surfaces shall contrast visually with adjacent walking surfaces - either light on dark or dark-on-light. The domes and the underlying surface shall have a minimum of seventy percent (70%) contrast with the light reflectivity of the adjoining surface. Pigment for pavers and prefabricated products shall be integral to the material. Externally applied pigment shall be heavy-duty grade, color hardener, dry-shake method.

iii) Detectable warnings shall consist of raised truncated domes with a diameter of nominal nine-tenths of an inch (0.9”), a height of nominal two-tenths of an inch (0.2”) and a center-to-center spacing of nominal two and thirty-five hundredths of an inch (2.35”).

iv) In new construction applications, truncated domes may be either cast into the new concrete or be constructed of pavers with the domes integral to the pavers.

v) In retrofit applications, the truncated dome product shall be approved by the Engineer prior to its use.

vi) Detectable warning surfaces shall extend twenty-four inches (24") in the direction of pedestrian travel and the full width of the curb ramp, landing or blended transition. The detectable surface shall be located so that the edge nearest the curb line is six inches (6") minimum and eight inches (8") maximum fromthe curb line.

vii) The cost of providing truncated domes shall be included in the unit price bid for curb ramps.

34.04 Method of Measurement.

a) The area of accepted sidewalk shall be measured in square yards complete in place.

b) The number of accepted curb ramps shall be measured per each complete in place.

34.05 Basis of Payment.

a) The accepted square yards of sidewalk shall be paid for at the unit price for concrete sidewalk paving, complete in place, which shall be payment in full for furnishing all materials (including joints), for the hauling, preparation and placing of all materials, for the preparation of the subgrade, backfilling and for all labor, equipment, tools and incidentals necessary to complete the work.

b) The curb ramps shall be paid for at the unit price for each accepted curb ramp, complete in place.

END OF SECTION

SECTION 35 - CONCRETE PAVING

35.01 Description. The work specified in this section includes constructing, in one course, concrete pavement, concrete alleys, driveways, and driveway and alley turnouts, with or without reinforcement, on a prepared subgrade. The type, form, and dimensions of paving shall be as indicated in the contract.

35.02 Materials.

a) Concrete. All materials, tests, proportions, methods of mixing, and ultimate compressive strength shall conform in every respect to the requirements of Section 31.

b) Joint fillers, caulking and sealants shall meet the requirements of Section 58.

c) Other materials shall conform to the requirements of the appropriate sections of these specifications.

35.03 Construction Requirements.

a) General. The construction requirements for concrete paving shall, with the modifications noted below, conform to the requirements of Section 31. This shall include excavation, forming, placing steel reinforcing, curing, cold weather requirements, test specimens, re-tempering concrete, etc.

b) The subgrade shall be prepared in accordance with Section 27.

c) Placing Concrete.

i) After all preliminary work has been completed, checked, and approved by the Engineer, the concrete shall be deposited over the entire width of the section, without the use of intermediate forms or bulkheads between joints.

ii) The concrete shall be brought to the specified thickness and contour by means of a screed or template. The screed or template for concrete pavement work shall be shaped to the cross-section of the pavement and shall have sufficient strength to retain its shape under all working conditions. The screed or template shall rest on the side forms and shall be drawn ahead with a sawing motion. At transverse joints, the screed or template shall not be drawn closer than three (3) feet toward the joint. It shall then be lifted and set down at the joint and drawn away from the joint. Surplus concrete shall be taken up with shovels and thrown ahead of the joint.

d) Joints.

i) Construction, contraction and expansion joints shall be constructed at the locations shown in the contract or as directed by the Engineer.

ii) All joints shall be made at right angles to the finished surface. Joints shall be formed between the pavement under construction and all other rigid types of pavements, curbs and gutters, and other rigid structures. In pavements with integral curb, the joint shall be continuous, in one straight line, through pavement and curb.

iii) Transverse expansion joints shall be one-half (1/2) inch wide and spaced as shown in the contract or as directed by the Engineer. The joint filler material shall conform to Section 58.

iv) Transverse contraction joints shall be formed where indicated by the contract or as directed by the Engineer. These joints shall be one-quarter (1/4) inch wide and three-quarter (3/4) inch in depth. The joint shall be filled with a sealant meeting the requirements of Section 58.

v) Transverse construction joints shall be formed, whenever it is necessary to stop placing

concrete for more than thirty (30) minutes, by staking a bulkhead in place and finishing the concrete to it. When work is resumed, the bulkhead shall be removed, taking care not to disturb the concrete. The fresh concrete shall be placed directly against the face of the concrete previously placed. These joints, when finished, shall have the dimensions of transverse contraction joints and be filled with a sealant meeting requirements of Section 58.

vi) Longitudinal expansion joints shall be one-quarter (1/4) inch wide by one and one-half (1½) inches in depth, placed as shown in the contract or as directed by the Engineer. The joint shall be filled with a sealant meeting the requirements of Section 58.

e) Surface Finishing.

i) The concrete surface shall be given a broom finish. The finish shall be applied when the water sheen has practically disappeared. The broom shall be drawn transversely across the pavement with adjacent strokes slightly overlapping. The brooming shall be completed before the concrete is in such a condition that the surface will be torn or unduly roughened by the operation. The finished surface shall have a uniform appearance and be free of corrugations exceeding one-eighth (1/8) of an inch in depth. The method shall produce a surface with a rough texture that conforms in every way to the lines, grades, and cross-sections shown in the contract.

ii) Concrete that is chipped, broken, cracked, spalled, has exposed aggregate, is not flush with adjacent work, has concrete spilled on it, or in any other way is determined to be unacceptable by the Engineer shall be replaced by the Contractor without additional compensation.

f) Opening to Traffic. The new work shall be kept closed to traffic for a period of at least three (3) days or until a test cylinder breaks at sixty percent (60%) of the specified concrete compressive strength. This time period shall be extended at the discretion of the Engineer if weather or other conditions warrant such an extension.

35.04 Method of Measurement. The accepted concrete paving shall be measured in square yards, complete in place, measured parallel to the surface on which it is placed.

35.05 Basis of Payment. The accepted number of square yards of concrete paving shall be paid for at the respective unit price bid per square yard of concrete paving for a specified thickness, which price shall be payment in full for all excavation; for furnishing all material, equipment, tools, labor, and incidentals necessary to complete the work, including storage of material, mixing, placing, curing, and finishing the concrete surface, furnishing, placing, and removing forms; joint construction and material, and other incidental construction attached to or incorporated in the masonry. Where items and unit prices for any of the above work or material are included in the contract, such work or material shall be paid for separately as provided for in the contract.

END OF SECTION

SECTION 36 - CONCRETE COMBINED CURB AND GUTTER

36.01 Description. The work specified in this section includes the furnishing of all materials and equipment, and performing all labor and services necessary to install concrete curbs and gutters complete. The work shall include all excavation and backfill, subgrade preparation, shoring and bracing, pumping, drilling and blasting, construction of curbs and gutters, disposal of surplus materials, maintenance during construction, and all other work incidental to the concrete curbs and gutters.

36.02 Materials.

a) Concrete. All materials, tests, proportions, methods of mixing, and ultimate compressive strength shall conform in every respect to the requirements of Section 31.

b) Joint fillers, caulking and sealants shall meet the requirements of Section 58.

c) Other materials shall conform to the requirements of the appropriate sections of these specifications.

36.03 Construction Requirements.

a) Subgrade.

i) The subgrade shall be constructed or excavated to the required depth below the finished surface in accordance with the cross-section shown in the contract or as designated by the Engineer. If the subgrade is of suitable material, the curb and gutter may be constructed on the original subgrade. If the subgrade is of unsuitable material, the material shall be removed and the subgrade backfilled with crushed stone. The removal of unsuitable material shall be measured and paid for as *Unclassified Excavation*. No specific payment shall be made for crushed stone backfill under curb and gutter. The Engineer shall be the sole judge as to the suitability of the subgrade material and his decision shall be final

ii) Subgrade preparation shall conform to the requirements of Section 27 if constructed on original subgrade of suitable material. If crushed stone backfill is used it shall conform to the requirements of Section 28.

b) Forms.

i) The Contractor shall use standard-type metal forms as noted hereinafter or an approved automatic extrusion type curb and gutter machine may be used. Forms for concrete curb and gutter shall be of not less than 12-gauge metal, shall be of approved section and shall have a flat surface on top of not less than two (2) inches in width.

ii) All forms shall be straight, free from bends and warps at all times. Forms shall be cleaned thoroughly and oiled each time prior to use and before concrete is placed against them. The forms shall be set so that they shall rest firmly upon the thoroughly compacted subgrade throughout their entire length. Forms shall be jointed neatly and tightly. Forms shall be staked securely to line and grade, by using at least three (3) bracing pins or stakes to each ten (10) foot length of side form so that they shall resist the pressure of the concrete. Forms shall not be removed until the concrete has attained sufficient set.

iii) Any automatic extrusion type curb and gutter machine considered for approval must be demonstrated to produce a section conforming to the dimensions, cross-section, lines and grades shown in the contract. Failure to consistently produce an acceptable product shall be cause to withdraw approval of the machine and order the use of standard forms.

iv) All curbs and gutters shall be placed in one operation and to the depth of the cross-section

specified in the contract. The placement of curb separate from the gutter shall not be permitted.

c) Division plates shall be of three-sixteenths (3/16) inch steel and shall conform to the exact dimensions of the section shown on the general drawings on file in the office of the Engineer, except that a small lug provided with a hole for a hook shall project above the surface of the concrete to aid in removing the plate. Plates shall be cleaned and oiled each time prior to use. Division plates must be set truly vertical and must not be withdrawn until the concrete has stiffened sufficiently so that concrete will not fill the joints. The joints shall be set every ten (10) feet, except where connecting into driveways and existing improvements.

d) Joints.

i) The edges of the joints formed when division plates are withdrawn shall be tooled with the proper edger and the joint shall be cleaned completely through the section with a long pointed trowel.

ii) Expansion joints shall extend entirely through the concrete and shall be placed at the intersection of curb and gutter and sidewalks, at the intersection of curb and gutter and driveway returns, or as directed by the Engineer. Expansion joint materials shall meet the requirements of Section 58.

iii) When automatic extrusion-type curb and gutter machines are used to lay curb and gutter, all joints shall be saw-cut at intervals not to exceed ten (10) feet.

iv) All joints shall be straight, clean, and clear of all loose concrete.

e) Finishing.

i) General. The concrete shall be struck off flush with the top of the forms and given a true and even finish with a wooden float and brush, care being taken that none of the coarse aggregate is exposed. Concrete shall not be worked so much as to cause excessive water to come to the surface. Corners and edges shall be rounded with suitable tools to the shape shown in the contract.

ii) Surface Finish. Concrete curb and gutter shall be troweled smooth and finished with a light brush.

f) Curing.

i) Immediately after the concrete has been finished, all exposed surfaces of concrete shall be covered either with liquid membrane-forming compound, Type 1, ASTM C309, or with burlap. The entire surface shall be sealed by hand or machine spraying thereon a uniform application of a translucent membrane curing solution that shall be applied in one or two separate applications as may be recommended by the manufacturer and as directed by the Engineer. If the solution is applied in two increments, the second application shall follow the first application within thirty (30) minutes. The curing solution shall be applied so as to result in a uniform coverage on the surface at a rate of one (1) gallon for each two hundred (200) square feet of area. In the event of removal of the coated surface by rainfall or areas cut by finishing tools subsequent to the application of the curing solution, a new application shall immediately be made at the rate specified above.

ii) In the event burlap is used, it shall be kept thoroughly wetted and shall remain until after the final set, or in any case a minimum of twenty-four (24) hours after placement. Burlap shall remain in place and shall be kept wet for such a period of time as the Engineer may deem necessary.

g) Protection.

i) The Contractor shall protect the concrete work from all damage by traffic by the use of barricades, fences, flashing yellow lights, or such other means as may be necessary, and shall provide cross-overs for pedestrians at all street crossings. Every reasonable precaution is to be taken to prevent obstructing street traffic.

ii) Any work damaged by the weather shall be replaced or renewed, as determined by the Engineer, by the Contractor without additional compensation.

h) Backfilling. After the concrete has set sufficiently, spaces along the front and back sides of the curb and gutter shall be backfilled to the required elevation with suitable material which shall be compacted by tamping with approved metal tamps or mechanical tamps in layers not more than four (4) inches thick until firm and solid. No separate payment shall be made for backfilling under curb and gutter unless approved by the Engineer.

i) Cleaning Up. The surplus material, earth, sand, rubbish and stone, except such stones as are retained by order of the Engineer, are to be removed from the lines of the work as rapidly as the work progresses. When material is removed, the curb and gutter must be immediately swept clean by the Contractor, and when public or local inconvenience is caused by dust, the Contractor shall water any piles or surface of earth on the curb and gutter, or pavement foundations, sweeping when and where necessary or whenever required by the Engineer to do so. If the Contractor fails to clean up all surplus material, earth, sand, rubbish and stone along the line of work, day by day, as provided above, the City of Birmingham shall cause such material to be removed and the expense of such removal shall be deducted from the final payment. After the concrete work has been properly cured, the Contractor shall, without additional compensation, remove any material that might have been used to cover the work, and shall leave the work clean and in a condition satisfactory to the Engineer.

36.04 Method of Measurement. Accepted concrete curb and gutter shall be measured in linear feet, complete in place, to the nearest one-tenth (1/10) of a foot along the base of the curb face or along the flow line of the gutter for the entire length of the curb and gutter except across driveways and alley turn-outs. The gutter length from PC to PC across driveways and alleyways shall not be counted as curb and gutter.

36.05 Basis of Payment. The accepted length of curb and gutter shall be paid for at the unit price for concrete curb and gutter, complete in place, which shall be payment in full for furnishing all excavation, backfilling, disposal of surplus material, all joints, all special construction at driveways and other points, furnishing all materials, hauling and placing materials, and for all labor, equipment, tools and incidentals necessary to complete the work.

END OF SECTION

SECTION 37 - GROUND PREPARATION AND FERTILIZER

37.01 Description. The work specified in this section includes furnishing and incorporating into the soil, to the depth specified or as directed by the Engineer, fertilizers of the type provided herein and the preparation of the ground to receive fertilizer.

37.02 Materials.

a) General. The fertilizer or fertilizers used shall be of the type and grade provided herein. When tested by methods adopted by the Association of Official Agricultural Chemists, fertilizer or fertilizers shall comply with Title 2, *Code of Alabama 1975*, as amended.

b) Manufactured Fertilizers.

i) Manufactured fertilizers shall be standard commercial products and shall contain not less than the percentages by weight of the ingredients set out in the following table:

-	**NITROGEN N**	**PHOSPHORUS P_2O_5**	**POTASH K_20**
15-0-15	15	0	15
13-13-13	13	13	13
10-10-10	10	10	10
8-8-8	8	8	8
0-14-14	0	14	14
4-12-12	4	12	12
4-16-8	4	16	8
Super Phosphate	-	18	-
Ammonium Nitrate	33.5	-	-
Ammonium Sulphate	20.5	-	-
Sodium Nitrate	16	-	-
Potassium Chloride	-	-	60

ii) An allowance of five percent (5%) variation or tolerance of the above proportions shall be permitted based on relative commercial value (see Agricultural Code).

iii) Nitrogen may be derived from any nitrogen carrying material approved by the State Commissioner of Agriculture and Industries.

iv) All fertilizers shall be transported in containers which shall insure proper protection, handling, and which are commonly used with such fertilizers.

c) Agricultural limestone shall contain not less than ninety percent (90%) of calcium and magnesium

carbonate and shall be crushed so that ninety-five percent (95%) shall pass a No. 8 sieve.

d) Basic Slag.

i) Basic slag shall be ground, open hearth, basic slag containing not less than the percentage by weight of the following ingredients:

INGREDIENT	% BY WEIGHT
P_2O_5 (Available)	2
Magnesium Oxide	6
Manganese Oxide	2
Iron Oxide	20
Calcium Oxide	18
Neutralizing Value	55

Note: At least eighty percent (80%) shall pass a No. 100 sieve and at least ninety percent (90%) shall pass a No. 50 sieve.

e) Bone meal shall be finely ground and steamed with an analysis of the material showing at least two percent (2%) total nitrogen and twenty-four percent (24%) total phosphoric acid.

37.03 Construction Requirements.

a) Equipment. All equipment necessary for properly handling, storing, placing, and incorporating the fertilizer into the prepared ground and for ground preparation shall be on hand, proved to be in good condition, available when required, and shall have been approved before work shall be permitted to begin.

b) Ground Preparation.

i) Ground preparation shall consist of cultivation to loose depths of from four (4) inches to eight (8) inches of the ground surface. The plowing, harrowing, cultivating, and all other operations shall be performed with proper equipment and in such manner as to break up all clods, lumps, or earth balls, and remove all boulders, stumps, large roots, or other particles which shall interfere with the work. In small or inaccessible areas, the use of hand tools shall be permitted. The work must result in a smooth, uniform, loose, well-broken fine-grained soil, thus providing a suitable bed for seed, sod, or plants. If directed, the Contractor shall wet the soil to obtain proper ground preparation. Full advantage shall be taken of weather and soil conditions for the obtaining the best results.

ii) Should the ground area to be planted contain Nutgrass or Johnsongrass, ground preparation shall include the eradication of these grasses with the use of proper herbicide(s).

c) Applying Fertilizer. Fertilizers shall be applied uniformly into the areas to be planted or improved. The fertilizer shall be well pulverized and free of lumps. In no case shall full strength fertilizer be permitted in direct contact with roots.

37.04 Method of Measurement. No measurement shall be made for fertilizer incorporated in or on the soil, or for ground preparation.

37.05 Basis of Payment. The cost of ground preparation and the furnishing and placing of fertilizer shall be considered as an incidental part of the seeding, sodding, or temporary erosion control work described in other sections of these specifications and no direct payment shall be allowed.

END OF SECTION

SECTION 38 - TOPSOIL

38.01 Description. The work specified in this section includes furnishing topsoil material from an offsite source and incorporating it into the work as planting material or for other uses as may be designated by the Engineer or as shown in the contract. Topsoil that is salvaged from the project site and stockpiled shall be utilized before topsoil is obtained from offsite sources.

38.02 Materials.

a) Topsoil is defined as a natural, workable, friable, loamy soil or a satisfactory type of humus, without admixture of subsoil, refuse, or foreign materials, reasonably free from hard lumps, stiff clay, hardpan, gravel, noxious weeds (especially Nutgrass and Johnsongrass), brush, or other undesirable material, and suitable for growing grasses, legumes, or other vegetative ground cover.

b) Acceptable topsoil shall demonstrate, by the occurrence upon it of healthy vegetative growth, that it is well drained and that it does not contain toxic amounts of either acidic or alkaline elements.

c) The areas from which the topsoil is obtained shall possess such uniformity of soil depth, color, texture, drainage, and other characteristics so as to offer assurance that, when removed in quantity, the product shall be homogeneous in nature and of acceptable quality.

38.03 Construction Requirements.

a) General. Basic work consists of loading, hauling, spreading, manipulating, and minimally compacting the topsoil material, all in accordance with these specifications, to the lines, grades, and cross-section indicated in the contract or as directed by the Engineer.

b) Hauling. Topsoil shall be hauled in vehicles suitable for the purpose. Hauling of topsoil shall be done in accordance with Section 4-5-5 of the *General City Code*, requiring hauling vehicles to be covered during the transportation of material over city streets. Excessive spillage will not be tolerated and loads shall be controlled to prevent such. Topsoil spilled on the subgrade or other base or pavement structure layers shall be removed immediately.

c) Conditioning of the Area to Receive Topsoil. Unless otherwise directed by the Engineer, all shaping and dressing of such area shall have been completed and approved prior to depositing topsoil upon any area.

d) Application and Ground Preparation.

i) All areas where topsoil is to be placed shall receive ground preparation in accordance with Section 37, unless otherwise directed by the Engineer.

ii) Topsoil shall be placed to a depth of four (4) inches. The area shall then be harrowed and disked entirely through the layer of topsoil and into the underlying soil to a depth of at least two (2) inches to insure a proper bond between the topsoil and the subsoil.

iii) All large lumps, large rocks, roots, or other objectionable matter resulting from the harrowing and disking operation shall be gathered up and disposed of by the Contractor.

iv) Fertilizer, limestone, or other additives, when required, shall be incorporated during the harrowing and disking operation of the topsoil.

e) Compaction. It is intended that the grassing operation shall follow immediately after the placing of topsoil, in which case such grassing operation would require satisfactory compaction in order to prevent erosion. In the event that grassing operations are delayed, the layer of topsoil shall be compacted to the

satisfaction of the Engineer.

f) Maintenance. The Contractor shall maintain the topsoil that has been placed, without additional compensation, in connection with any seeding, sodding, planting, or other work, until final acceptance of the project. Maintenance shall consist of preserving, protecting, and such other work as may be necessary to keep the work in a satisfactory condition.

38.04 Method of Measurement. The accepted topsoil, complete in place, shall be measured in cubic yards derived from the following formula:

$$\left(\frac{(\text{Area over which topsoil is placed (sf)}) \text{ x } (\text{Depth (ft)})}{27 \text{ (ft}^3\text{/cy)}} \right)$$

38.05 Basis of Payment. The accepted number of cubic yards of topsoil, measured as noted above, shall be paid for at the unit price bid per cubic yard, which shall be payment in full for ground preparation; for cleaning and removing refuse from the topsoil; for furnishing the material, handling, hauling, spreading, shaping and compacting in its final position; for incorporating fertilizer or other additives; for disposal of surplus material; and for furnishing all equipment, tools, labor, and incidentals necessary to complete the work.

END OF SECTION

SECTION 39 - SOLID SOD

39.01 Description.

a) The work specified in this section includes furnishing and planting solid sod in various locations throughout the construction limits of the work.

b) Basic work consists of furnishing sod, ground preparation, the furnishing and application of fertilizer at the rates noted herein, the furnishing and applying of all water necessary to establish and maintain the sod, and the maintenance of the established sod throughout the life of the contract including mowing, weeding, etc.

39.02 Materials.

a) General.

i) In areas where sod is to be replaced after an area has been disturbed by construction, the sod furnished shall be of the same variety or kind as existed prior to construction.

ii) In areas of new construction, the sod furnished shall be of the variety or kind as set up in the contract.

iii) Solid sod shall be obtained from sources of the Contractor's choosing subject to the approval of the Engineer.

iv) The sod shall be of the variety as stated in the contract. In cases of replacement, sod shall be replaced in-kind and of the variety approved by the Engineer.

b) Procuring and Handling Sod.

i) General.

(1) All sod shall be procured from areas where the soil is fertile and contains a high percentage of loamy topsoil, the grass is well rooted and full grown, and from areas that have been grazed or mowed sufficiently to form a dense turf (two (2) inches high at time of cutting).

(2) The soil shall be free from noxious weeds or other undesirable grasses (especially Johnsongrass and Nutgrass) and shall not contain any matter deleterious to its growth. The sod shall be live, fresh growing grass at the time of harvesting as well as at the time of placement.

ii) Harvesting. Mechanical devices, such as sod cutters, may be used for cutting the sod into strips, blocks, or rolls at least twelve (12) inches wide, except when sod strips are specified, then they shall be at least three (3) inches wide. Depth of sod cutting shall be such that approximately three-quarter (3/4) inch of soil is removed with the turf. Care shall be exercised at all times to retain native soil on the roots of the sod during the process of excavation, hauling, and planting.

iii) Control.

(1) The sod shall, in general, be transplanted within three (3) days from the time it is harvested. However, if held in temporary storage, the sod shall be spread in a shady location with the grass side up. The sod shall be sprinkled with water when and as directed by the Engineer. If required, it shall be covered with moist burlap, straw, or other acceptable material so as to retain moisture. Any sod permitted by the Contractor to dry out

may be rejected whenever, in the judgment of the Engineer, its survival after placing shall have been rendered doubtful and no payment for such sod shall be made.

(2) In no event shall more than ten (10) days elapse between the cutting and planting of the sod. Prior to permitting sod planting, the Engineer shall inspect the sod stacks for retention of native soil. Such may be accomplished by measuring the stack height and determining the average layer thickness (three-quarter (3/4) inch minimum).

39.03 Construction Requirements.

a) Preparation of Planting Site.

i) Areas that are to be planted with sod shall have all shaping and dressing performed prior to commencing planting operations.

ii) The surface of the area designated for sodding shall receive ground preparation, as described in Section 37. The Engineer may authorize elimination of ground preparation on shoulders and fill slopes, or other areas where the soil is sufficiently loose or pulverized. Fertilizer must be incorporated into planting areas by approved means to a depth of at least two (2) inches. If the soil is not moist it shall be watered until it is in a condition suitable for placement of sod.

iii) Areas to be sod shall be initially fertilized with two (2) tons of agricultural limestone or basic slag and fifteen hundred (1500) pounds of grade 8-8-8 fertilizer per acre. In lieu of grade 8-8-8, a sufficient quantity of any other approved grade or grades of commercial fertilizer may be used that provides at least one hundred-twenty (120) pounds of nitrogen, one hundred-twenty (120) pounds of available phosphoric acid and one hundred-twenty (120) pounds of total potash per acre as computed from the nominal content of fertilizing ingredients. The sod shall be placed immediately following the application of fertilizer.

b) Planting Sod. The sod shall be placed on the prepared surface with the edges in close contact, cracks between blocks of sod shall be closed with small pieces of sod, and acceptable loamy top soil shall be used to fill joints, The entire sodded areas shall then be tamped in place in a satisfactory manner and watered as necessary.

c) Care During Construction.

i) General. The Contractor shall preserve, protect, water, apply additional fertilizer, and perform other work as may be necessary to keep the sod in a satisfactory condition. The Contractor shall be responsible for satisfactory growth of the grass and shall mow the grass at such intervals as shall insure a living and growing sod at the time of final acceptance.

ii) Watering. Watering of the sodded areas shall be applied in the form of a spray or sprinkle without erosive force and in sufficient amounts that shall keep the sod in a living and growing condition.

iii) Damaged Areas. Any sodded areas outside the construction limits of the project that are damaged by the Contractor shall be re-sodded by the Contractor without additional compensation.

d) Basis of Acceptance. Acceptance of sodded areas shall be based on verification of the establishment of a well knitted, living and growing sod covering the areas designated to be sodded. If an acceptable stand of living and growing sod is not obtained, the area shall be re-sodded by the Contractor without additional compensation. A living and growing sod shall be interpreted to include sod that is seasonally dormant during the cold or dry season with roots that have taken hold on the sod and capable of growing after the dormant period.

39.04 Method of Measurement. The completed and accepted sod placed as shown in the contract or as directed, shall be computed in square yards from measurements made parallel to the surface of the actual area sod.

39.05 Basis of Payment.

a) The accepted square yards of sod shall be paid for at the unit price bid which price shall be full compensation for furnishing all materials, ground preparation, planting, fertilizing, rolling, watering, top dressing, mowing as necessary, and maintaining the sod until acceptance of the contract, and for all materials, equipment, tools, and labor necessary to complete the work.

b) Sod furnished in-kind for the replacement of sod in a disturbed area shall be paid for as *Solid Sod (In Kind)*. Sod placed in areas of new construction shall be paid for as *Solid Sod (variety)*, with the variety(s) of sod stated in the contract.

END OF SECTION

SECTION 40 - SEEDING

40.01 Description. The work specified in this section includes furnishing and delivering grass and/or legume seeds of the kind or mixture specified, furnishing and incorporating fertilizer, mulching, ground preparation, inoculating and sowing seed, raking and rolling of the seed bed areas , protection and care of the seed bed areas after planting, in accordance with these specifications and at the locations as shown in the contract or as specified by the Engineer.

40.02 Materials.

a) General.

i) All seed used shall meet the requirements of these specifications and comply with the Section 26, Title 2, *Code of Alabama 1975*, as amended. Seed shall have been tested within five (5) months prior to use in accordance with *Rules for Seed Testing 2002,* as amended and adopted by the Association of Official Seed Analysts. Each kind of seed for use, either pure or as a part of mixed seeding, shall be separately packed and delivered to the project in standard seed-tight shipping bags, all prominently identified. Each bag shall bear a tag or label certifying as to contents, tests, and analysis. The analysis on any such tag or label shall be subject to verification by random sampling by the Engineer and such samples may be tested by the Alabama Department of Agriculture and Industries to determine the correctness of labeling.

ii) A seed deficient in purity or germination shall be accepted for use, provided the impure and imperfect fraction consists substantially of seeds of plants that can be tolerated and provided the Contractor elects to cover a deficiency in either purity or germination by a proportionate increase in the rate of sowing.

iii) Seed furnished shall be hulled and scarified where indicated by the letter symbols "H" and "S", respectively. All seeds of legumes, as indicated by the letter "N", shall be inoculated just before use with the appropriate commercial inoculant manufactured by a reputable concern. Such material shall be approved by the Engineer and used according to the manufacturer's instructions.

b) Pure Seeding.

i) The table on the following page specifies the quantity, by weight, of the different seeds required when sown alone, their purity, and germination:

COMMON AND SCIENTIFIC (INTERNATIONAL) NAMES	SEED REQUIRED (pounds per acre)	MINIMUM PURITY (%)	MINIMUM % GERMINABLE
Bermuda Grass (Cynodon Dactylon)	30 Unhulled	98	80
Bermuda Grass (Hulled Seed)	20 HS	98	85
Kentucky 31 Fescue (Festuca Elatior Var Arundinacea)	30	98	85
Lovegrass (Weeping) (Eragrostis Curvula)	5	97	80
Sericea Lespedeza (Lespedeza Cuneata)	50 HS	98	85
Annual Lespedeza (Lesp. Striata Var Kobe)	60 HN	95	80
Reseeding Crimson Clover (Trifolium Incarnatum) (Certified of Affidavit Grown)	30 HN	99	85

ii) Pure Seeding Planting Schedule. In general, pure seeding of construction areas shall be allowed only in residential areas or other areas designated by the Engineer where it is necessary to match a particular species of grass. The following planting schedule shall serve as a guide:

FROM	TO	SEED
November 15	February 15	None
February 15	April 1	Kentucky 31 Fescue
April 1	July 15	Common Bermuda, Centipede
July 15	September 1	None
September 1	November 15	Kentucky 31 Fescue

iii) Unhulled Bermuda may be planted with Kentucky 31 Fescue, at the same rate as the fescue, if planted in the fall.

iv) Pure seeding shall be paid as *Seeding - In-Kind*.

c) Seed Mixtures.

i) In general, the following mixtures shall be used in areas where the establishment of lawn type grasses is not economically feasible or practical. The seed mixtures listed on the following page shall serve as a guide. The Engineer reserves the right to make adjustments as necessary.

SHOULDERS, MEDIANS AND RELATIVELY FLAT AREAS (pounds per acre)				
ALDOT Planting Zone	1			
ALDOT Mix Number	1A		1B	
Planting Dates	March 1 until May 15	May 16 until August 1	March 1 until May 15	Sept. 1 until Nov. 15
Hulled Bermuda Grass	15	20	10	-
Unhulled Bermuda Grass	10	-	10	-
Tall Fescue	-	-	50	50
Annual Lespedeza	-	30	-	-
Reseed Crimson Clover	-	-	30	-
Required Permanent Plant	Common Bermuda Grass	Common Bermuda Grass	Tall Fescue	Tall Fescue

BACKSLOPES, FILL SLOPES AND AREAS NOT SUBJECT TO FREQUENT MOWING (pounds per acre)		
ALDOT Planting Zone	1	
ALDOT Mix Number	1D	
Planting Dates	March 1 until July 31	August 1 until Nov. 15
Tall Fescue	-	30
Weeping Lovegrass	4	
Sericea Lespedeza	50	75
Required Permanent Plant	Sericea Lespedeza	Sericea Lespedeza

ii) Seed mixtures shall be paid as *Seeding - Seasonal*.

d) Temporary Seeding.

i) Ryegrass may be planted as a temporary ground cover from August 1st to January 15th. The rate of seeding shall be twenty-five (25) pounds per acre.

ii) Temporary seeding shall be paid as *Seeding - Temporary*.

40.03 Construction Requirements.

a) General.

i) Seeding operations shall be performed as provided herein and/or as shown in the contract and at times and seasons stated herein, for the seeding involved.

ii) In general, the contract shall include sufficient appropriate seeding or seeding mixes to enable the

Engineer to designate effective mixes for the season in which the earthwork or the project as a whole is otherwise completed. Since quantities are subject to wide variation, properly balanced unit prices shall be expected. No price adjustments due to such fluctuation in quantities shall be considered.

iii) The seasonal limitations tabulated in the schedules listed in Section 40.02 are specified for the area as a whole. During the early or late parts of the season, planting conditions may be favorable in a part of the area and not in the whole area. When, during any part of the specified season, weather or ground conditions are such that satisfactory results are not likely to be obtained, the Engineer shall not permit the work to proceed.

b) Inspection.

i) The Contractor shall notify the Engineer at least twenty-four (24) hours in advance of the time he intends to start inoculating and mixing seed, or begin sowing seed, and shall not proceed with such work until the Engineer gives permission to do so.

ii) All ground preparation, incorporation of fertilizer, inoculation of legume seed, seed mixing, and other work preparatory to seeding as well as the sowing, covering and rolling of seed shall be done in the presence of the Engineer.

c) Conditioning of the Area to be Seeded. Before sowing any seed upon any area, all shaping and dressing of such areas shall have been completed unless otherwise directed by the Engineer.

d) Ground Preparation and Fertilizer. All ground preparation and fertilizing shall be done in accordance with Section 37 and the following:

i) The seed bed for all seeding shall be fertilized initially with fifteen hundred (1500) pounds of grade 8-8-8 fertilizer per acre or a sufficient quantity of any other acceptable grade or grades of commercial fertilizer that shall provide at least one hundred-twenty (120) pounds of nitrogen, one hundred-twenty (120) pounds of P_2O_5 and one hundred-twenty (120) pounds of K_2O per acre, as computed from the nominal contents of fertilizer elements. After the grass has shown growth and while the soil surface is moist, a second application of fertilizer shall be a top dressing of sodium nitrate, ammonium sulphate, ammonium nitrate, or other approved nitrogen fertilizer uniformly applied at a rate to provide at least sixty-seven (67) pounds of nitrogen per acre.

e) Mixing Seed. Following inoculation, seeds provided for the mix being used shall be mixed until uniform on detail using methods and equipment approved by the Engineer.

f) Sowing.

i) Sowing shall be done uniformly at the provided rate by approved mechanical seeders. Hand operated sowers, in sufficient number, shall be considered mechanical seeders. No sowing shall be done during windy weather, when the prepared surface is crusty, or when the ground is frozen, wet, or otherwise in a non-tillable condition.

ii) Immediately after sowing, the seeded area shall be harrowed, dragged, raked, or otherwise worked so as to cover the seed with a layer of soil one-quarter (1/4) inch in depth or as directed by the Engineer, depending on the seed types. Care shall be exercised during covering operations to preserve the lines, grades, and cross-sections of the seeded areas and to see that areas adjacent to pavements, walks, etc., are not left higher than the paved surface.

iii) After the seed has been properly covered, the seedbed shall be compacted immediately by means of a cultipacker, light roller or approved drag. The Engineer shall determine the required weight of the roller or drag according to the type and physical condition of the soil.

g) Maintenance.

i) It shall be the responsibility of the Contractor to establish and maintain a satisfactory stand of grass until final acceptance of the project. A satisfactory stand of grass shall be defined as a cover of living grass (limited to the species of seed that are expected to germinate in the current season) in which gaps larger than ten (10) square inches do not occur. If a satisfactory stand of grass is not established in an area, the Contractor shall, without additional compensation, reseed the area.

ii) Seeded areas shall be mowed, as directed by the Engineer, when weeds or other undesirable vegetation threaten to smother the planted species.

iii) Watering of the seeded areas, when ordered by the Engineer, shall be applied by the Contractor in the form of a spray or sprinkle having no erosive force. There shall be no additional compensation for this work unless an item for watering is included in the contract.

iv) When seeding containing seed expected to lie dormant for a long period of time or seed characteristically slow in development are properly sowed and maintained as specified herein, the Contractor shall be relieved of further maintenance of the seeded areas when all other work of the contract is ready for acceptance.

v) Damage by either pedestrian or vehicular traffic, or by negligence on the part of the Contractor, shall be re-seeded by the Contractor without additional compensation.

40.04 Method of Measurement. The completed and accepted seeding shall be measured in square yards parallel to the seeded surface.

40.05 Basis of Payment. Completed and accepted seeding shall be paid for at the unit price per square yard for *Seeding*, either *In-Kind, Seasonal* or *Temporary* as specified in the contract, which shall be payment in full for all ground preparation, fertilizing, soil tests, furnishing and preparing all fertilizers, seeds and inoculants, including water needed in mixing, furnishing mulching, planting and maintaining (including mowing) of the seeded areas until final acceptance, and for all materials, equipment, tools, and labor necessary to complete the work, and for any of the foregoing material, operation, etc., necessary and incidental to seeding as previously provided.

END OF SECTION

SECTION 41 - MULCHING

41.01 Description. The work specified in this section includes furnishing mulching materials on areas indicated in the contract or as directed by the Engineer.

41.02 Materials.

a) General. Mulch shall be any of the following materials or of any approved, locally available material. Mulch material that contains matured seed of species that would volunteer and be detrimental to the proposed planting shall not be acceptable.

b) Mulching Materials to be used to Produce Grasses.

i) General. The following mulch materials shall, in general, require the use of some type of adhesive, crimper, or netting to hold the mulch in place.

ii) Hay shall be applied at the rate of not less than two (2) tons per acre, and may be native hay or Sudan grass, broom straw, coastal Bermuda grass, or any other acceptable material, when approved as compatible with the planted species. Low-grade, musty, spoiled, partially rotted hay unfit for animal consumption is acceptable.

iii) Straw shall be threshed straw of oats, wheat, or rye and applied at the rate of not less than one and three-quarter (1¾) tons per acre.

iv) Excelsior (wood) shall be manufactured from freshly cut wood stock, coarse grade, six (6) to ten (10) inches long and one-sixteenth (1/16) to one-eighth (1/8) inch wide and applied at the rate of not less than two (2) tons per acre.

v) Wood Cellulose Fiber or Natural Wood Fiber.

(1) Mulch for use with the hydraulic application of grass seed shall consist of specially prepared wood cellulose or a natural wood fiber containing clean, whole-cut chips. It shall be processed in a manner such that it shall contain no growth- or germination-inhibiting factors, and shall be dyed an appropriate color to verify by visual inspection a uniform spread of the ground surface. It shall be manufactured in such a manner that after addition and agitation in slurry tanks with fertilizers, grass seeds, water, and other approved additives, the fibers in the material shall become uniformly suspended to form a homogeneous slurry; and that when hydraulically sprayed on the ground, the material shall form a blotter-like ground cover, uniformly impregnated with grass seed; and which, after application, shall allow the absorption of moisture and allow rainfall or mechanical watering to percolate to the underlying soil. Based upon laboratory tests, suppliers shall be prepared to show that the material meets all of the foregoing requirements.

(2) The fiber shall be applied at the rate of not less than two thousand (2000) pounds per acre.

c) Mulch to be Used with Vines, Shrubs, and Other Plantings.

i) Forest litter shall be the surface layer of semi-decayed leaves, twigs, needles, and small branches from local woods, and shall be removed in such a way so as to avoid injury to existing trees.

ii) Hulls may be the hulls of cottonseed, cotton bolls, peanuts, or ground corncobs.

iii) Manure shall be partially decomposed stable manure. It shall contain no more than twenty-five

percent (25%) shavings, sawdust, and shall be free from noxious weeds and harmful chemicals, and shall be at least three (3) months old.

iv) Sphagnum peat moss under this requirement shall be partially decomposed material, shall contain not more than twenty-five percent (25%) ash by dry weight and shall meet the requirements of Article 4.11of ASTM D2607.

v) Sawdust shall be in a decomposing state. The Engineer shall approve sources.

vi) Pine bark or other approved wood bark mulch materials shall be clean and free of noxious weed seed, harmful material, and basically without decomposition.

41.03 Construction Requirements.

a) General. Mulching material shall be applied in accordance with the rate specified in Section 41.02.

b) Equipment.

i) Straw and hay mulch shall be applied with either a mechanical mulch spreader designed to break up balls or clusters of mulch and apply it evenly over the surface, or it may be applied by hand if the same results can be obtained. In either case, the mulch cover shall provide adequate shading from direct sunlight.

ii) On slopes steeper than 3:1, a method providing for an anchored, uniform, porous, and stable mulch blanket over the slope shall be used. The Engineer shall approve the method of anchoring the mulch before it is used. On slopes 3:1 or flatter, a mulch crimper shall be used. The crimper shall be a roller-type device equipped with flat, uncupped, dull edged disks. The crimper shall be designed so that the mulch shall be embedded in soil a minimum of two (2) inches. Under no circumstances shall a disc harrow be used to perform the crimping operation. The Contractor may use other methods of anchorage provided the Engineer approves the method before it is used.

iii) Wood fiber mulch shall be applied only by satisfactory hydraulic equipment.

iv) Excelsior (wood) shall be applied evenly with mechanical mulch spreaders or other approved equipment.

c) Mulching Operations.

i) Immediately after the area to be mulched has received ground preparation and the specified plantings, the mulch shall be applied at the specified rates for the type of mulch used. Hay or straw mulch material that contains an excessive quantity of matured seeds, noxious weeds, or a species that would constitute a menace to the planted species, shall not be acceptable. Mulch that is too fresh, excessively brittle, or so decomposed as to retard growth of grass shall not be acceptable.

ii) Mulch shall not be applied during periods of high winds or other unfavorable conditions. Care shall be exercised to protect the public, adjacent property, curbs, sidewalks, and the like from damage due to the mulching operation. The Contractor shall, without additional compensation, be responsible for repairing any such damage to public or private property.

d) Care During Construction. The Contractor shall maintain the mulch in a satisfactory condition, including repairing any damage due to erosion, fire, wind or other causes, without additional compensation, until final acceptance of the project.

41.04 Method of Measurement. No measurement shall be made for mulching unless an item for mulching is included in the contract.

41.05 Basis of Payment. The cost of furnishing, placing, and maintaining mulching shall be considered as an incidental part of the work and no direct payment therefor shall be allowed, unless an item for mulching is included in the contract.

END OF SECTION

SECTION 42 - PLANT MATERIALS

42.01 Description.

a) The work specified in this section includes furnishing, planting, and establishing healthy, live, growing trees, shrubs, or other plants at designated locations on the project. The specie, size, etc., shall be as indicated in the contract.

b) Basic work consists of furnishing or harvesting of plants and transporting thereof, preparation of plant site or beds including furnishing and preparation of soil, fertilizer, mulch and other miscellaneous items incidental to the planting procedure, the planting of the plants in a workmanlike manner in accordance with accepted horticultural practices along with the water necessary to establish and maintain the plants in a live, growing condition throughout the life of the project. The amount of water to be used and when it shall be applied shall be the Contractor's responsibility.

42.02 Plant Materials.

a) General.

i) Plants shall be in accordance with the *American Standards for Nursery Stock*, latest edition, except as provided in the contract. All plants shall have normal habit of growth and shall be typically characteristic of the particular variety and species. All plants shall conform to the measurements provided which are the minimum acceptable sizes. They shall be measured before pruning with branches in normal position. When a minimum and maximum size is provided, an average size is required. Deciduous trees shall be measured by approved calipers. Plants that have been cut back from larger grades to meet these specifications shall not be acceptable. Plants shall be nursery grown and shall bear evidence of proper top and root pruning unless otherwise provided. No cold storage plants shall be accepted. Plants shall have been growing for a period of at least one (1) year under the same climatic conditions as exist at the location to be planted.

ii) The Contractor shall be responsible for all certificates of inspection of plant materials that may be required by federal, state or other authority to accompany shipments of plants. All plants shall be subject to inspection and approval by the Engineer at any place and at any time.

iii) Plants may be inspected where growing, but approval at the place of growth shall not preclude the right of subsequent rejection of plants not fully meeting the requirements of the specifications. The removal and replacement of rejected plants shall be effected by the Contractor in compliance with the specifications and shall be without additional compensation.

iv) The growing medium of plant materials shall be free of noxious weeds including, but not limited to, Nutgrass, Johnsongrass, and Bermudagrass. Noxious weeds shall be eradicated in accordance with Section 37.

b) Plant Tagging Trips. The Contractor shall be required to provide round-trip transportation, lodging, meals, etc., for one representative from each landscape architecture firm that may be actively engaged on a project or one representative from the City of Birmingham for the purpose of selecting and tagging suitable plant materials. The cost of these trips shall be included in the unit prices bid for other items of work. The City of Birmingham shall not be responsible for the number of trips required to find suitable plant materials.

c) Digging and Transportation.

i) All plants shall be dug with reasonable care and skill immediately before shipping, avoiding all possible injury to, or loss of, roots. Plants shall be of the size and with balls or roots spread as shown in the contract. After plants are dug, their roots shall not be permitted to dry out, and they shall not be exposed to artificial heat or freezing temperatures.

ii) During transportation, all plants shall be packed or protected in such a manner so as to insure adequate protection from sun, wind, and climatic seasonal injuries. All bare-root plants shall have their roots carefully protected by wet straw, moss, or other suitable material.

iii) Prior to shipment and after delivery to the project, all plants shall be properly protected. Bare-root plants shall be heeled-in trenches with the bundles opened and the plants spaced separately and all roots covered. Balled and burlapped, and balled and platformed plants, shall have their balls protected by earth or wet cloth or straw. Where possible, all plants shall be stored in a well-ventilated and shaded place, and protected from wind and sun.

d) Trees.

i) Trees shall be of the size and kind designated by the contract, have a straight trunk with a well-branched, symmetrical top, and with leader intact. Trees shall have no fresh cuts of limbs over three-quarter (3/4) inch which have not completely calloused over, no cut back trees and no abrasions of the bark. Trees must be free from insect and disease injury. Trees injured in transit or delivered in an unsatisfactory manner shall be rejected. Trees must have good fibrous root systems. All root cuts must be cleanly cut.

ii) Balled and burlapped trees shall be adequately balled with firm, natural balls of sufficient size to insure growth of the plants or cut to size as shown in the contract.

e) Shrubs shall be of the size and kind designated by the contract. Bare-root shrubs shall have good fibrous root systems. Balled and burlapped shrubs shall be vigorous, well-furnished plants of uniform quality and must have fibrous root systems. Plants provided as sods or clumps shall be collected from good soil that has produced a fibrous root system typical of the nature of the plant. The sods shall be dug with earth and incidental vegetation adhering to the roots. If the soil or habit of the root growth is such that the roots are not adequately protected, the sods shall be wrapped in burlap or other suitable material.

42.03 Construction Requirements.

a) General.

i) The normal growing period for trees and shrubs is defined as that time between April 1st and September 30th. All trees and shrubs shall be planted so as to provide the maximum growing time allowable under the contract time.

ii) Any rock or underground obstructions shall be removed to the depth necessary to permit planting, according to the contract, unless other locations for the planting are approved. There shall be no additional compensation for this work.

b) Planting Operations.

i) Generally, plants should be planted according to the detail sheet and as specified herein.

ii) All plants shall be set plumb at such a level to the surrounding ground as they bore to the ground from which they were dug. All plants shall be planted in plant topsoil that shall be settled by watering, when required, and by tamping. For spring planting, a shallow saucer capable of holding water shall be formed about each plant by placing a mound of soil around the edge of each pit, unless otherwise directed. Care shall be taken in setting plants to protect adjacent planting from damage.

iii) Balled and burlapped plants or balled platform plants are to be planted with plant topsoil carefully tamped around and under the base of each ball to fill voids. Platforms shall be removed. All cloth, ropes, etc., shall be removed from the tops of balls, but no cloth shall be pulled out from under the balls.

iv) Roots of bare-root plants shall be properly spread out in a natural position and plant topsoil shall be carefully worked in among them. All broken and frayed roots shall be cleanly cut off.

c) Fertilizer. After the roots have been completely covered with plant topsoil, grade 8-8-8 fertilizer shall be evenly scattered over the surface of the plant topsoil.

d) Pruning.

i) All pruning shall be done on the site before planting in accordance with the details in the contract and as directed by the Engineer. Pruning shall follow modern horticulture practices outlined in the publication *American Standard for Nursery Stock*, latest edition. Pruning shall be done with approved tools designed for the purpose intended. Lopping, topping, or shearing of trees or shrubs shall be grounds for rejecting the plants as unsuitable and not meeting the requirements of these specifications.

ii) Damaged, scarred, frayed, split, or skinned branches, limbs, or roots shall be pruned back to live wood nearest to the next sound outside lateral bud, branch, limb or root. The terminal leader or bud in all trees or shrubs shall be left intact and not removed unless damaged. The top growth of all vines shall be cut back approximately one-third (1/3) unless otherwise directed.

e) Guying and Staking. All trees shall be staked or guyed as shown on the planting detail.

f) Watering.

i) The vine, shrub, and tree plantings shall be given one watering during the course of the planting operation and additional watering as needed. Sufficient water shall be applied to wet thoroughly the adjacent area down through the root system. Water shall be applied in such a manner that shall prevent erosion of the finished surface.

ii) There shall be no payment for watering.

42.04 Care During Construction.

a) The Contractor shall properly care for all vine, shrub, and tree planted areas in a satisfactory condition until the work has been completed, and until final acceptance. Weeding and repairing of all planted areas or pits, including an area three (3) feet outside of the normal perimeter of the beds, pits, or bedding areas, shall be required.

b) The Engineer shall make periodic inspections of the work to determine the condition of the plantings. On these inspections, all plants that the Engineer determines are not in a healthy growing condition shall be rejected. All plants rejected shall be immediately replaced by the Contractor with the same kind and size and in the same manner as originally provided.

42.05 Warranty.

a) Trees and shrubs shall be warranted for one (1) year after the date of substantial completion against defects, including death and unsatisfactory growth, except for defects resulting from abuse or damage by others, or unusual phenomena or incidents which are beyond the Contractors control. Lack of maintenance by the property owner (including watering) shall not exclude trees and shrubs from this warranty.

b) If a maintenance period is set up in the contract, the warranty shall extend to the end of the maintenance period.

c) Another inspection shall be conducted at the end of the warranty period to determine acceptance or rejection of the plant materials.

42.06 Method of Measurement. The quantity of vines, seedlings, shrubs, and trees to be paid for under this item shall be the actual number planted and accepted. Only vines, seedlings, shrubs, and trees in a living, healthy condition shall be accepted.

42.07 Basis of Payment. Vines, seedlings, shrubs, and trees planted and accepted shall be paid for at the contract unit price for each. Such price and payment shall be full compensation for furnishing plants, plant tagging trips, plant testing or certification service, planting, pruning, guying and staking, wrapping, mulching, furnishing and applying fertilizer, watering and for all materials, labor, equipment, tools, and incidentals necessary to complete the work.

END OF SECTION

SECTION 43 - WATER METERS RESET

43.01 Description.

a) The work specified in this section includes removing existing water meters as shown in the contract or as designated by the Engineer, and resetting them at the locations and at the elevations designated.

b) The term *water meter* shall include the water meter, the meter box and cover, the adjacent water cutoff, and all connections necessary in resetting the meter.

43.02 Materials.

a) All new materials furnished and approved for use shall be equivalent in kind and quality to the materials used in the original construction, unless prohibited by local laws, codes or regulations.

b) Utility companies may furnish new meter boxes. The Contractor shall be responsible for contacting the utility company to determine their policy concerning the furnishing of new meter boxes. There shall be no additional compensation for expenses related to obtaining meter boxes from a utility company.

43.03 Construction Requirements.

a) In general, water meters shall be adjusted in accordance with the standard drawing on file in the Department of Planning, Engineering and Permits. The Contractor shall be responsible for all necessary trenching, placing new copper water pipe in the trench, and, in general, having all items in place and ready for the utility company to make the physical connections to the main and meter.

b) The meter box shall be adjusted carefully to the designated elevations. The meter box shall not be removed during grading operations without the permission of the Engineer and shall be carefully protected from damage. The Contractor shall accurately reference the location of each box that will be permitted to be removed in order to make correct replacement.

c) Any meter, meter box, or accessories lost or rendered unfit for reuse due to negligence or improper handling by the Contractor shall be replaced by the Contractor without additional compensation.

43.04 Method of Measurement. The number of water meters reset shall be the number of each, reset complete, in place, as directed and accepted.

43.05 Basis of Payment.

a) The number of water meters reset, measured as noted above, shall be paid for at the unit price each, which shall be payment in full for all excavation, backfilling, resetting the meter, all necessary connections, equipment, tools, labor and material necessary to complete the work.

b) Final acceptance of the work shall be subject to approval by the utility company involved; therefore, the Engineer may withhold payment for this work until the Contractor has obtained the utility's written approval that the work performed complies with the local codes and requirements of the utility company.

c) There shall be no payment for the adjustment of the meter box only.

END OF SECTION

SECTION 44 - COPPER PIPE

44.01 Description.

a) The work specified in this section includes furnishing and installing new copper water pipe as indicated in the contract or as directed by the Engineer and substantially to the established locations, lines and grades.

b) Water pipe is defined as lateral lines leading from water mains to buildings.

44.02 Materials. Copper water pipe shall be either three-quarter (3/4) inch or one (1) inch inside diameter. Pipe and fittings shall meet the requirements of ASTM B88 and FSS-WW-T-799 and shall be Type K.

44.03 Construction Requirements.

a) General.

i) The Contractor shall be required to replace, without additional compensation, sections of pipe damaged through carelessness or use of improper methods.

ii) All work shall be performed under the supervision of a licensed plumber experienced in this type of work.

iii) The Contractor shall coordinate the work with the respective utility company.

iv) The Contractor shall be required to use either compression or flare-type connections as directed by the respective utility company.

b) Excavation and Backfilling.

i) The trench shall be excavated to the designated line and grade. The trench shall be of sufficient width to permit work on the pipe and inspection of the work.

ii) After installation of the pipe and inspection by the utility company and the City of Birmingham, the trench shall be backfilled with crushed stone if the trench is or will be within a roadway. Otherwise, the trench shall be backfilled with excavated material. All backfill material shall be compacted in accordance with the requirements of these specifications.

c) Testing. The respective utility company shall check completed lines for leaks.

44.04 Method of Measurement. The length of copper pipe laid shall be the overall length measured, along the top of the pipe in linear feet, complete in place, which shall include all fittings, connections, and backfill material.

44.05 Basis of Payment. The accepted footage of copper pipe laid measured as noted above shall be paid for at the respective unit price per linear foot for the size specified which shall be payment in full for furnishing and installing copper pipe; including all materials, labor, equipment, tools, crushed stone, and incidentals necessary to complete the work.

END OF SECTION

SECTION 45 – EROSION CONTROL

45.01 Description.

a) The work specified in this section includes providing, establishing, and maintaining appropriate best management practices (BMP's) in accordance with the Contractor's Construction Best Management Practices Plan (CBMPP) as approved by the Alabama Department of Environmental Management (ADEM) and/or the City of Birmingham, or as ordered by the Engineer during the life of the contract to control erosion and sedimentation on or beyond the project limits.

b) Special attention is directed to ADEM Administrative Code Chapter 335-6-12, as amended.

c) Special attention is directed to the *Soil Erosion and Sediment Control Code* of the *General City Code*, as amended.

d) Special attention is directed to the Alabama Soil and Water Conservation Committee's (ASWCC) *Alabama Handbook For Erosion Control, Sediment Control, and Stormwater Management On Construction Sites And Urban Areas (Handbook)*, as amended

45.02 Materials.

In general, materials used in BMP's shall conform to the requirements of the *Handbook* or as specified in the contract.

45.03 Construction Requirements.

a) Permits.

i) The Contractor shall procure all permits, pay all fees and charges, provide all required bonds, and give all notices necessary and incidental to the due and lawful prosecution of the work as it relates to erosion and sedimentation control. This shall include, but is not limited to, ADEM's *Notice of Registration* (NOR) and NPDES permit and the City of Birmingham's *Clearing and Earthwork* permit.

ii) A copy of the NOR and the application for the *Clearing and Earthwork* permit shall be presented to the Engineer at the pre-construction conference. In lieu of the foregoing documents, the Contractor may submit a copy of the NPDES permit and *Clearing and Earthwork* permit for the project. The *Notice to Proceed* will not be issued until this documentation is presented to the Engineer.

iii) Failure to provide the documentation specified in 45.03a)ii) within the timeframe cited above shall be grounds for declaring the Contractor to be in default of the contract.

b) General.

i) The Contractor shall be responsible for preventing sediment from polluting stormwater runoff to the maximum extent practical.

ii) The appropriate BMP's shall be constructed at the locations as determined by the Contractor's approved CBMPP and as may be ordered by the Engineer.

iii) Any BMP not designated by the Engineer as permanent shall remain the property of the Contractor and be removed and disposed of by the Contractor prior to final acceptance of the project. Any salvage value shall be reflected in the original unit price bid.

iv) All BMP's shall meet or exceed the requirements of the *Handbook*.

v) The Contractor shall exercise planning and forethought in coordinating the work of protecting the project and adjoining properties from soil erosion by effective and continuous erosion control methods of either a temporary or permanent nature.

vi) BMP's damaged as a result of negligence on the part of the Contractor shall be repaired or, if not repairable, replaced by the Contractor at no cost to the City of Birmingham.

c) Maintenance. The Contractor shall maintain all BMP's as recommended by the *Handbook* or as directed by the Engineer. Maintenance of BMP's shall be considered as an incidental part of the work and no specific payment therefor shall be allowed.

d) Compliance.

i) The Contractor shall comply with the requirements and conditions of the contract, all permits, the CBMPP, and orders by the Engineer as they relate to erosion and sedimentation control. Failure on the part of the Contractor to comply with said requirements and conditions shall be cause for the Engineer to withhold progress payments.

ii) Contractor violations of the ADEM NPDES permit which result in enforcement action from ADEM including fines and/or work stoppage shall be the responsibility of the Contractor. Fines assessed to the Contractor or the City of Birmingham by ADEM because of Contractor action shall be paid by the Contractor. No extension of contract time shall be considered as a result of enforcement.

45.04 Method of Measurement.

a) Lump Sum Pricing. No measurement shall be made.

b) Unit Pricing. BMP's shall be measured as specified in the contract.

45.05 Basis of Payment.

a) Lump Sum Pricing.

i) At the end of each pay period, the Engineer shall pay a fractional portion of the lump sum price bid for *Erosion Control*, if the erosion and sedimentation control measures are determined to be acceptable, which shall be payment in full for procuring all permits and paying all fees and charges, and posting bonds; maintaining all BMP's; furnishing all materials, equipment, tools, labor, and incidentals necessary to complete the work in accordance with the contract, permits, the CBMPP and orders of the Engineer.

ii) The fractional portion of the lump sum price to be paid each pay period for erosion and sedimentation control measures shall be determined in accordance with the following chart. For the purpose of determining the fractional portion to be paid, a month shall be assumed to contain thirty (30) days with fractions rounded up to the next whole number.

Pay Period	Fractional Portion to be Paid
1st	50% of the Lump Sum Price
All Subsequent	$\left[\frac{\text{50\% of the Lump Sum Price}}{\text{Contract Time (in months)-1}}\right]$

b) Unit Pricing.

i) The accepted BMP's, measured as noted above or as specified in the contract, shall be paid for at the unit price bid which shall be payment in full for procuring all permits and paying all fees and charges, and posting bonds; furnishing all materials, equipment, labor, tools, and other incidentals necessary to complete the work.

END OF SECTION

SECTION 46 – RIPRAP

46.01 Description. The work specified in this section includes furnishing and constructing riprap, which shall consist of a protective course of stone, on areas and in conformity with the lines and grades shown in the contract or as designated by the Engineer.

46.02 Materials.

a) Stone.

i) General.

(1) All stone for riprap shall consist of fieldstone or rough, unhewn quarry stone as nearly rectangular in section as is practicable.

(2) At the Engineer's option, control of the gradation of riprap shall be by visual inspection either at the source or at the project site. The Engineer shall have final authority as to the suitability of the material to be used as riprap.

ii) Riprap. Stone for use as riprap shall consist of graded stones ranging from ten (10) to two hundred (200) pounds with not more than ten percent (10%) weighing over two hundred (200) pounds and at least fifty percent (50%) weighing over eighty (80) pounds and not over ten percent (10%) weighing less than ten (10) pounds (ALDOT Class 2 Riprap).

b) Geotextile Filter Fabric.

i) In general, any geotextile filter fabric approved for use as a geotextile filter by ALDOT may be used on City of Birmingham projects. The Contractor shall submit evidence to the Engineer that ALDOT has approved a material for use as a geotextile filter. Failure to submit such evidence may result in the material being rejected.

ii) The fabric shall be formed in widths of not less than six (6) feet. Sheets of the fabric shall be sewn together at the point of manufacture to form the required fabric widths, if manufactured in widths of less than six (6) feet.

iii) During shipment and storage, the fabric shall remain wrapped in a covering that shall protect the fabric from direct sunlight, ultraviolet rays, temperatures greater than 140^{o} F, mud, dirt, dust, and other debris.

iv) Securing pins for anchoring filter fabric shall be three-sixteenths (3/16) inch diameter steel bars, pointed at one end and fabricated with a head to retain a steel washer having an outside diameter of not less than one and one-half (1½) inches. The length of the pin shall not be less than eighteen (18) inches.

46.03 Construction Requirements.

a) General.

i) All slopes to be treated with riprap shall be trimmed to the lines and grades indicated by the contract or as directed by the Engineer. All outer edges and the top of riprap, where the riprap terminates, shall be formed so that the surface of the riprap shall be embedded and even with the surface of the ground and/or slope.

ii) The bottom course of riprap shall be keyed to the ground by means of a toe trench.

iii) Riprap shall be placed to a thickness of eighteen (18) inches unless otherwise shown in the contract.

b) Geotextile Fabric Filter Blanket.

i) A geotextile filter fabric blanket shall be placed on the prepared areas before the riprap is placed. The fabric shall be placed with the long dimension parallel to the horizontal dimension of the prepared area, unless otherwise directed by the Engineer. The material shall be laid free of tension, stress, folds, wrinkles, or creases. The strips of material shall be placed to provide a minimum width of thirty-six (36) inches of overlap for each joint. Overlap joints and seams shall be measured as a single layer of cloth. Overlap joints shall be made by placing the upslope strip of fabric over the downslope strip of fabric. Securing pins with washers shall be inserted through both strips of overlapped material at not greater than the following intervals, or at intervals recommended by the manufacturer, along a line through the midpoint of the overlap.

PIN SPACING	SLOPE
2 feet	Steeper than 3H:1V
3 feet	3H:1V to 4H:1V
5 feet	Flatter than 4H:1V

ii) The fabric shall be turned down and buried two (2) feet at all exterior limits, except where a stone-filled key is provided below ground.

iii) The fabric shall be rejected if, at the time of installation, it has defects, rips, holes, deterioration, or damage incurred during manufacture, transportation, or storage.

iv) The Contractor shall, without additional compensation, replace any fabric damaged during its installation or during placement of riprap.

v) Riprap shall not be dropped on the fabric from a height greater than one (1) foot. Greater drop heights shall be permitted provided the Contractor can demonstrate that the greater drop height shall not result in the riprap puncturing the fabric.

c) Stone Riprap.

i) Unless otherwise shown by the plan details or directed by the Engineer, stone riprap shall not be placed on slopes steeper than the angle of repose of the riprap material.

ii) Placement of stones may be placed by methods and equipment approved by the Engineer and suitable for the purpose of placing riprap without damaging any existing facility or construction feature.

iii) The stones shall be placed in such a manner as to produce a reasonably well-graded mass of rock with the minimum practical percentage of voids. The riprap shall be constructed to the lines, grades, and thickness shown in the contract or as directed by the Engineer within a tolerance of plus fifteen (15) inches and minus three (3) inches from the designated finished surface of the riprap. Riprap shall be placed in its full course thickness in one operation and in such a manner as to avoid displacing the filter fabric.

iv) Placing riprap by dumping into chutes or by other methods likely to cause segregation of sizes shall not be permitted. Rearranging of individual stones by mechanical equipment or by hand shall

be required to the extent necessary to obtain a reasonably well-graded distribution of stone as specified above.

d) Maintenance. The Contractor shall maintain all riprap until final acceptance of the project and shall replace, without additional compensation, any damaged or lost riprap.

46.04 Method of Measurement. Riprap shall be measured in square yards computed from measurements taken parallel to the surface of the riprap.

46.05 Basis of Payment. The accepted number of square yards of riprap, measured as noted above, shall be paid for at the unit price bid for riprap, which shall be payment in full for furnishing all materials, including filter fabric, equipment, labor, tools , and other incidentals necessary to complete the work.

END OF SECTION

SECTION 47 - CHAIN LINK FENCE

47.01 Description. The work specified in this section includes furnishing and installing, complete in place, chain link fence and gates on posts and frames with either standard ground mounting or mounted on structures (retaining walls, headwalls, etc.) as required by the contract, at locations shown in the contract or as designated by the Engineer, all in accordance with the details shown in the contract and these specifications.

47.02 Materials.

a) Fabric. Fence fabric shall conform to the requirements of ASTM A392, Class 2 (two (2) ounces of zinc coating per square foot of surface area) for zinc coated steel chain link fence fabric or ASTM A491 for aluminum coated chain link fence fabric. It shall consist of a good grade of commercial steel wire of at least nine (9) gauge (coated size). It shall be woven approximately in the form of a two (2) inch uniform square mesh having parallel sides with horizontal and vertical diagonals of approximately uniform dimensions.

b) Fence Supports.

i) General. Fittings and connections may, in general, be of the fabricator's design, provided they are approved by the Engineer, comply with plan details and the following: Post caps, tops, etc., shall be of the heavy duty cast metal design of either malleable steel or aluminum, consistent with other parts of the material. Straps, bands or similar type connections, unless otherwise noted, shall be fabricated from material of not less than one-eighth (1/8) inch thick.

ii) All fence supports shall have a minimum one and two-tenths (1.2) ounces per square foot hot-dipped zinc coating in accordance with ASTM A120.

c) Fence components.

FENCE COMPONENT	UP TO 6 FEET IN HEIGHT		OVER 6 FEET IN HEIGHT	
	RESIDENTIAL	INDUSTRIAL	RESIDENTIAL	INDUSTRIAL
Line Post	1?" DIAMETER TUBING, 0.042 INCH WALL THICKNESS	2" DIAMETER SS40 PIPE	USE SIZE SPECIFIED FOR 6 FOOT INDUSTRIAL FENCE	2½" DIAMETER SS40 PIPE
Terminal Post	2½" DIAMETER TUBING, 0.048 WALL THICKNESS	3" DIAMETER SS40 PIPE	USE SIZE SPECIFIED FOR 6 FOOT INDUSTRIAL FENCE	4" DIAMETER SS40 PIPE
Top Rail	1?" DIAMETER TUBING	1?" DIAMETER SS40 PIPE	USE SIZE SPECIFIED FOR 6 FOOT INDUSTRIAL FENCE	1?" DIAMETER SS40 PIPE

	RESIDENTIAL GATES		INDUSTRIAL GATES	
	UP TO 12 FEET WIDE	OVER 12 FEET WIDE	UP TO 15 FEET WIDE	OVER 15 FEET WIDE
Railing	2½" DIAMETER TUBING 0.048 WALL THICKNESS	3" DIAMETER SS20 PIPE	4" DIAMETER SS40 PIPE	6?" DIAMETER SS40 PIPE

d) Miscellaneous steel fittings and hardware shall be of a good grade commercial steel, hot-dipped galvanized after fabrication in accordance with ASTM A153.

e) Miscellaneous structural shapes such as "H", "I", or "C" sections shall be considered for use as line posts, terminal posts, etc., on a project by project basis.

47.03 Construction Requirements.

a) General.

i) Postholes shall be excavated using hand tools, or equipment, or power augers. The chain-link fence fabric shall be stretched using any method or equipment that shall stretch the fabric taut and not damage the fabric.

ii) Postholes for fence that is to be placed on concrete structures shall be constructed as shown on the standard drawing on file in the Department of Planning, Engineering and Permits.

iii) The fence shall be constructed to follow the ground line as far as it is practical to do so.

b) Clearing Fence Line. All brush, stumps, logs, large roots, humps of earth, boulders or other debris which would interfere with the proper construction of the fence in the required location and which would prevent a pleasing and acceptable profile along the tops of the posts shall be removed by the Contractor, without additional compensation, prior to beginning fencing operations.

c) Setting Posts.

i) Line posts shall be set at a maximum interval of ten (10) feet unless otherwise shown in the contract or directed by the Engineer. Anchorages shall be set at the locations shown in the contract or as directed by the Engineer. The posts shall be set plumb and true in alignment on the side on which the chain-link fence fabric is to be attached. For fences four (4) feet or less in height, all end and corner posts, line posts, brace posts, pull posts and gate posts shall be set in concrete footings two (2) feet deep with a minimum diameter of four (4) times the diameter of the post being set. For fences greater than six (6) feet in height, all end and corner posts, line posts, brace posts, pull posts and gate posts shall be set in concrete footings two (2) feet deep plus an additional three (3) inches in depth for every foot the fence is taller than four (4) feet, with a diameter of four (4) times the diameter of the post being set.

ii) Posts for fence that is to be placed on concrete structures shall be grouted, using a grout approved by the Engineer, in the postholes constructed as shown on the standard drawing on file in the Department of Planning, Engineering and Permits.

d) Fence Erection. Chain link fence shall be stretched taut and securely fastened to each post by means of nine (9) gauge wire spaced not more than twelve (12) inches apart on posts and not more than fifteen (15) inches apart on the rail. The chain-link fence fabric shall be attached to end posts, gates and corner posts using the appropriate hardware.

e) Gates.

i) Gates shall be tubular shaped with welded or steel fitted corners. Braces and trusses shall be furnished when necessary to prevent sagging. The chain-link fence fabric used on the gate shall match that used on the fence line. Hinges shall be pressed steel or malleable iron. One (1) pair shall be provided for each gate leaf. Latches shall be the forked type for single gates and the plunger bar type for double gates. Both types shall have a padlock eye and permit operation from either side of the gate.

ii) Keepers shall be provided for each gate leaf over five (5) feet wide and shall consist of a mechanical device for securing the free end of the gate when in the full open position.

47.04 Method of Measurement.

a) The quantity of chain link fence of the specified height shall be the accepted lengths measured along the top rail in linear feet to the nearest foot, complete in place.

b) The quantity of gates of the same height as the chain link fence shall be the accepted lengths measured along the top rail in linear feet to the nearest foot, complete in place.

47.05 Basis of Payment. The accepted linear feet of fence and gates, measured as noted above, shall be paid for at the respective unit prices for each separate height, complete in place, which shall be payment in full for all preliminary clearing, grubbing, excavating and filling; for all materials, including concrete for posts, hardware, fittings and appurtenances; for erecting, bracing and aligning, and for all equipment, tools, labor and incidentals necessary to complete the work.

END OF SECTION

SECTION 48 - FENCE RESET OR REPLACED

48.01 Description. The work specified in this section includes the resetting or replacing of fences and gates required to be removed from their original position as shown in the contract or as directed by the Engineer.

48.02 Materials. Existing materials shall be utilized to the fullest extent possible.

48.03 Construction Requirements.

a) General.

i) The Contractor shall be required to remove and reset the fences to the locations designated by the Engineer or as shown in the contract using the material from the original fences. The fences shall be left in as good or better condition as before removal from their original location.

ii) Where, in the opinion of the Engineer, existing materials cannot be used, the Contractor shall furnish new materials similar to that used in the original fence. The Contractor and the Engineer shall agree in writing to a unit price for new fence material prior to it being used.

b) Installation. Reset or replaced fences shall be true to line and grade, with all wires taut and well fastened, and shall present a workmanlike appearance.

c) Temporary Fencing.

i) The Contractor shall, as directed by the Engineer, install fencing in a temporary location using materials from the fence to be reset, as far as it is practical to do so. If the existing fence materials cannot be used, the Contractor shall provide new materials. New fence materials used as temporary fencing shall be incorporated into any permanent fencing required on the project.

ii) Temporary fencing may be required for a variety of reasons, i.e., keeping dogs penned up, security of the property, etc. In all cases, the Contractor shall be responsible for all damages of any nature arising from the removal of the fence or the delay or negligence in resetting. There shall be no additional compensation for this work.

48.04 Method of Measurement. The quantity of fence reset or replaced shall be the accepted net length, including gates, of completed fence removed and reset at the location designated by the Engineer or as shown in the contract, measured along the top of the post line in linear feet to the nearest foot. No measurement or direct payment shall be made for fence removed and not reset.

48.05 Basis of Payment. The accepted length of fence reset or replaced shall be paid for at the unit price bid per linear foot which shall be payment in full for furnishing all material, labor, equipment, tools and incidentals necessary to complete the work.

END OF SECTION

SECTION 49 - GUARDRAIL

49.01 Description. The work specified in this section includes furnishing and installing complete sections of steel beam guardrail and guardrail end anchor systems at the locations shown in the contract or designated by the Engineer in conformity with the detailed requirements of the contract.

49.02 Materials.

a) Steel rail elements and accessories shall conform to the requirements of AASHTO M180 and shall be galvanized with a two (2) ounce per square foot coating in accordance with ASTM A123.

b) Posts.

i) Treated Timber Posts.

(1) Timber posts shall be sawed to within plus or minus one (1) inch of the length and to plus or minus three-eighths (3/8) inch of the full end dimensions as shown in the contract. Timber block-outs shall be sawed to within plus or minus one-quarter (1/4) inch of the length and to plus or minus three-eighths (3/8) inch of the full end dimensions as shown in the contract. Holes shall be drilled slightly smaller than the designated bolt size so as to provide a driving fit.

(2) All timber shall be Southern Yellow Pine, Grade No. 1SR or better, in accordance with the Southern Pine Inspection Bureau's grading system. Post treatment shall be in accordance with AWPA-C-14, as applicable to guardrail posts. The preservative shall be one recommended under AWPA-C-14. All timber posts shall be fabricated and any necessary holes drilled before treatment. However, where field modifications are necessary to be made, the new surfaces shall be given a preservative treatment in accordance with the provisions of AWPA-M-4.

ii) Steel posts, including block-outs for guardrail, shall comply with the requirements of ASTM A36, modified to waive the maximum tensile strength. All material shall be new and of the size, shape, etc., noted by the plan details, and hot-dip galvanized after fabrication in accordance with ASTM A123.

c) Anchors.

i) Concrete for anchors shall conform to the requirements of Section 31.

ii) Wire rope (cable) for anchors shall be three-quarter (3/4) inch nominal diameter, meeting the requirements of AASHTO M30, Type II, having a Class A galvanization coating.

iii) Metal parts used in anchors shall comply with the appropriate requirements for metals noted elsewhere in this section.

d) Miscellaneous Parts. All bolts, nuts, and washers shall conform to ASTM A307 and shall be galvanized in accordance with ASTM A153.

49.03 Construction Requirements.

a) Erection of Posts and End Anchors.

i) Posts. The Contractor shall use the type of posts shown in the contract. Posts shall be erected in such a manner that they shall be vertical with their top inside edges within one-quarter (1/4) inch of

their correct position for both vertical and horizontal line. The posts shall be erected to the dimensions shown in the contract and compacted by tamping to obtain a rigid installation. Where posts are driven, the tops shall be protected by a suitable driving cap and the adjacent area compacted, if deemed necessary by the Engineer. If raising or other moving of the post is required, the earth shall be compacted to fill any voids caused by such movement. All posts damaged in any way during construction shall be removed and replaced without additional compensation.

ii) End Anchors. The Contractor shall use the type of end anchor shown in the contract. The anchor assemblies shall be erected to the dimensions shown in the contract, the area backfilled, and compacted as provided in the preceding paragraph. Posts that are attached to the anchor assembly shall be erected to the requirements for individual posts as provided in the preceding paragraph.

b) Erection of Rail.

i) All metal, except concrete reinforcement, shall be fabricated in a shop. No punching, cutting, burning, or welding shall be done in the field.

ii) The rail may be erected in any manner resulting in a smooth, continuous rail closely conforming to the established line and grade of the surface the rail parallels. The top of the rail shall be constructed to the height designated in the contract.

iii) Rail shall be erected so that the bolts at expansion joints shall be located at the centers of the slotted holes. Bolts may be rethreaded after galvanizing if necessary. All bolts, except where otherwise required at expansion joints, shall be drawn tight. However, bolts through expansion joints shall be drawn up as tight as possible without being tight enough to prevent the rail elements from sliding longitudinally past one another.

iv) Bolts shall be sufficiently long to extend at least one-quarter (1/4) inch beyond the nuts. Bolts shall not extend more than one-quarter (1/4) inch beyond the nuts except where required for adjustments. Bolts through variable thickness posts shall be cut off one-quarter (1/4) inch beyond the nuts and burred.

c) Metal Treatments.

i) General. All steel elements, including all accessories used in the construction of the guardrail, shall be galvanized, except when otherwise provided in the contract.

ii) Steel (Galvanized). Painting of galvanized steel shall not be required except that any damage to galvanizing or any bare areas developed during construction shall be painted with two (2) coats of approved galvanizing repair paint. However, should any galvanized metal be required by the contract to be painted, the surface shall be treated with a wash of eight (8) ounces of copper or zinc sulphate dissolved in one (1) gallon of water prior to the application of the required paint surface.

iii) Steel (Not Galvanized). All metal not galvanized shall be cleaned and painted with one (1) primer coat and two (2) coats of paint of the type and colors, according to the patterns, if any, shown in the contract.

d) Safety of the Traveling Public. When the construction of the guardrail is to be performed under traffic, the Contractor shall plan his work so that no undue hazardous condition shall be left unmarked during the hours of darkness or for any extended time period.

49.04 Method of Measurement. Standard guardrail installations cover one rail element, its supports (posts), end anchor assemblies when specified in the contract, and accessories. The length of the steel beam guardrail

constructed and accepted shall be measured in linear feet to the nearest foot along the centerline of the top of the rail posts and shall include the overall length of end anchor assemblies when they are included.

49.05 Basis of Payment. Accepted guardrail, measured as noted above, shall be paid for at the unit price bid per linear foot for Steel Beam Guardrail, which shall be payment in full for excavating, backfill, disposal of surplus material; for furnishing, transporting, erecting of posts, rail, and end anchor assemblies; for all incidental material, bolts, brackets, etc., as shown in the contract; and for all equipment, tools, labor, and incidentals necessary to complete the work.

END OF SECTION

SECTION 50 - MAILBOX RESET

50.01 Description.

a) The work specified in this section includes removing existing mailboxes as shown in the contract or as designated by the Engineer, and resetting them at the locations and at the elevations designated.

b) The term *mailbox* shall include the mailbox and support on which it is mounted.

50.02 Materials. All new materials furnished and approved for use shall conform to the standard drawing on file in the Department of Planning, Engineering and Permits.

50.03 Construction Requirements.

a) Access to existing mailboxes shall be maintained for mail delivery service during construction.

b) As soon as the state of the work permits and the Engineer so directs, all mailboxes shall be reset by the Contractor in permanent locations in compliance with postal regulations. The *Domestic Mail Manual* states that mailboxes "*must be placed so that they may be safely and conveniently served by carriers without leaving their conveyances*...". The Postal Service recommends that mailboxes be placed with the bottom of the box at a vertical height of between three and one-half (3½) feet to four (4) feet from the road surface.

c) The Contractor shall replace, without additional compensation, any mailboxes, supports, or any related parts that have been damaged as a result of the construction work.

50.04 Method of Measurement. The actual number of mailboxes reset shall be the number of each reset, complete in place as directed or designated.

50.05 Basis of Payment. The accepted number of mailboxes reset, measured as noted above, shall be paid for at the unit price for each which shall be payment in full for furnishing all material, labor, equipment, tools and incidentals necessary to complete the work.

END OF SECTION

SECTION 51 - YARD LIGHTS RESET

51.01 Description.

a) The work specified in this section includes removing existing gas or electric lights as shown in the contract or as designated by the Engineer and resetting them at the locations and at the elevations designated.

b) The term *yard light* shall include the fixture, support on which it is mounted, pipe and all necessary connections.

51.02 Materials. All new materials furnished and approved for use shall be equivalent in kind and quality to the materials used in the original installation.

51.03 Construction Requirements.

a) Existing yard lights within the limits of construction shall be removed by the Contractor and stored in a safe place until they are reset. As soon as the state of the work permits and the Engineer so directs, all yard lights shall be reset by the Contractor in permanent locations in compliance with all local codes and/or regulations of the utility company involved.

b) Gas or electric lights or any parts that have been damaged by the Contractor shall be replaced by him without additional compensation.

51.04 Method of Measurement. The actual number of yard lights reset shall be the number of each reset, complete, in-place, as directed or designated.

51.05 Basis of Payment. The accepted number of yard lights reset, measured as noted above, shall be paid for at the unit price for each, which shall be payment in full for furnishing all material, labor, equipment, tools and incidentals necessary to complete the work.

END OF SECTION

SECTION 52 - POLICE PATROL TIME

52.01 Description. The work specified in this section includes furnishing uniformed police officers for the purpose of traffic control on a project.

52.02 Construction Requirements. The Contractor shall furnish uniformed police officers for traffic control when the work is performed in, along, or across a roadway that is to be kept open to traffic during the construction.

52.03 Method of Measurement. The time that each police officer is on duty at the project site shall be measured in hours.

52.04 Basis of Payment. The accepted number of hours, measured as noted above shall be paid for at the unit price established by the Fraternal Order of Police per hour for *Police Patrol Time* which shall be payment in full for compensating the police officer. The current hourly rate shall be shown in the contract.

END OF SECTION

SECTION 53 - TRAFFIC CONTROL IN CONSTRUCTION WORK ZONES

53.01 Description. The work specified in this section includes furnishing, erecting, lighting as directed, handling, and maintaining all construction signs (warning, regulatory, and guide), barricades, and other traffic control devices for the purpose of handling traffic safely through work zones.

53.02 Materials. All materials used in the fabrication, construction, and installation of the construction signs, barricades, markers, lights, and other warning devices shall meet the requirements specified by the *Manual on Uniform Traffic Control Devices* (M.U.T.C.D.).

53.03 Construction Requirements.

a) General.

i) The Contractor shall, without additional compensation, be responsible for providing, erecting, and maintaining all traffic control devices as required by the M.U.T.C.D., as last revised, or as designated by the City Traffic Engineer.

ii) All construction signs shall be erected in a workmanlike manner such that all supports are vertical, sign panels generally perpendicular to the travelway, and legends horizontal so that they effectively convey the intended message.

iii) Flaggers with proper attire and flags shall be provided, without additional compensation, when ordered by the Engineer or when the Contractor deems flaggers are necessary to safely handle traffic through the construction zone.

iv) When it becomes necessary to close a street to traffic, the Contractor shall obtain from the Traffic Engineer a closing schedule and an approved detour plan.

b) Maintenance.

i) The Contractor shall assume full responsibility for the maintenance of all warning signs, barricades, and other traffic control devices. Maintenance shall include, but not be limited to, replacement of sign panels, barricades, and other devices which, in the opinion of the Engineer or Traffic Engineer, are damaged or deteriorated beyond effective use, replacement of broken supports, plumbing of leaning signs, cleaning of dirty signs, barricades and other devices, repair of defaced signs, replacement of stolen signs, etc.

ii) All items used for traffic control shall be generally maintained in its original placement condition and such maintenance shall be considered a part of the original installation cost. If, at any time, the Engineer or Traffic Engineer determines that proper provisions for safe traffic control are not being provided or maintained, the Engineer may order suspension of the work until the proper level is achieved. In cases of serious or willful neglect by the Contractor for the safety of the public or his employees, the Engineer may proceed forthwith to replace the traffic control measures in the proper condition and deduct the cost thereof from monies due or becoming due the Contractor.

c) Liability.

i) The Contractor agrees to hold the City of Birmingham harmless from any and all claims for damages resulting from obstruction of the street or from any neglect on the part of the Contractor, or his agents and employees, in failing to provide and maintain flaggers, barricades, signs, or other traffic control devices.

ii) Although the City of Birmingham may be designating and directing the placement of certain

traffic control devices, the Contractor shall not be relieved of his responsibility to continuously review and maintain all traffic handling measures and insure himself that adequate provisions have been made for the safety of the public and workmen.

iii) The Contractor may furnish traffic control devices in addition to those required by the M.U.T.C.D. or the Traffic Engineer.

53.04 Method of Measurement. No measurement shall be made for traffic control devices.

53.05 Basis of Payment. No direct payment shall be made for furnishing, erecting, and maintaining, as previously described, traffic control devices. This work shall be considered as an incidental and necessary part of the work, the cost of which shall be included in the prices bid for other items of work.

END OF SECTION

SECTION 54 - ELECTRICAL

54.01 Description. The purpose of this section is to establish the requirements for furnishing and installing electrical items and/or systems as shown in the contract. The plans shall be prepared and sealed by a licensed professional engineer (Design Engineer) practicing electrical engineering and who shall be licensed in the state of Alabama. Generally, this section addresses all systems, power, lighting, and control circuits. The Engineer reserves the right to alter, modify or amend this section as may be applicable to the work. The Design Engineer shall specify via the plans, notes and instructions the criteria for all electrical/electro-mechanical materials and installation standards and requirements per this section and the standards named herein or designated by the Engineer. That is, class of service such as hazardous location, explosion proof, insulation of materials, supply service and grounding description, and any standard or special requirements. In the case of any discrepancy or interpretive point of code the Engineer shall be the final authority. This section is primarily written and intended for service less than 600 volts. If the installation requires higher voltage the Design Engineer shall prepare the specifications and plans subject to approval by the Engineer.

54.02 Codes and Standards.

a) General.

i) All plans, drawings, details, methods and means of work and testing shall be in accordance with the *National Electrical Code* as adopted by the City of Birmingham and the rules and regulations of the City of Birmingham.

ii) The code and regulatory requirements applied to the design, drawings and installation shall be those that are in effect on the date the contract is executed by the Mayor of the City of Birmingham.

iii) The following organization standards shall apply, as applicable, as are in effect on the contract date defined in paragraph ii):

American National Standards Institute (ANSI)
American Wood Preservers Association (AWPA)
Insulated Cable Engineers Association (ICEA)
Institute of Electrical and Electronics Engineers (IEEE)
International Code Commission (ICC)
International Standards Organization (ISO)
National Electrical Manufacturers Association (NEMA)
National Fire Protection Association (NFPA)
Underwriters Laboratories, Inc. (UL)

54.03 Plans and Shop Drawings.

a) Shop and Erection Drawings.

i) The Contractor shall submit to the Engineer, ten (10) days prior to the bid date, three (3) copies of any items that are proposed as substitutes for those specified.

ii) The Contractor shall submit to the Engineer after award of contract and prior to purchasing, six (6) copies of manufacturer's shop drawings and catalog data for the following items. All shop drawings of a specific item or system shall be made in one (1) submittal, and within thirty (30) days after award of contract.

iii) Shop drawings of all power equipment shall contain exact details of device placement, phasing and numbering, in form of elevations, for each following piece of equipment:

(1) Contactors

(2) Equipment Enclosure

(3) Panelboards

(4) Lighting Equipment

(5) Lighting Pole

(6) Photocell

iv) Shop drawings for the following items may consist of typewritten lists, listing manufacturer with description, to be used (one only for each item):

(1) Wire, General

(2) Wire, Connectors

(3) Conduit - Rigid, I.M.C. and P.V.C.

(4) None of the above items shall be installed until shop drawings or catalog data has been accepted in writing. Any listed item not submitted even if specified shall be considered not acceptable, and shall be removed if directed.

v) The Contractor shall submit to the Engineer a certificate of final inspection from the Permits Division of the Department of Planning, Engineering and Permits.

vi) The Contractor shall submit to the Engineer for review, within ten (10) days after award of contract, complete shop drawings for all material and equipment to be furnished. Shop drawings shall be submitted on a timely basis to allow adequate lead-time for review, resubmission if necessary, manufacture and delivery to project.

vii) Motor schedule. The Design Engineer shall submit a comprehensive motor schedule covering location, designation, type, voltage, phase, RPM, temperature rating, manufacturer and any other pertinent information. The Contractor may not substitute any motor for those specified without written approval.

b) Plans.

i) The Design Engineer and/or Contractor as may be applicable, shall submit a complete set of plans to the Engineer covering all material and equipment used for the complete electrical system. The Design Engineer shall make all necessary calculations and investigations to insure safe operation and adequate performance for the intended service including adequate spare capacity.

ii) The plans shall be complete and contain sufficient detail for full and complete construction of the electrical system. This includes, but is not limited to, elementary and schematic diagrams, devices, and panel layout with interconnection wire terminal designation. Any materials and/or components that require composite certification or are non-standard shall be clearly and specifically described in the contract and related bills of material as applicable.

iii) Plans shall indicate only diagrammatically the extent, general character and approximate location of the work. Where work is indicated but with minor details omitted, the Contractor shall furnish and install the work complete in such a manner that it will perform its intended function(s).

iv) The Contractor shall take finish dimensions at the job in preference to scale dimensions.

v) The Contractor shall make no changes in or deviate from the work as shown or specified except on written order of the Engineer, except as noted above.

vi) The Contractor shall obtain from the manufacturer's data on all equipment the dimensions that may affect electrical service. This data shall be used to coordinate proper service characteristics, entry location, etc., and to ensure minimum clearances are maintained.

vii) The plans shall be suitable for successful application for permit without additional engineering. Block diagrams of elements and single line diagrammatic outlines are not acceptable. All materials shall be clearly specified, including class of service, voltage, phase, category and type.

viii) The Contractor shall keep two (2) sets of plans at the construction site at all times of activity and shall record all site modifications. The Contractor shall prepare a set of as-built drawings accurately reflecting the final construction details. These shall be provided to the Engineer upon acceptance of the work. For those installations where dynamic/electronic operations are in effect, pumping stations, fountains, chippers, et al, an operation and maintenance manual shall be prepared to supply with the as-built drawings. This manual shall be accurate and shall be successfully used during the testing of the installation.

54.04 Materials.

a) General.

i) All materials shall be new and shall carry an UL label, issue or article designation or a certification by a nationally recognized testing laboratory, the latter being subject to the written approval of the Engineer. For those items not specifically covered by UL or a nationally recognized testing laboratory as approved, the component shall meet NEMA, ANSI or IEEE standards. All such items shall be readily identified as to the applicable standard and the Engineer without any additional imposed fee or increase in contract cost may require proof of such. This requirement may be invoked without any notice and those items not documented shall be removed and replaced with acceptable items/materials by the Contractor without additional compensation. The Engineer must approve, in writing, any substituted material prior to its incorporation into the work.

ii) No material shall be substituted for material specified in the contract, except by prior written approval of the Engineer. Specified catalog numbers are used for description of equipment and standard of quality only. Equivalent material shall be given consideration only if adequate comparison data, including samples, are provided. Approval of substitute materials shall be required prior to date of bid opening. Substitution data should be submitted ten (10) days prior to the bid date. The Contractor should bid on substituted material only if approved in writing by the Engineer.

iii) The Contractor shall submit to the Engineer within thirty (30) days after award of contract a complete list of proposed material manufacturers. List does preclude submission of shop drawings. Approval of manufacturer on list does not constitute approval of specific material or equipment.

iv) Protection of electrical equipment - All equipment shall be stored so as to prevent damage from rust, corrosion, physical injury, etc. All electrical equipment shall be covered and protected during construction.

b) Circuit Breakers.

i) Circuit breakers shall be quick-make, quick-break, thermal magnetic, trip indicating, and molded-case type for alternating current. Breakers shall trip free of the handle and tripping shall be

indicated by the handle assuming a position between off and on. Multi-pole breakers shall be internal common trip.

ii) Circuit breakers shall be equal to Siemens BQ (10KA), for 120/240, or an approved equal. Single pole breakers up through thirty (30) amps shall be UL listed as switching breakers and shall carry the SWD marking.

iii) Breakers shall be bolt-on type.

iv) Main breakers shall have interrupting ratings RMS Symmetrical not less than the following:

VOLTAGE	120/240 VOLTS
Frame	100
IC	10 KA

v) Other breaker accessories shall be as shown in the contract.

c) Conduit.

i) Conduits in raceway systems shall be as specified in the contract. Exposed conduit shall be hot-dipped galvanized, heavy wall rigid steel, intermediate metal conduit (IMC), electrical metallic tubing (EMT) or aluminum conduit. The minimum size for any conduit shall be nominal three-fourths (3/4) inch unless otherwise specifically noted. Cable trays shall be designated in detail by the contract and shall designate type, material, brand name or equivalent, and details of attachment.

ii) Conduits below grade shall be polyvinyl chloride (PVC), ultraviolet resistant, Schedule 40 minimum. All PVC conduits shall be rated for 90°C conductors. PVC-coated rigid conduit is acceptable.

d) Couplings and Connectors.

i) Metallic fittings shall be of the standard threaded-type and hot-dipped galvanized inside and out. Threadless connectors shall not be used. Compression couplings shall be appropriate for the class of service and location.

ii) PVC couplings and connectors for PVC shall be of the appropriate schedule and shall be of the same material as the conduit. All solvents and adhesives shall be compatible with the material being joined.

iii) Watertight flexible connectors shall be steel, code approved for grounding Type UA, with an extruded PVC overall jacket or Type E.F., if the circuit contains a code size ground wire, plus an external grounding jumper. Sizes one and one-half (1½) inches through four (4) inches shall have a separate external grounding jumper since factory bonding is not available in sizes above one and one-quarter (1¼) inches.

iv) Watertight Flexible Conduit Connectors. Where required by service or otherwise specified flexible conduit shall be liquid tight with insulated throats and corresponding waterproof fittings. Bare flexible conduit is not permitted unless otherwise designated. Such designation shall specify type, brand name or equivalent, and rating.

v) Junction and pull boxes shall be galvanized steel suitable for the service location. Boxes shall be fitted with the correct corresponding covers as applicable and shall be sealed if watertight. Where liquid proof boxes and covers are required the contract shall designate the material, pattern, rating, and brand name or equivalent.

vi) Raceway Supports. Clamps or supplemental supports/hangers shall support conduits. Anchoring of supports shall be to suitable structural or wall members. Conduit one and one-half (1½) inches nominal or smaller may use single point clamps; larger conduit shall use two-hole clamps/straps. Conduit shall not be suspended from other piping, ducting or suspended ceilings. Conduits shall cross in a manner described in the NEC and shall not interfere with each other. Cable securing for trays and other securing methods, when required, shall be designated by the contract and shall be depicted in such detail as to provide complete type, spacing, anchoring, and any other specifics.

vii) Miscellaneous fittings, hardware, spacers, adapters, bushings, etc., shall match the material being used or as specified in the contract. Fasteners one-quarter (1/4) inch and larger shall be Grade 5 or better. The Engineer shall be the sole judge as to the suitability of a material for a particular use and may reject any material considered unsuitable for service without recourse.

e) Lighting Elements, Fixtures and Materials.

i) All lighting components, fixtures, and related details shall be as shown in the contract. The Design Engineer shall provide a complete schedule of lighting components describing type, wattage, manufacturer or approved equal, pattern, and any other details to precisely describe any and all fixtures and accessories.

ii) Ballasts, HID.

(1) Ballast shall have a UL label. Ballast shall be core and coil construction with minimum power factor of ninety (90) percent.

(2) All high-pressure sodium ballasts shall be magnetic regulator type.

(3) Ballast shall be as manufactured by General Electric, Universal, Advance or other approved manufacturer.

iii) Fuses.

(1) Each ballast shall be fused (one (1) fuse required per phase wire to each ballast).

(2) For pole mounted fixtures, provide Buss – TRON waterproof holder, Type HEB, or an approved equal, one (1) for each phase wire to each ballast, complete with proper size HEB fuse.

(3) For fixtures mounted on hollow steel or aluminum poles, fuses shall be located inside pole hand holes. Fuse holders shall be connected with slack conductor to extend six (6) inches beyond hand holes.

iv) Lamps.

(1) All fixtures shall be equipped with lamps. Lamps shall be installed new.

(2) Fluorescent, quartz and/or HID lamps shall be of the size and type as shown in fixture schedule.

(3) H.I.D. lamps shall be rated horizontal, vertical or universal as required by fixture socket position. High-pressure sodium and metal halide lamps shall be clear.

(4) The guaranty/warranty shall apply to lamps as follows: H.I.D. lamps shall be guaranteed for one (1) full year. Guarantees shall begin from date of final acceptance.

(5) The Contractor shall provide spare lamps as set up in the contract. A minimum of one (1) spare lamp shall be required.

(6) Fixture entrance shall require one (1) wing nut removal for access.

v) Poles.

(1) Poles shall be of the height, shape and finish as shown in the contract. For direct burial style poles, the pull box details and grounding scheme shall be adequately shown and/or described in the contract.

(2) All poles shall have a rated minimum strength for a ninety (90) MPH wind with A1-3 gust factor. For other wind loading information refer to *Minimum Design Loads in Buildings and Other Structures*, as published by the American Society of Civil Engineers, Publication ASCE 7 (interchangeable with ANSI-A58.1). In case of conflict the most stringent shall apply.

(3) All poles to be equipped with two (2) one-quarter (1/4) inch threaded ground studs to accept one-hole ground lugs.

(4) All poles shall have at least one hand hole. Hand holes shall have tamper proof bolt or screw to secure. Minimum hand hole size shall be four (4) inches by six (6) inches.

(5) A ground rod shall be installed outside of the concrete base and connected to a ground lug in the pole.

(6) The Contractor shall furnish spare fixtures and poles as set up in the fixture schedule.

f) Panelboards, Boxes, Fronts and Trims.

i) General.

(1) Panelboards shall be dead front type and shall be in accordance with UL's standard of panelboards and enclosing cabinets and be so labeled. Panelboards shall be factory assembled. Panelboards not factory assembled must be listed and certified by the assembler through UL or a nationally recognized testing laboratory as approved, in writing, by the Engineer.

(2) Where required, lighting/receptacle panelboards shall be suitable for service entrance equipment.

ii) Assembled Panel/Control/Power Boxes and Units.

(1) All assembled operation and power control units shall be assembled to the requirements of UL and labeled/certified by the assembler. No panel cabinet or unit may be installed without prior labeling. Onsite labeling shall not be permitted without written authorization from the Engineer. Equipment suitable for service entry shall be labeled as such.

(2) Each assembled panel/cabinet must, as a complete unit, have a full (not series or integrated) short circuit rating. This rating shall be as required by UL, NEC, NEMA or IEEE as applicable. The Design Engineer shall specify the rating/testing as may be required by the applicable code or service.

iii) Boxes, Fronts and Trims.

(1) Panelboard boxes shall be fabricated from sheet steel (galvanized or equivalent rust-resistant). The size of the wiring gutters and gauge of steel shall be in accordance with NEMA and UL standards for panelboards unless shown or specified to be larger. Gutters shall be increased on double lug panels to include the additional required wiring space.

(2) Boxes for panelboards with twenty (20) or more circuits including active and spare breakers and spaces shall be twenty (20) inches wide.

(3) Fronts shall include hinged door, lock and latch. The locks shall be flush, cylinder types. The lock shall be held in place by concealed screw to a captive nut. Panelboard locks shall be keyed alike. Doors shall have concealed steel hinges. A metal-framed circuit directory with removable clear plastic cover shall be welded to the inside of the door. Fronts shall be code gauge steel. Fronts shall be for surface or flush mounting as shown in the contract. Fronts for flush mounting shall overlap the box by a minimum of three-quarter (3/4) inch all around. Surface fronts shall have the same overall dimensions as the box. Fronts shall have the interior and exterior steel surfaces cleaned and finished in approved ANSI No. 49 or No. 61 gray finish over a rust-inhibiting phosphatized coating. Panelboards shall have no exposed or accessible live parts when the front is installed whether the door is open or closed.

iv) Panelboard Bus Assembly.

(1) Panelboard bus structure and main lugs shall have current rating as shown. Such rating shall be established by heat rise test with maximum hot spot temperature on any connector or bus bar not to exceed 50^{o} F rise above ambient, at full rated load.

(2) Bus bars shall be copper or tin plated aluminum arranged for distributed phase arrangement so that one, two, and/or three pole breakers may be installed in any location. Bussing shall allow the removal, replacement or installation of circuit breaker units without disturbing adjacent units and without machinery drilling or tapping.

(3) Ampacity and service voltage, lugs or main breakers and branch breakers shall be as shown in the contract.

(4) Main lugs shall be compression type.

(5) Neutral bar shall be full sized with lugs suitable for incoming and outgoing conductors.

(6) Equipment grounding bar shall be furnished with lugs suitable for incoming and outgoing conductors.

g). Wire and Cable, 600 volts or Less.

i) All conductors shall be new, stranded annealed copper. Insulation shall be cross-linked thermo - setting polyethylene described by ICEA publication S-66-524. All insulated wire shall be UL labeled and listed as applicable. Bare annealed copper wire (ASTM B-3) may be used for grounding in sizes and manner prescribed by the NEC.

ii) All insulation shall be rated for temperature service and shall be the appropriate class as designated by the Design Engineer, the detail drawings or the NEC. Type RWH for 75°C, Type RHH for 90°C or as specifically noted.

iii) The minimum wire size shall be AWG No. 14 for any circuit unless specifically noted in the contract. In these cases the type, class, rating, brand name (or equal) shall be designated by the Design Engineer and shall be limited to primarily control and communication service.

h) Wire Connection and Splices, 600 Volts or Less.

i) Connectors and Splices (Copper) Above Grade.

(1) Split bolt connectors shall not be used in any work performed for the City of Birmingham. Compression connections shall be made with compatible tools and sleeves. Connectors shall be compatible with the installation equipment; interchanging manufactured brands is not recommended and may be rejected. The Engineer may require standard testing of any compression connection.

(2) For No. 12 and smaller wire in lighting circuits, connections and splices shall be made with splicing caps with metal inserts or by use of compression connectors, such as Buchanan Series No. 2000 or an approved equal, installed with a C24 pressure tool and complete with nylon snap-on insulator. One (1) connector shall join no more than four (4) conductors.

(3) For No. 10 and No. 8 wire in lighting circuits, connections and splices shall be made by use of compression connectors, such as a Buchanan Series #2000 or an approved equal, installed with a C24 pressure tool and complete with nylon snap-on insulator. One (1) connector shall join no more than three (3) conductors.

(4) Control conductor splices shall be kept to an absolute minimum. All connections and splices shall be made by use of terminal strips only. All connections shall be accessible for checking. There shall be no splices allowed in pull boxes unless specifically shown. There shall be no more than one (1) wire and one (1) flat jumper per terminal.

(5) Power conductors (any size) and lighting conductors larger than No. 8 shall be made only with approved compression connectors for the specific size wire involved and covered with electrical tape or approved connectors, such as ILSCO Type GTA with GTC cap or an approved equal.

ii) Connectors and Splices (Copper) Below Grade.

(1) Connectors for No. 12 wire and smaller shall be Scotch nylon insulated butted seam connectors with insulation grip plus Scotch E-Z Seal No. 2200, or an approved equal, to give a completely watertight connection.

(2) Connectors for No. 10 wire and larger shall be compressed fittings for specific sized conductor applied with hydraulic tool plus Scotch multi-mold, or approved equal, to give a completely watertight connection.

54.05 Construction Requirements.

a) General.

i) The Contractor shall be responsible for all permits, licenses and service connection coordination. The Contractor shall utilize licensed personnel as required by state law and the rules and regulations of the City of Birmingham. The Contractor shall have total responsibility for furnishing and installing the complete, operable electrical system. The Contractor shall provide all tools, labor, equipment, materials, storage, security and sundries to perform the work. All operations and installation shall be performed in a workmanlike manner. All testing required for the installation shall be the responsibility of the Contractor unless specifically prescribed

otherwise by the contract. The Contractor shall pursue the work in a timely manner in accordance with the provisions of these specifications.

ii) All work shall be in accordance with the *National Electrical Code* and the rules and regulations of the City of Birmingham. All work shall be permitted and inspected by the Permits Division of the Department of Planning, Engineering and Permits.

b) Utilities.

i) It shall be the responsibility of the Contractor prior to bid to reaffirm with the respective utility companies that the locations, arrangement (and with Alabama Power Company the voltage, phase, and metering requirements) and connections to utility service are in accordance with their respective requirements. If their requirements are at variance with the contract, any additional cost necessary to meet those requirements shall be included in the unit prices bid for other items of work.

ii) It shall be the responsibility of the Contractor to obtain any and all permits and to coordinate service connection with Alabama Power Company. The Contractor shall confirm that power is available at the specified site and that the power available is the voltage, phase and amperage as will be required for the project. Some projects of the City of Birmingham may not be metered. The Contractor shall act as intermediary on such projects to establish the service by registering the power requirements with the Department of Traffic Engineering and making connections with Alabama Power Company.

iii) The Contractor shall arrange with utility companies for such services as shown or herein specified and installation of meter where shown. A signed document from the utility companies shall be furnished with the shop drawings describing the location and type of services to be furnished and any requirements they may have. A person responsible for granting such services shall sign this document for each utility company. The Contractor shall pay all charges associated with such services or connections, including permanent meter deposit.

iv) The Contractor's responsibility shall begin at the distribution side terminal of the connection provided by Alabama Power Company.

v) On certain projects the utility company may levy a charge to establish service as required for the project. The Contractor shall inform the Engineer and the City Traffic Engineer of any such charges. The City of Birmingham shall be responsible for payment of these charges.

vi) For metered projects, the Contractor shall arrange for the establishment of the service and the installation of the meter as shown in the contract. The Contractor shall provide all documents to establish the metered service and shall pay all charges associated with such service including permanent meter deposit.

(1) The Contractor shall obtain the service site address from the Department of Planning, Engineering and Permits and shall obtain any and all service registration documents from Alabama Power Company. These documents shall be provided to the City of Birmingham for permanent account registration. The Contractor will install the service entrance or as arranged between the Contractor and Alabama Power Company.

(2) The electrical service account shall be in the Contractor’s name. The Contractor shall pay all electric bills until the project is accepted by the City of Birmingham. At that time, the account will be transferred to the City of Birmingham.

c) As-built Drawings.

i) The Contractor shall be responsible for providing to the Engineer the as-built drawings, operations and maintenance materials, and spare parts list(s) as required by the contract. This documentation must be submitted in order to receive final payment for the work performed.

ii) At the completion of the job, the Contractor shall turn over to the Engineer two (2) sets of marked as-built drawings, one (1) set of all equipment catalogs and maintenance data and one (1) set of shop drawings on all electrical equipment, bound in a hardback book.

iii) All equipment tagging and marking shall be performed by the Contractor and shall be complete.

iv) Two (2) copies of invoices for all electric equipment, stating the manufacturer's name, pole and fixture numbers, shall be furnished to the Engineer.

v) The Contractor shall explain and demonstrate all systems to the City of Birmingham representatives responsible for future maintenance of the systems.

d) Excavation, Cutting and Patching.

i) The Contractor shall perform all excavating and pavement cutting as required completing the electrical work. The Contractor shall do all required backfilling, patching, etc.

ii) All cutting and patching of streets shall meet the requirements of the Department of Planning, Engineering and Permits.

iii) Prior to cutting any pavement, The Contractor shall obtain an *Excavation* permit from the City of Birmingham.

e) Means and Methods.

i) The Contractor shall perform all work in a professional manner. All workmanship will be subject to inspection by the Engineer and the Permits Division of the Department of Planning, Engineering and Permits.

ii) These specifications are not intended to cover every aspect of good workmanship and description of quality. As a general guide the following statements are listed as typical minimum criteria:

(1) Boxes, panels and raceways shall be securely fastened, plumb and level. Physical spacing shall allow for reasonable access to components.

(2) Conduit.

(a) Conduit shall be anchored securely in place by means of approved clamps, supports and fasteners. Arrangement and methods of fastening all conduits shall be subject to the Engineer's direction and approval. Use only approved clamps on exposed conduit.

(b) Conduit runs shall not have more than three (3) ninety-degree (90°) bends or equivalent between pulls.

(c) A one hundred (100) pound test nylon pull chord shall be installed in all empty conduits.

(d) Conduit ends shall be carefully plugged during construction.

(e) Conduit shall be cut square and the ends reamed after threading. Use of running threads is absolutely prohibited. Conduit shall be joined with approved threaded conduit couplings. Threadless and clamp type couplings shall not be used.

(f) The Contractor shall apply two (2) coats of asphaltum paint to all underground metallic conduit (except PVC or PVC-coated). Any breaks shall be carefully retouched with paint and allowed to dry before backfilling.

(g) Exposed threads on all metal conduits subject to exposure to the weather shall be painted with zinc primer.

(h) All conduit connections to sheet-metal cabinets or exterior enclosures and/or subject to exposure to the weather shall be terminated by use of rain tight hubs. Sealing locknuts shall not be used.

(i) For PVC materials, all elbows, bends, etc., shall be either factory bends or made with an approved heat bender. All cuts shall be made with hacksaws and ends de-burred. No PVC conduit shall be run exposed.

(j) For PVC materials, all joints shall be made as follows: With an approved cleaner, clean the inside of the socket and the outside of the conduit to the depth of the socket. Apply solvent cement to the interior of the socket and the exterior of the conduit, making sure to coat all surfaces to be joined. Insert conduit into the socket and rotate one-quarter (1/4) to one-half (1/2) turn and allow to dry.

(k) Conduit alignment in multi-run (two (2) and over) duct banks shall be maintained by the use of interlocking plastic spacers. Spacing between conduits shall be three (3) inches unless shown otherwise in the contract. Spacers shall be located at the following intervals:

CONDUIT SIZE	MAXIMUM DISTANCE BETWEEN SPACERS
¾" – 1½ "	4 feet
2" – 3½ "	8 feet
4" – 6"	10 feet

(l) Underground PVC conduit for street lighting circuits shall be no smaller than one (1) inch in size.

(m) A green ground wire sized in accordance with the NEC shall be required in all PVC conduits.

(n) Underground conduit located within a public right-of-way shall have a minimum cover of twenty-four (24) inches measured from the outside top of the conduit.

(3) Installation of Wire and Cables.

(a) No conductor shall be smaller than No. 6 except where so designated in the contract or otherwise specified. All conductors shall be stranded. Multi-wire lighting branches shall be used as indicated.

(b) All joints and splices in wire shall be made with approved solder-less connectors and covered so that insulation is equal to conductor insulation.

(c) Both conductors and conduits shall be continuous from outlet to outlet.

(d) No conductor shall be pulled until conduit is cleaned of all foreign matter.

(e) In installing secondary main services, a minimum of five (5) feet of cable per run shall be extended beyond the weather head for connection to the service drop.

(f) Where installed in panelboards, cabinets, wire ways, switches and equipment, wire and cable shall be neatly formed and tied.

(g) Care shall be exercised in installing all wire and cable to prevent damage to insulation. No force greater than the wire manufacturer's recommended pull shall be used.

(h) Connections shall be made as described elsewhere in this specification. No more than four (4) conductors shall be joined together by one (1) connector.

(i) Conduits shall be sized in accordance with the *National Electrical Code* as in effect under the contract except that conduits containing more than two (2) conductors less ground shall be sized based on thirty-five (35) percent fill and one-half (1/2) inch conduit where permitted by the contract shall contain no wire larger than No. 12 nor more than three (3) No. 12 wires.

(j) Connections above grade shall be made so that the insulation integrity of the entire wire or cable is maintained. The insulation of the connection shall be at least equal to the insulation on either side.

(k) Connections below grade shall be made so that the insulation integrity of the entire wire or cable is maintained while the connections are submerged in water.

(4) Panelboards.

(a) Installation.

(i) All panelboard dimensions shall be carefully checked and coordinated with the proper trades to ensure proper mounting space and support.

(ii) Wiring shall be grouped into neat bundles and secured with approved tie wraps.

(iii) Panelboard directories shall be typewritten and shall be filed verified by the Contractor to ensure accuracy. Directories shall include adequate descriptions to allow accurate identification of the load and location served.

(b) Circuit Beaker Arrangement. Circuit breakers shall be factory arranged as follows: Beginning at top left, breakers shall be installed single pole first, lowest trip, then higher trips in order, next two (2) pole breakers in order, next three (3) pole, then spares, then spaces. The entire left row shall be filled, then begin top right. Multi-section panelboards shall be numbered consecutively through all

sections. Breakers numbers shall be metal or plastic and permanently attached to trim (clear numbered tape is not acceptable).

(5) Poles.

(a) All poles or base mounted fixtures shall be installed level and pole shall be plumb. Base shall be grouted in. Concrete bases shall be hand rubbed leaving no voids or high places.
(b) Pole Set Back. All poles installed in the City of Birmingham shall have a thirty-six (36) inch minimum setback from the face of the curb the base of the pole.

(6) Wire and Cable Designation and Color-coding.

(a) Non-ferrous identifying tags or pressure sensitive labels shall be securely fastened to all cables, feeders and power circuits in vaults, pull boxes, manholes, switchboards, panels, starters, termination of cables, etc. Tags or labels shall be stamped or printed to correspond with markings on plans so that feeder or cable number and phase can be readily identified.

(b) Color-coding system, as listed in the table, shall be followed throughout the entire network of branch circuits:

PHASE	**120/240 VOLTS 1 PHASE 3 WIRE (color)**	**120/208 VOLTS 3 PHASE 4 WIRE (color)**	**277/480 VOLT 3 PHASE (color)**
A	Black	Black	Brown
B	-	Red	Orange
C	Red	Blue	Blue
Neutral	White	White	White
Ground	Green	Green	Green

f) Identification. The Contractor shall fasten identification nameplates to all equipment. The nameplates shall be of a laminated plastic and shall be white with engraved black core. Exterior marking tags shall be aluminum or stainless steel and attached with compatible permanent fasteners (rivets or screws).

g) Special Requirements. Any special requirements in the contract shall supersede these specifications but only insofar as that particular requirement is concerned.

h) Acceptance Testing. Upon completion of the work, the entire wiring system shall be tested and shown to be in perfect working condition, in accordance with the intent of the contract. It shall be the responsibility of the Contractor to have all systems ready for operation and to have an electrician available to operate same in accordance with and under the supervision of City of Birmingham representatives. The electrician shall be available to assist in the removal of panel fronts, etc., to permit inspection as required.

i) Warranty. All electrical items shall be warranted by the Contractor against failure for a period of one (1) year from date of acceptance of the electrical work by Traffic Engineering and the Department of Planning, Engineering and Permits.

54.06 Method of measurement. Electrical items will be measured as indicated in the contract.

54.05 Basis of payment. The accepted electrical items, measured as noted above, will be paid for at the unit price bid which shall be payment in full for furnishing all materials, equipment, labor, tools and other incidentals necessary to complete the work.

END OF SECTION

SECTION 55 - LANDSCAPE MAINTENANCE

55.01 Description.

a) The work specified in this section includes providing the complete care and guarantee of all planted trees, shrubs, ground covers, lawn areas, natural areas, seasonal color and mulching areas within the limits of the work shown in the contract for the period of time set forth in the contract.

b) It is the intention of these specifications to keep all planted areas neat and attractive during the contracted maintenance period.

55.02 Materials. Materials shall conform to the requirements of other sections of these specifications and/or any special conditions.

55.03 Construction Requirements.

a) Quality Assurance. The City of Birmingham reserves the right to reject any or all materials and any or all work which, in the opinion of the Engineer, does not meet the requirements of the contract at any stage of the operations. The Contractor shall promptly remove all rejected material from the site.

b) Submittals. A full written report of the past month's maintenance performed shall be submitted to the Engineer at the end of each month. The report shall include a description of the condition of all plant material. **There shall be no progress payment until this document is submitted.**

c) Warranty. The Contractor shall, without additional compensation, guarantee and replace one hundred percent (100%) of the plants that, in the opinion of the Engineer, fail to maintain a healthy, vigorous condition (excluding theft or vandalism). All replacement plant material shall meet all specifications in regard to species, size, color, and quality.

d) Watering.

i) All trees, shrubs, ground covers, seasonal color and lawns shall be checked weekly for dryness by taking a core sample twelve (12) to fifteen (15) inches deep. If it is determined that there is insufficient moisture, the Contractor shall thoroughly water each plant or planted area until the area is saturated to a depth of twenty-four (24) inches.

ii) If the project does not have an irrigation system, the Contractor shall, without additional compensation unless an item for watering is included in the contract, furnish all water required to meet the specifications.

e) Mulching. All tree saucers, shrubs, plant beds, ground cover, and seasonal color areas shall receive one (1) complete mulch application at nine (9) months after acceptance of initial landscape installation using three (3) inches of the type of mulch specified, and cosmetic mulch applications as required for maintaining a clean, fresh mulched appearance.

f) Fertilization.

i) Fertilizing requirements shall be in accordance with accepted horticultural practice.

ii) Trees planted in lawn areas shall be fertilized below grade by boring one and one-half (1½) inch diameter holes to a depth of eight (8) to twelve (12) inches (eight (8) to ten (10) holes per tree) and applying dry fertilizer, or by liquid fertilizer injection. All holes shall be immediately backfilled and repaired following fertilization.

iii) Trees within planted areas shall be fertilized by spreading fertilizer below the tree canopy at the drip line and working it into the soil.

iv) Shrubs shall be fertilized by spreading fertilizer around the base of the plant and working into the soil by hand.

v) Ground cover beds shall be fertilized by uniformly distributing fertilizer with a mechanical spreader using a crossing pattern.

vi) Lawn areas shall be fertilized by uniformly distributing fertilizer with a mechanical spreader using a crossing pattern.

g) Pruning.

i) All trees and shrubs shall be pruned or thinned as directed by the Engineer a minimum of two (2) times per year (once before spring and once during mid-summer) to adequately maintain an attractive shape and fullness with respect to the intended character of the plant.

ii) The Contractor shall consider individual plant characteristics to determine the pruning requirements.

iii) At least two (2) times per year, all dead branches shall be removed. All wounds and cuts shall be properly treated with an asphaltic tree wound paint.

iv) At least three (3) times per year, all sucker growth shall be removed from trees.

h) Straightening Trees. Any trees which are leaning shall be straightened by pulling to an upright position and tying with new guy wires and/or stakes. If the tree cannot be successfully straightened by pulling over, then the Contractor shall dig around the rootball and straighten. When wrapping wire around the tree, the Contractor shall install a piece of rubber hose such that the wire shall not cut the tree.

i) Edging. As necessary, the Contractor shall neatly edge and trim around all plant beds, curbs, walks, streets, trees, plants, and building areas. Edgers or weedeaters with monofilament line shall be used for edging. All shapes and configurations of plant beds shall be maintained as installed. A clean trench line shall be provided between grass and mulched areas. Care shall be taken not to injure trunks of trees or plant materials.

j) Policing.

i). The entire site, including parking areas, roadways, lawn areas, and planted areas shall be policed at least once a week to remove litter, broken limbs and other debris.

ii) All debris and litter collected shall be removed from the site by the Contractor at the time policing is done.

iii) All storm drains, ditches, culverts, etc., within the project limits shall be kept free of litter and other debris.

k) Soil Analysis. The Contractor shall, without additional compensation, take soil samples from all planted areas of the site at the beginning of the maintenance period for analysis to determine if adjustments in the fertilization program and/or soil pH are needed. A copy of the soil analysis shall be provided to the Engineer.

l) Disease and Insect Control. The Contractor shall employ mechanical or chemical measures, in accordance with accepted horticultural practice, to prevent and/or eradicate diseases or insects that threaten the appearance or vitality of all trees, shrubs, ground covers, and lawn areas.

m) Weed Control. The Contractor shall employ mechanical or chemical measures, in accordance with accepted horticultural practice, to insure that weeds or undesirable grasses do not encroach upon any lawn or mulched area.

n) Mowing.

i) All fescue lawn areas shall be mowed to a height of two and one-half (2½) to three (3) inches. All Bermuda lawn areas shall be mowed to a height of one-half (1/2) inch to one (1) inch. Other grass species shall be mowed to heights in accordance with accepted horticultural practice.

ii) Rotary type mowers designed for commercial use shall be used unless conditions require that smaller rotary mowers be used.

iii) All lawn areas shall be mowed in a one-day operation and performed at a frequency to maintain the specified height. During the growing season, lawn areas shall be mowed at least once per week.

iv) All grass clippings shall be removed from the lawn areas and the project site by the Contractor.

v) The Contractor shall trim around trees and appurtenances in lawn areas after each mowing.

vi) Re-seed lawn areas as necessary to maintain a thick, green, healthy and attractive appearance at all times. Sparsely grassed areas or areas of damaged lawns shall be re-seeded to re-establish a vigorous and lush appearance.

o) Safety. The Contractor is solely responsible for the safety of his employees and the public in the execution of the work.

55.04 Method of Measurement. Landscape maintenance shall be paid monthly. The Engineer shall determine if all areas of landscape maintenance have been addressed for the month that payment is requested.

55.05 Basis of Payment.

a) Landscape maintenance shall be paid at the unit price bid per month which shall be payment in full for furnishing all materials, equipment, labor, tools and other incidentals required to complete the work.

b) Partial Payments - Each month, the Engineer shall determine if all areas of landscape maintenance have been addressed. If it is determined that some aspects of landscape maintenance have not been performed, a partial payment for landscape maintenance shall be made for that month.

END OF SECTION

SECTION 56 - IRRIGATION

56.01 Description. The work under this section shall consist of installing a working irrigation system in accordance with the contract. Work under this section shall be permitted and inspected by the Permits Division of the Department of Planning, Engineering and Permits. All work shall conform to applicable codes.

56.02 Materials.

In general, materials used for irrigation systems shall conform to the following:

a) Plastic pipe. Main water lines shall be Class 160 or 200 polyvinyl chloride (PVC) pipe, Type 1120 or 1220. PVC pipe shall be continuously marked with the identification of the manufacturer, type, class, and size. Unless otherwise specified, PVC pipe two and one-half (2½) inches and larger in diameter shall be gasket pipe with thrust blocks at all directional changes.

b) Fittings shall be Schedule 40 PVC, Type 1. Fittings shall be identified as to pressure rating or schedule.

c) Solvent weld shall be of a type approved by the manufacturer of the pipe.

d) Shrub spray risers shall be Schedule 80 PVC. Risers shall be installed on Schedule 80 swing joints or an equal approved by the Department of Planning, Engineering and Permits.

e) Lawn spray risers shall be as specified in the contract.

f) Lawn rotary sprinkler heads shall be installed with Schedule 80 swing joints or an equal approved by the Department of Planning, Engineering and Permits.

g) 110 Volt AC wiring shall conform to the requirements of Section 54.

h) Control wiring shall be 24-volt solid wire, U.L. approved for direct burial underground. The minimum size shall be 14-gauge.

i) Sprinkler heads shall be as indicated in the contract. They shall be constructed of cycolac material or brass, or both, and easily serviced from above. Heads shall perform to manufacturer's specifications concerning diameter of throw and gallonage at the specified pressure after installation and prior to final acceptance.

j) Automatic controller(s) shall be of the electric type with 120 volts AC input and no greater than 26.5 volts AC output. It shall be wall, pole, or pedestal mounted as required by the contract, U.L. listed, and shall have a lockable metal cover and hasp. The quantity required by the contract shall be furnished, installed, and connected with the automatic valves designed in the system. Locks shall be furnished for the cabinets and shall be keyed alike. Six (6) keys for each lock shall be furnished to the Engineer.

k) Valves (Electric). Remote control valves shall be electrically operated, normally closed, 24 volt AC, 1 ampere, constructed of corrosion resistant cycolac and stainless steel, capable of manual operation, and shall have the valve body constructed of cycolac, and with accurately machined seat faces with female pipe threads or with bolted flange connections, depending on valve size. The valve shall be self-flushing. The motor assembly shall be easily removed from the valve body without removal from the piping system. The valve shall have a throttling device for system balancing and throttling of the valve shall not affect the speed of opening or closing. The valve shall be pre-wired by the manufacturer with sufficient extended wiring for easy, secure connection. Valve shall comply with all code and permitting requirements and shall be compatible with the automatic controller for the system.

l) Valves (manually operated) shall be bronze or brass with threaded connections, non-rising stem, and ball-type valves.

m) Miscellaneous Products. Products, materials, and supplies for mounting, connecting, and fully completing the irrigation system and which may not be noted in the contract and/or described herein shall be furnished and installed as new or unused and shall comply with all codes and permitting requirements. Such products, materials and supplies shall constitute a part of the specification just as though they were enumerated herein.

56.03 Construction Requirements.

a) Permits. The Contractor shall be responsible for acquiring all required permits from the Department of Planning, Engineering and Permits. The Contractor shall coordinate all field inspections by the Department of Planning, Engineering and Permits necessary to complete the work.

b) Excavation and Backfilling.

i) Trenching and excavation shall be done with careful regard for existing trees, shrubs, underground utilities, and structural elements. Backfill shall be placed and tamped in layers not to exceed six (6) inches. Backfill shall be clean, friable soil, without lumps and debris. Excavation shall be done in accordance with the requirements of the City of Birmingham's plumbing code. Defacements, stains, damages, and destruction of other work shall be replaced or repaired to the satisfaction of the Engineer.

ii) Excavation in paved areas, such as streets, parking lots, etc., shall be repaired in accordance with the requirements of the Department of Planning, Engineering and Permits.

iii) Should any excavation be undertaken on newly sodded or grassed areas, the area shall be re-graded and re-sodded/grassed as directed by the Engineer.

c) Irrigation Main.

i) The irrigation main shall be installed in accordance with the manufacturer's recommendations. Pipes two (2) inches and smaller in diameter shall be joined by the solvent weld system. All pipe ends shall be cleaned with a manufacturer's recommended PVC pipe cleaner immediately prior to applying cement and joining the pipe ends.

ii) Unless specified otherwise, pipes larger than two (2) inches in diameter shall be joined with an approved compression type push on joint.

iii) The main shall be flushed and pressure tested for one hour at a pressure of one hundred (100) psi static pressure prior to making any lateral connections and shall show no loss in pressure.

iv) All piping shall be installed at proper grade so that the entire system of piping may be completely drained. The circuit piping shall be properly pitched to a low point or low points and a drain valve installed at each low point with gravel drainage sump. All main line or other piping of the system shall have a one and one-half (1½) inches manual angle drain.

v) All pipe shall be laid at the depth specified by the City of Birmingham's plumbing code.

d) Lateral Lines.

i) Lateral lines, including pipes and fittings, shall be installed by standard techniques. Methods of joining PVC pipe shall follow procedure outlined herein. When necessary to "snake-in" a section of pipe, it shall be done in a manner so as to avoid excess strain on the pipe due to contraction in cold weather.

ii) Contractor shall plug all lines upon installation and prior to installing heads to avoid debris entering the pipe.

e) Shrub spray risers shall be adjusted to a height of two (2) inches above the existing plant material or as designated in the contract.

f) Sprinkler Heads.

i) Rotary and spray sprinkler heads shall be installed so that the top is two (2) inches above the finished grade and level in lawn areas. If the finished grade has not been established, the sprinkler shall be extended a minimum of four (4) inches above the existing level and marked with a stake to prevent damage by equipment. Upon establishment of finish grade, heads shall be adjusted to the specified finished height. The Contractor shall then backfill around the head assembly.

ii) Shrub spray sprinkler heads shall be mounted on risers that include a flexible nipple attachment as specified herein.

iii) Sprinkler heads shown in the contract are essentially diagrammatic. It shall be the Contractor's responsibility to establish the location of all sprinkler units. In no case shall spacing of sprinkler units be changed by more than one (1) foot from those dimensions shown in the contract.

g) Electric Control Lines.

i) All control lines shall be installed in a workmanlike manner and may be installed in the main, lateral trenching, or in their own separate trench. The lines shall be bundled together and taped to the top of the water supply line every ten (10) feet.

ii) Control wiring shall be installed at least eighteen (18) inches below finish grade. The Contractor shall provide looped slack at valves and “snake” wires in conduits under paved surfaces.

iii) Control wire splices shall be allowed only in runs more than five hundred (500) feet in length.

iv) Expansion curls shall be provided within three (3) feet of each wire connection to a solenoid and at least every three thousand (3000) feet in length.

v) All wire passing under existing or future paving, construction, etc., shall be encased in plastic or galvanized steel conduit extending a minimum of twelve (12) inches beyond the edge of paving, construction, etc.

h) Valve Boxes. The Contractor shall provide and install valve boxes as noted and detailed in the contract for all valves throughout the system. Boxes shall be affixed with a tightly fitted cover that provides quick and easy access. Valve boxes shall be installed four (4) inches above finished grade in all shrub beds and flush with finished grade in lawn areas.

i) Automatic Controller. The Contractor shall install the controller at the location shown in the contract or as directed by the Engineer. The controller shall be fully energized, securely mounted at forty-two (42) inches of height in a weatherproof and lockable case as provided by the manufacturer.

j) Closing of Pipe and Flushing Lines.

i) The Contractor shall cap or plug all openings as soon as the lines have been installed to prevent the entrance of materials that would obstruct the pipe. These caps or plugs shall be left in place until removal is necessary for completion of installation.

ii) The Contractor shall thoroughly flush out all water lines before installing heads, valves, and other hydrants.

iii) Upon completion of the system testing, the Contractor shall complete assembly and adjust sprinkler heads for proper distribution.

k) Operational Testing. Upon completion of the irrigation system, after pressure testing, and after head installation, the Contractor shall test the entire system for proper operation. All air shall be bled from the system and all components checked for proper operation by the Contractor in the presence of the Engineer.

l) Balancing and Adjustment. The Contractor shall balance and adjust the various components of the system so that the overall operation is most effective. This work shall include adjustment to pressure regulators, all sprinkler heads, and individual station adjustments.

m) Orientation. Prior to acceptance of the system, the Contractor shall provide instruction to City of Birmingham representatives in the operation and adjustment of all aspects of the system. This instruction shall be limited to a maximum of eight (8) hours.

n) Warranty and Guarantee. The Contractor shall guarantee the irrigation system to be free from defects in materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the irrigation system by the City of Birmingham. The Contractor shall, without additional compensation, promptly make repairs if any are required during this period.

o) Water Meter(s).

i) The Contractor shall pay any tapping fees and have the water meter(s) installed in the Contractor's name. The Contractor shall pay all water bills until final acceptance of the project by the City of Birmingham or to the end of the landscape maintenance period if one is included in the contract. At that time, the City of Birmingham shall have the account(s) transferred to its name.

ii) There shall be no additional compensation for this work.

p) Electrical Service to Controller(s).

i) The Contractor shall be responsible for installing all electrical components (required to make the irrigation controller(s) operational) from the service riser/meter socket to the irrigation controller(s). This shall include, but is not limited to, all conduit, wiring, connectors, fittings, enclosures, etc. The Contractor shall furnish two (2) copies of shop drawings to the Engineer detailing how power will be supplied to the irrigation controller(s).

ii) The Contractor shall pay all fees and acquire all permits required to have the meter(s) set. This shall include the meter deposit(s). The electrical account(s) shall be in the Contractor's name. The Contractor shall pay all electrical bills until final acceptance of the project by the City of Birmingham. At that time, the City of Birmingham shall have the account(s) transferred to its name.

iii) There shall be no additional compensation for this work.

56.04 Method of Measurement.

a) Unit Pricing. Irrigation items shall be measured as indicated in the contract.

b) Lump Sum Pricing. No measurement shall be made. However, the Engineer and Contractor shall agree as to the percentage of work complete.

56.05 Basis of Payment.

a) Unit Pricing. The accepted irrigation items, measured as noted above, shall be paid for at the unit price bid which shall be payment in full for furnishing all materials, equipment, labor, tools, and other incidentals necessary to complete the work.

b) Lump Sum Pricing. At the end of each pay period, the Engineer shall pay a percentage of the lump sum price bid for irrigation based on the amount of irrigation work completed. This shall continue each month until the irrigation system is completed. The lump sum price bid shall be payment in full for furnishing all materials, equipment, labor, tools, and other incidentals necessary to complete the work.

END OF SECTION

SECTION 57 - MANSONRY PAVING

57.01 Description. The work under this section shall consist of installing masonry paving in accordance with the contract documents.

57.02 Materials.

a) Pavers shall be as specified in the contract documents.

b) Mortar shall be in accordance with ASTM C270, Type M for below grade and ground contact masonry; use Portland cement lime only.

c) Concrete shall have a minimum 28-day compressive strength of 4000 psi.

d) Codes and Standards.

i) ASTM C902 - *Standard Specification for Pedestrian and Light Traffic Paving Brick*.

ii) ASTM C936 - *Specification for Interlocking Concrete Paver Units*.

iii) Brick Institute of America (BIA), applicable section.

iv) *International Building Code*, applicable section.

e) Submittals.

i) The Contractor shall submit to the Engineer for approval the manufacturer's technical data for each manufactured product, including certification that each product complies with requirements of the contract documents.

ii) Samples.

(1) The Contractor shall submit to the Engineer for approval a set of samples (minimum 5 per set) of each size of each brick paver or material specified in the contract documents. Each set shall include a full range of exposed color and texture to be expected in the completed work.

(2) The Contractor shall submit to the Engineer, for approval, cured samples of each type of grout and mortar, showing range of color to be expected in the completed work.

(3) The Contractor shall submit samples prior to constructing mock-up panels.

57.03 Construction Requirements.

a) General.

i) The Contractor shall coordinate with other trades to make provisions for the installation of required adjacent work to avoid cutting and patching of newly installed masonry paving.

ii) The Contractor shall execute masonry paving using skilled masons experienced in laying flat masonry work.

iii) The Contractor shall not install mortared work when ambient temperature is below 35° F or when there is a danger of freezing before mortar is set. The Contractor shall protect masonry from freezing for forty-eight (48) hours after being laid.

iv) The Contractor shall lay masonry paving only over a concrete slab having the dimensions and elevations as indicated in the contract documents.

v) The Contractor shall only lay masonry units which are clean and without chips or cracks. Cracked, chipped or broken units shall not be used in the work.

vi) The Contractor shall provide specified job mock-ups and shall not proceed without acceptance by the Engineer, in writing, of the mock-ups for visual quality.

b) Quality Assurance.

i) The Contractor shall have not less than five (5) years of successful experience in the required types of masonry paving. Any subcontractor shall meet this requirement as well.

ii) The Contractor shall not change sources of brands for masonry units, setting materials or grout during progress of the work.

c) Product, Delivery, Storage and Handling.

i) The Contractor shall protect paving materials during storage and construction against moisture, soiling, staining and physical damage.

ii) The Contractor shall handle brick and pavers to prevent chipping, breakage, soiling.

iii) The Contractor shall store brick and pavers on wood skids or pallets covered with a non-staining, waterproof membrane. Place and stack skids or pallets to distribute weight evenly and to prevent breakage or cracking of brick or pavers. Protect stored brick and pavers from weather with a waterproof, non-staining cover or enclosure that will allow air to circulate around stored materials.

d) Job Mock-up.

i) Prior to installation of paving, the Contractor shall provide a sample panel at the site of each pattern and material specified in the contract documents as masonry paving, minimum 5' x 5' square, over slab and specified setting bed. The mock-up shall provide the jointing as specified.

ii) The Contractor shall replace unsatisfactory mock-ups as directed by and until acceptable to the Engineer.

iii) The Contractor shall obtain the Engineer's acceptance of the visual qualities of mock-up panels before the start of finished masonry paving.

iv) The Contractor shall retain sample panels during construction as a standard for judging completed masonry paving work.

v) The Contractor shall not alter, move or destroy the mock-up until work is completed.

e) Job Conditions.

i) The Contractor shall review installation procedure and coordination with other work, and other contractors and subcontractors whose work may be affected.

ii) Weather.

(1) The Contractor shall not use frozen materials or materials mixed or coated with ice or frost. Salt shall not be used to thaw ice. The Contractor may lower the freezing point of mortar by using admixtures or anti-freeze agents. Calcium chloride shall not be used in mortar or grout.

(2) The Contractor shall not build on frozen work. The Contractor shall remove and replace masonry paving damaged by frost or freezing.

(3) During all seasons, the Contractor shall protect partially complete masonry paving against weather when work is not in progress

(4) The Contractor shall comply with requirements of Brick Institute of America (BIA) Technical Notes, N.1A *Cold Weather Masonry Construction – Construction and Protection Recommendations.*

f) Installation.

i) Butt-Joint Applications.

(1) Lay masonry paving only over a concrete slab of the dimensions and elevations specified in the contract documents. The Contractor shall verify dimensions and elevations prior to commencing any masonry paving work.

(2) Install paving units in a setting bed of Type M mortar approximately three-fourths of an inch (3/4") thick. Butt paving units tightly together. Use string lines to keep straight lines. Saw-cut edges when full-size units cannot be used. Select units from at least three (3) pallets or cubes to blend color and texture variations.

(3) Remove excess mortar promptly as work progresses.

(4) Lay paving units into the pattern specified in the contract documents or as specified by the Engineer with straight, uniform joints.

(5) Level surface to the elevation shown.

(6) Fill joints with sharp sand. Sweep and re-apply sand as many times as necessary throughout warranty period so as to fill and secure joints.

ii) Mortar-Joint Applications.

(1) Lay masonry paving only over a concrete slab of the dimensions and elevations specified in the contract documents. The Contractor shall verify dimensions and elevations prior to commencing any masonry paving work.

(2) Install paving units in a setting bed of Type M mortar approximately three-fourths of an inch (3/4") thick with full joints. Use string lines to keep straight lines. Saw-cut edges when full-size units cannot be used. Select units from at least three (3) pallets or cubes to blend color and texture variations.

(3) Remove excess mortar promptly as work progresses.

(4) Lay paving units into the pattern specified in the contract documents or as specified by the Engineer with straight, uniform joints.

(5) Level surface to the elevation shown.

(6) Strike 3/8" joints flush with the top surfaces and tool slightly concave.

(7) Cure mortar by maintaining in a damp condition for seven (7) days.

(8) Install joint filler and sealant where indicated.

g) Adjusting, Pointing and Cleaning.

i) When mortar has set and hardened, the Contractor shall clean all exposed surfaces leaving all paver surfaces clean, free of mortar daubs, smears or stains, with tight uniform joints throughout.

ii) The Contractor shall remove and replace masonry units that are broken, chipped, stained, or otherwise damaged. Provide new matching units, install as specified and point-up joints to eliminate evidence of replacement. Re-point defective and unsatisfactory joints as required to provide a neat, uniform appearance. Re-clean where necessary. Eliminate evidence of replacement.

iii) The Contractor shall adjust pavers to flush if settlement occurs. Continue adjustment throughout warranty period and immediately upon settlement occurring.

iv) The Contractor shall provide final protection and maintain conditions in a manner which ensures masonry paving is without damage, discolorations, or deterioration during subsequent construction and until time of substantial completion.

57.04 Method of Measurement. The accepted masonry paving shall be measured in square feet, complete in place, measured parallel to the surface on which it is placed.

57.05 Basis of Payment. The accepted masonry paving, measured as noted above, shall be paid for at the unit price bid which shall be payment in full for furnishing all materials, equipment, labor, tools, and other incidentals necessary to complete the work.

END OF SECTION

SECTION 58 – JOINT FILLER, CAULKING AND SEALANTS

58.01 Description. The work under this section is to include furnishing and installing joint filler, caulking and sealants as specified in the contract.

58.02 Materials.

a) Submittals. Before beginning any caulking or sealant work or delivery of materials to the site, the Contractor shall submit to the Engineer for approval the product data for any type or types of joint fillers, caulking and/or sealants proposed for use. Product data includes manufacturer's specifications, handling/installation/curing instructions, performance tested data sheets for each product required, and color samples.

b) General.

i) The Contractor shall provide the colors indicated in the contract or, if not otherwise indicated, as selected by Engineer from the manufacturer's standard colors.

ii) The Contractor shall select materials for compatibility with joint surfaces and other indicated exposures, and except as otherwise indicated; select modules of elasticity and hardness or grade recommended by manufacturer for each application indicated.

iii) Where exposed to foot traffic, the Contractor shall select non-tracking materials of sufficient strength and hardness to withstand stiletto heel traffic without damage or deterioration of sealer system.

iv) The Contractor shall furnish primer as recommended by sealant manufacturer.

c) Preformed Joint Filler.

i) General.

(1) Preformed joint filler units shall be furnished in one piece of the length, thickness, and depth shown in the contract for a complete joint, unless otherwise authorized by the Engineer. When the use of more than one piece is authorized, the abutting ends shall be fastened securely and held accurately in place to correct shape by stapling or other satisfactory means.

(2) Damaged filler units shall be rejected.

ii) Expansion Joint Filler.

(1) Redwood board or one of the materials provided by AASHTO M153 or AASHTO M213, with the latter being modified to allow a maximum of twenty-five percent (25%) water absorption may be used. If the Contractor elects to use redwood, it shall meet the requirements set forth in ALDOT's *Standard Specifications for Highway Construction,* latest edition.

(2) Preformed bituminous-type joint filler shall meet the requirements of AASHTO M33 or AASHTO M213, the latter being modified to allow a maximum of twenty-five percent (25%) water absorption.

(3) Preformed recycled rubber joint filler shall meet the requirements of ASTM D1752-84 (AASHTO M153).

d) Poured Joint Sealers.

i) General.

(1) Poured sealers may be used for sealing both expansion joints and construction joints in concrete sidewalks and wheelchair ramps.

(2) Vertical joints shall require the use of a non-sag compound.

(3) The joint configuration shown by the plan details may require the use of a backer rod or strip to insure proper shape of the joint sealer. When a backer rod or strip is necessary, it shall be compatible with the sealant and no bond or reaction between the sealant and backer rod or strip shall occur. A bond breaking tape may be used to insure no bond occurs between the two materials.

ii) Low Modulus Silicone Cold Poured Joint Sealant.

(1) This type sealant shall be a resilient adhesive compound capable of effectively sealing joints from infiltration of incompressible materials and water throughout repeated contraction and expansion cycles.

(2) The sealer shall be capable of being prepared on the job site and may be placed by machine, pressure gun, or by hand. The compound, when used in other than horizontal joints, shall be capable of conforming to the slope face without sagging.

(3) The compound shall be a homogeneous blend of materials meeting the following requirements:

TEST	REQUIREMENT	TEST METHOD
Flow	0.2 inches max.	ASTM D1851
Tack free time @ 77° F., plus/minus 3° and 45-50% R.H.	100% @ 75 minutes	ASTM C679
Durometer harness cured 7 days @ 77° F. plus/ minus 3° & 45-50% R.H.	10 - 25	ASTM D2240 Shore A
Tensile Stress @ 150 % elongation (7 day cure @ 77° F. plus/minus 3° and 45-50% R.H.)	45 psi maximum	ASTM D412 Die C
Bond (using mortar blocks)	1/4 inch max. as per Item 3.3 of ASTM D1850	ASTM D1851

(4) The Contractor shall furnish evidence to the Engineer that the proposed joint sealant meets these requirements prior to incorporating the sealant into the work.

e) Other Types of Joint Fillers, Caulking and Sealants . In addition to the types of materials noted in this section, other types developed may be approved for use by the Engineer or when specified by the contract.

f) Quality Assurance. Except as otherwise indicated, caulking and sealants are required to establish and maintain airtight, waterproof continuous seals on a permanent basis, within recognized limitations to wear and aging, as indicated for each application. Failures of installed sealers to comply with this requirement shall be recognized as failures of materials and workmanship.

58.03 Construction Requirements.

a) General. The Contractor shall examine substrates, joint surfaces and conditions under which caulking and sealant work is to be performed. The Contractor shall notify Engineer in writing of unsatisfactory conditions. The Contractor shall not proceed with work until unsatisfactory conditions have been corrected to the satisfaction of the installer.

b) Preparation. The Contractor shall clean all joints before sealing, removing all dust, moisture and loose materials. The Contractor shall etch concrete and masonry joint surfaces as recommended by the manufacturer. The Contractor shall prime joints where required or recommended by sealant manufacturer.

c) Installation.

i) The Contractor shall comply with the manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where the manufacturer's technical representative directs (in writing) otherwise.

ii) The Contractor shall install sealant to size and shape shown on the drawings and to the requirements of the sealant manufacturer. Support sealant with backer rod if shown in the contract.

iii) The Contractor shall not execute any caulking or sealant work when the temperature is below 40^{o} F or during rainy or wet conditions

58.04 Method of Measurement. No measurement shall be made for joint fillers, caulking or sealants.

58.05 Basis of Payment. No direct payment shall be made for furnishing all material, labor and equipment necessary for the installation of joint fillers, caulking and sealants. This work shall be considered as an incidental and necessary part of the work, the cost of which shall be included in the unit prices bid for other items of work.

END OF SECTION

SECTION 59 - MEMBRANE WATERPROOFING

59.01 Description. The work described in this section shall include providing and installing elastomeric membrane waterproofing with sealed joints to form concealed waterproof membranes as specified in the contract.

59.02 Materials.

a) Submittals.

i) The Contractor shall submit to the Engineer the manufacturer's complete and current product data, including certification of compliance.

ii) The Contractor shall identify membrane and each auxiliary product and indicate where it shall be used in the waterproofing application. Contractor shall verify the products' intended uses are as recommended by manufacturer.

b) Asphalt Extended Urethane Waterproofing. The Contractor shall furnish a high solids, two component, liquid, cold applied, chemical resistant asphalt extended urethane elastomer that cures to a durable abrasion resistant film, forming a flexible, impermeable barrier to water and most aqueous agents and meeting the following requirements:

i) Minimum dry film thickness: 70 mil,

ii) Tensile Strength: 570 psi minimum, per ASTM D412, 100 mil sheet,

iii) Ultimate Elongation: 350% minimum, per ASTM D412,

iv) Hardness: 52, Shore A, min. Per ASTM D2240 @ 77^{o} F,

v) Mullen Burst Strength 150 psi min., per ASTM D751, 50 mil.,

vi) Tear Strength: 118 lbs./in. Per ASTM D624 (Die C),

vii) Deflection (Minimum Use) Temperature: Minus 60^{o} F, per ASTM D648, and

viii) Permeability to Water Vapor: 0.03 perms, per ASTM E96 Method E, 100^{o} F, 100 mil sheet.

c) Auxiliary Materials.

i) The Contractor shall furnish a bonding agent, fillet material and tapes, and polyester fabric scrim as recommended by the manufacturer, to bond to substrate and make seams, corners, terminations, joints and flashing waterproof.

ii) The Contractor shall furnish a top coating recommended by the manufacturer to protect exposed membrane.

iii) The Contractor shall furnish metal flashing where indicated and where reasonably best provided as part of waterproofing system.

iv) The Contractor shall furnish a protection course if recommended by the manufacturer.

59.03 Construction Requirements.

a) Inspection. The Contractor shall examine the substrate and notify the Engineer, in writing, if unacceptable. Do not begin work until unacceptable conditions are corrected.

b) Preparation.

i) Before proceeding with work, the Contractor shall ensure substrate construction is complete and current and forecasted weather conforms to the manufacturer's recommendations.

ii) Before installation, the Contractor shall meet at site with installer or manufacturer's representative, testing agency representatives, and installers of related work, to review materials and procedures.

iii) The Contractor shall properly prepare all surfaces following the manufacturer's recommendations. All surfaces shall be clean and dry prior to application. Contractor shall prepare surfaces as follows or as recommended by the manufacturer:

(1) Steel in non-immersion service shall be cleaned in accordance with Steel Structures Paint Council Surface Preparation Specification No. 10 (SSPC-SP10 - Near-White Blast Cleaning).

(2) Concrete with a Class B Float Finish. Clean, fully cured concrete without release agents or curing compounds; brush off blast or acid etch as appropriate for surface contaminants.

(3) Non-ferrous metals shall be cleaned in accordance with SSPC-SP1- Solvent Cleaning. Clean and brush off blast to roughen and de-gloss surface.

iv) The Contractor shall use a bonding agent for non-porous surfaces as recommended by the manufacturer. The Contractor shall apply bonding agent to cover as recommended by manufacturer

c) Installation.

i) The Contractor shall not perform installation if any one or more of the following conditions exist:

(1) Material temperature at the time of application is below 60^{o} F,

(2) Surface temperature is below 50^{o} F,

(3) Surface moisture is present or rain is imminent,

(4) Surface temperature drops below dew point,

(5) Full sun shining on a surface,

(6) Concrete is in a temperature-rising mode, or

(7) Other conditions are obviously unsuitable.

ii) The Contractor shall follow manufacturer's instructions relative to installation of the membrane.

d) Coating. The Contractor shall recoat within a reasonable time after bottom coat firms to obtain maximum interlayer adhesion. Recoating must occur within four (4) hours of first coat. If membrane has cured more than four (4) hours, it must be abraded with brush off blast, wire brush or sandpaper and bonding agent applied and allowed to completely dry before recoating.

e) Joints. If conditions require work stoppage before application is complete, the Contractor shall follow manufacturer's instructions for joint lines. Joint lines shall be clean and straight with a minimum overlap

of six (6) inches to assure impervious joint. All areas to be coated where more than four (4) days cure has occurred shall be abraded with sand sweep (light sandblast), wire brush or sandpaper and bonding agent applied following manufacturer's recommendations.

f) Fabric Reinforcement. The Contractor shall use polyester fabric scrim to achieve specified dry mil thickness over unusually irregular surfaces, following manufacturer's recommendations for use of fabric reinforcement.

g) Cleaning and Protection. After completion, the Contractor shall remove any masking materials and stains from exposed surfaces.

h) Quality Assurance.

i) The Contractor shall obtain primary materials from single manufacturer and shall provide secondary materials as recommended by the primary manufacturer.

ii) Manufacturer-approved installer shall have at least five (5) years experience with systems similar to that specified.

iii) Prior to installation, the Contractor shall meet at project site with installers of associated work requiring coordination with waterproofing work.

iv) The Contractor shall review material selections and procedures to be followed in performing work. Notify the Engineer at least forty-eight (48) hours prior to meeting.

v) The Contractor shall be responsible for incidental work related to waterproofing system when recommended by the manufacturer. This may include, but is not limited to, vapor barriers, metal flashing and counter flashing and joint sealers.

vi) The Contractor shall cause the manufacturer's representative to visit the job during waterproofing installation to review installation procedures.

59.03 Method of Measurement. The accepted membrane waterproofing shall be measured in square feet, complete in place, measured parallel to the surface on which it is placed.

59.04 Basis of Payment. The accepted membrane waterproofing, measured as noted above, shall be paid for at the unit price bid which shall be payment in full for furnishing all materials , equipment, labor, tools, and other incidentals necessary to complete the work.

END OF SECTION