

CITY
STANDARD
SPECIFICATIONS

FOR

CITY OF JACKSONVILLE
FLORIDA
DEPARTMENT
OF PUBLIC WORKS

COMPLETE THROUGH REVISION #16

August 1996

CITY STANDARD
SPECIFICATIONS AND DETAILS

REVISIONS

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| 15 | | November, 1995 |
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TO: ALL USERS OF CITY STANDARD SPECIFICATIONS

This is a compilation of Division V, Technical Specifications; the Standards for all construction which, ultimately, will be dedicated to, and therefore maintained by, the City. It contains the following Standards:

| <u>Technical Specifications</u> | <u>Section Number</u> |
|---------------------------------|-----------------------|
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| Drainage | 200-299 |
| Water | 300-399 |
| Sewer | 400-499 |
| Traffic | 500-599 |

To compliment these "City Standard Specifications", the Department of Public Works publishes a volume entitled, "City Standard Details", a volume entitled "City Standard Construction Contract Documents" and a volume entitled "Land Development Procedures". In addition to abiding by these three Standards, the designer may be required to meet the provisions of City Ordinances and Building Codes, and State and Federal laws and regulations.

Those individuals, firms and corporations under contract with the City to prepare plans and specifications for construction of City projects will require all four (4) volumes, and will be required to create a tailored set of specifications for each project in accordance with the format of the Table of Contents contained in the "City Standard Construction Contract Documents".

For "first time" Consultants, the Office of the City Engineer, will make available a set of specifications of a similar completed project, thereby permitting the Consultant to more easily create a set of Specifications acceptable to the City.

Those who are not under contract to the City, but who are preparing plans and specifications for construction of streets and bridges, drainage structures and systems, and potable water and sewer collector systems, will be required to comply with the Standards and Details. They will not, however, be required to prepare their contract document in the same manner as is required for projects developed under contract with the City and, therefore, may not require the "City Standard Construction Contract Documents". The City, in this instance, is only interested in receiving a product built to City Standards.

This volume will be amended from time to time. The index of each of the sections contains revision dates. It is the responsibility of the owner of the individual documents to ascertain whether he or she is using the latest revised edition. If you are in doubt, you may call or write for a determination to:

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Revision #12, July 10, 1986

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SECTIONS 100-199

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(Revised 8/3/79, 11/3/80, 8/26/83, 5/20/92)

**SECTION 102
SITE PREPARATION**

102.1 **STANDARD SITE PREPARATION:**

Standard site preparation shall consist of the complete removal and disposal of all timber, brush, stumps, roots, grass, weeds, sawdust, rubbish and all other obstructions resting on or protruding through the surface of the existing ground and the surface of excavated areas.

Unless otherwise provided, the work shall also include, but not be limited to, removal and disposal of old pavement, drainage pipe culverts, headwalls, endwalls, etc.

102.2 **AREAS COVERED:**

Unless otherwise shown on the plans, Standard Site preparation shall be done within the following areas:

102.2.1 All areas where necessary to accomplish this project as directed by these plans & specifications.

102.2.2 All areas where excavation will be done, including borrow pits, lateral ditches, right-of-way ditches, etc.

102.2.3 All areas where roadway embankments or roadway base will be constructed.

102.2.4 All areas where structures will be constructed, including pipe culverts and other pipe lines.

102.3 **DEPTHS OF REMOVAL OF ROOTS, STOMPS AND OTHER DEBRIS:**

In areas where excavation is to be done and where the excavated material is to be used in the construction of roadway embankment or roadway base or pavement, all stumps, roots and other debris shall be removed to a depth of at least one (1) foot below the ground surface.

102.4 **REMOVAL OF TRASH, VEGETATION, ETC.:**

On roadways where no significant grading is necessary and no clearing and grubbing of the roadway is called for in the plans, all trash and all vegetation, including bushes, shrubs, saplings, become the property of the contractor.

102.5 **TREES TO REMAIN:**

As an exception to the above provisions, where so directed by the Engineer, desirable trees within the roadway area shall be trimmed, protected and left standing. Branches of the trees extending over the area occupied by the roadway shall be trimmed as directed, to give a clear height of sixteen (16) feet above the roadway.

102.6 **LEVELING TERRAIN:**

Within the areas between the limits of construction and the outer limits of clearing and grubbing all holes and other depressions shall

be filled, all mounds and ridges cut down, and the area brought to sufficiently uniform contour so that the owner's subsequent mowing and cutting operations will not be hindered by irregularities of terrain. This work shall be done regardless of whether the irregularities were the result of the Contractor's operations or existed originally. Permanent ponds or other permanent water areas, so designated by the Engineer, will not be required to be filled.

102.7 **DISPOSAL OF MATERIALS:**

102.7.1 **GENERAL DISPOSAL:**

Timber, stumps, brush, roots, rubbish and objectionable material resulting from clearing & grubbing shall become the property of the contractor.

102.7.2 **PAVING MATERIALS:**

Paving materials excavated in the removal of existing pavements, such as paving brick, asphalt block, concrete slab, limerock, sidewalk, curb & gutter, etc., shall be disposed of as approved the Engineer, and, if required by the Engineer, such materials shall be placed in neat piles within the designated areas.

102.7.3 When it is designated, the Contractor will be required to furnish at his own expense, the areas for disposal of unsuitable or surplus materials.

102.8 **BURNING:**

If debris are burned, all precautions necessary shall be exercised to prevent the spread of fire. Burning shall be done only at approved locations and in conformity with the regulations and requirements of agencies and officials having jurisdiction. The Contractor shall obtain and for any and all permits required thereof.

102.9 **DISTURBANCES OR EXISTING IMPROVEMENTS:**

Wherever the underground installation of utility lines will proceed through surface improvements previously made by the Owner, other governmental bodies, or adjacent property owners, the Contractor will be responsible for their protection and preservation, including necessary removal and storage of such improvements, and subsequent replacement to obtain to the fullest extent possible, the undisturbed condition.

102.10 **SHRUBS AND SOD:**

Shrubs and sod within the limits of trench excavation not shown or directed to be removed shall be taken up with sufficient root ball and soil, suitably stored and watered and replaced as soon as backfilling permits. Shrubbery and sod mishandled or damaged during construction operations so that it does not survive upon completion of the work shall be replaced with similar vegetation and maintained until survival is assured.

102.11 **FENCES AND RETAINING WALLS:**

If construction work so requires, affected fences and/or retaining walls shall be carefully removed and later re-installed by personnel qualified to accomplish such work. The condition of the re-installed facilities shall be equal to the original facilities, all subject to the Engineer's decision.

102.12 **RECREATIONAL PROJECTS:**

Site preparation for recreational projects shall include, but not be limited to, the removal and disposal of all trees, stumps, roots, rubbish and debris and all other obstructions resting on or protruding through the surface to a depth of two (2) feet below the finish grade for concrete slabs and one (1) foot below finish grade for natural ground.

102.13 **PAYMENT:**

Payment for the work specified in this section shall be included in the price submitted in the Proposal for Site Preparation.

(Revised 8/26/83)

**SECTION 103
EXCAVATION AND FILL**

103.1 **EXCAVATION:**

Excavation shall consist of the excavating of materials, of whatever nature, encountered within the limits required for the work. This includes the removal, utilization, and disposal of such materials, as required. It shall also include the excavation necessary for inlet and outlet ditches, and for all channel work unless specifically spelled out in the Proposal to be paid for as a separate item and shown on the drainage drawings. This work shall include all excavation and shaping necessary for construction, preparation, and completion of all embankments, sub-grades, shoulders, ditches, slopes, gutters, intersections, approaches, and private entrances; all in accordance with the required alignment, grade, and cross section shown in the Plans, or as directed by the Engineer. Payment for all excavation mentioned herein, unless specifically spelled out in the Proposal to be paid for as a separate item, shall be included in the lump sum price submitted in the Proposal for site preparation.

103.2 **UNSUITABLE MATERIALS:**

In the event that unsuitable material is encountered during this excavation, this material shall be removed and replaced with proper allowance for subsequent compaction. All submerged stumps, roots, muck, or other perishable matter encountered in preparation of the sub-grade shall be removed to a depth of at least three (3) feet below finished sub-grade and from two (2) feet behind curb or edge of paving to two (2) feet beyond the opposite curb or edge of paving. Should any doubt exist as to the suitability of material, an independent testing laboratory shall be engaged to perform soil analysis to classify the material in accordance with the American Association of State Highway & Transportation Officials Classification for Soils. Material classified by analysis as A-5, A-6, or A-7, is deemed unacceptable. All other material shall have a maximum Plasticity Index of 10 and a maximum Liquid Limit of 40.

When the plans or specifications contain the results of a soil survey, such data is not to be construed as a guarantee of the depth, extent or character of material present. It is the responsibility of the Contractor to make such examination of the site of the work, and of any material sources indicated in the plans, as may be necessary to inform himself of the conditions under which the work is to be performed.

103.3 **SALVABLE MATERIALS:**

All suitable material resulting from excavation shall be used where needed on the job site. Suitable material shall be used as shown on the Plans or required for completion of the work, as directed by the Engineer, including backfill of pipe trenches and spaces from which unsuitable materials are required to be excavated, whether anticipated or unanticipated. Final disposition of surplus salvable material, if applicable, shall be at the discretion of the Engineer.

103.4 **FILL:**

103.4.1 In the event that the excavated material does not meet the full requirements of the job in either quality or quantity, the Contractor shall be required to furnish any necessary fill.

103.4.2 Embankment or fill, other than load carrying, that is required shall be equal to or better than A-3 soil as set forth by the latest AASHTO Soil Classification standards. The fill materials shall be placed on the areas to be filled in layers not exceeding twelve (12) inches measured loose and compacted to 95% of the maximum density at optimum moisture as determined by AASHTO T180 Test. No fill shall be placed on a layer not sufficiently compacted or on existing ground not cleared of vegetation and all other organic and deleterious material.

All fill shall be placed to the line and grade shown on the drawings. Any fill furnished by the Contractor shall be paid for at the unit price established in the Proposal. Payment shall be based on the cubic yards compacted and in place as determined by recross-sectioning the limits of the area to be filled and calculated by the average end area method unless the Engineer determines that another method of calculation will provide a more accurate result.

For some situations where a small amount of fill is necessary, the special conditions may specify that the fill may be paid for as a part of site preparation or included in the unit price or lump sum price submitted for a project or a portion of a project.

103.5 **MAINTENANCE AND PROTECTION OF WORK:**

103.5.1 While construction is in progress adequate drainage for the roadbed shall be maintained at all times. A shoulder at least three (3) feet wide shall be maintained adjacent to all pavement or base construction in order to provide support for the edges.

103.5.2 The contractor shall maintain all earthwork construction throughout the life of the Contract, unless otherwise provided, and shall take all reasonable precautions to prevent loss of material from the roadway due to the action of wind or water. He shall repair at his expense, except as otherwise provided herein, any slides, washouts, settlements, subsidence, or other mishap which may occur prior to final acceptance of the work.

103.5.3 All channels excavated as part of the Contract work shall be maintained against natural shoaling or other encroachments to the lines, grades, and cross-sections shown in the Plans, until final acceptance of the project.

103.6 **UTILITY TRENCH BACKFILLING:**

All utility trenches shall be backfilled and finished to grade with soil similar to that adjacent to the trench, if suitable, or with approved granular backfill. Backfill under the pavement and out to a line extending on a 45 degree angle below the horizontal outward from the back of curb (or edge to pavement) shall be compacted to a density of at least 98% of the maximum density determined by AASHTO T180. Backfill outside the above limits shall be compacted to a

density comparable to the in-place material, sufficient to prevent subsidence in the cut area. If any settlement occurs, the trench cut shall be refilled, smoothed off, and finally made to conform to the surface of the surrounding ground. The resulting surface of the trenches shall conform and be equal in quality, character, and material to the original surface immediately prior to making the excavation, or to a higher quality, as may be shown on the Contract Plans & Provisions, and according to the Contract Bid Document.

103.7 **METHOD OF PAYMENT:**

Quantities shall be paid for as outlined in preceding paragraphs.

(Revised 8/3/79, 8/26/83)

SECTION 104
STABILIZED SUBGRADE

104.1 **SCOPE OF WORK:**

The work specified in this section consists of the preparation of the firm and unyielding subgrade having the required bearing value specified in the Plans & Specifications. It is intended that the desired bearing value be obtained regardless of the quality of the existing soil or materials available on the site.

104.2 **MATERIALS:**

The subgrade may consist of the existing soil and/or existing materials encountered on the site or of commercial and/or local borrow materials provided all materials comply with the following standards. No trash, organic matter or other deleterious clods will be allowed in the subgrade.

104.2.1 Maximum particle size shall be 3-1/2 inches with 97% passing a 1-1/2 inch sieve.

104.2.2 The liquid limit shall not exceed 25, and the plastic index shall not exceed 6.

104.2.3 All subgrade material for streets 1,000 feet or less in length, shall have a minimum average L.B.R. of 30. All subgrade material for streets over 1,000 feet in length shall have a minimum average L.B.R. of 40.

104.3 **METHOD OF CONSTRUCTION:**

After completion of the clearing and grubbing, and/or evacuation and fill operations, the subgrade shall be constructed to an elevation such that upon completion it will conform to the lines, grades and cross-section shown in the Plans. The Contractor shall use an independent laboratory to determine the appropriate testing if the existing materials have the required L.B.R., and meet the other criteria established in Section 104.2. If material with a low L.B.R. value is encountered within the limits of the subgrade, the Contractor shall either remove and replace such material with material having the correct L.B.R. value, in accordance with Section 104.3.1. or stabilize the existing materials in accordance with Sect. 104.3.2. If existing materials encountered within the limits of the subgrade have the required L.B.R. value as defined in Section 104.2, the Contractor is not required to remove or add stabilizing material to the existing subgrade but will be required to obtain the density requirements to a minimum depth of twelve inches below the design top of subgrade.

104.3.1 Unsuitable subgrade materials shall be removed to a minimum depth of twelve inches below the top of the subgrade. Suitable subgrade materials as specified in Section 104.2 shall be uniformly spread in maximum six inch layers and compacted to obtain the minimum density specified in Section 104.4.

104.3.2 When the contractor elects to stabilize the existing deficient materials, the method and choice of stabilizing material shall be determined by the contractor and approved by the Engineer. Commercial limerock or other approved stabilizing materials shall be thoroughly mixed with the existing material to a depth of twelve inches below the top of the subgrade.

104.4 **DENSITY REQUIREMENTS:**

Within the entire limits of the width and depth of subgrade, the minimum density acceptable at any location will be 98% of the maximum density as determined by the AASHTO T180 test.

104.5 **BEARING VALUE REQUIREMENT:**

The completed subgrade shall be constructed to obtain as a minimum L.B.R. shown in the Plan & Specifications. The contractor shall obtain and submit test results from an approved independent testing laboratory showing the results. A minimum of one test shall be taken per 1,000 lineal feet of roadway center line for each type of soil of completed subgrade.

104.6 **BEARING VALUE TOLERANCES:**

For subgrades specified to have a minimum average L.B.R. of 30, any material which test below an L.B.R. of 27 will be unacceptable. For "subgrades specified to have a minimum average L.B.R. of 40, any material which tests below an L.B.R. of 36 will be unacceptable.

104.7 **MAINTENANCE OF COMPLETED SUB-BASE:**

After the subgrade has been completed as specified above, the Contractor shall maintain it free from ruts, depressions and any damage resulting from adverse weather conditions or from the hauling or handling of materials, equipment, tools, etc. It shall be the Contractor's responsibility to maintain the required density until the subsequent base or pavement is in place. Such responsibility shall include any repairs, replacement, etc. of the curb and gutter, sidewalk, etc., which might become necessary in order to recompact the subgrade in the event of damage occurring to the previously prepared subgrade. Any such work required for recompaction shall be at the Contractor's expense. Ditches and drains may be constructed and maintained at the Contractor's discretion, along the completed subgrade section, but without additional cost to the City. All such drainage facilities shall be closed prior to the completion of construction, without additional cost to the City.

104.7 **METHOD OF PAYMENT:**

Unless specified otherwise in the Special Conditions, subgrade prepared to the limits shown on the Plans shall be paid for at the Contract unit price established in the Proposal for subgrade complete and accepted regardless of the method of construction or amount of stabilizing material used to obtain the required bearing value. Quantities will be determined by field measurements of acceptable subgrade in square yards of surface area.

This should be paid for one of two items:

1. Square yards of stabilized subgrade.
2. Subgrade density preparation only.

Revised 7/1/82, 8/26/83

**SECTION 105
LIMEROCK BASE COURSE**

105.1 **DESCRIPTION:**

The work specified in this section consists of the construction of a base course composed of limerock. It shall be constructed on the prepared subgrade, in accordance with these specifications and in conformity with the lines, grades, notes and typical cross sections shown in the plans, and the Florida Department of Transportation Specifications, Section 911.

105.2 **MATERIALS:**

Where new limerock is used to construct the base course it shall be classified either as Ocala Formation or as Miami Oolite Formation limerock unless a particular type is designated in the Special Conditions.

105.3 **EQUIPMENT:**

The rock shall be spread by mechanical rock spreaders, equipped with a device which strikes off the rock uniformly to laying thickness, and capable of producing an even distribution of the rock. For crossovers, intersections and ramp areas; for roadway widths of twenty (20) feet or less; for the main roadway area when forms are used and for any other areas where the use of mechanical spreader is not practicable; spreading may be done by bulldozers or blade graders.

105.4 **TRANSPORTING LIMEROCK:**

The limerock shall be transported to the point where it is to be used, over rock previously placed if practicable, and dumped on the end of the preceding spread. Hauling over the subgrade and dumping on the subgrade will be permitted when, in the Engineer's opinion, these operations will not be detrimental to the base.

105.5 **SPREADING LIMEROCK:**

105.5.1 **METHOD OF SPREADING:**

The limerock shall be spread uniformly, with equipment as previously specified. All segregated areas of fine or coarse rock shall be removed and replaced with properly graded rock.

105.5.2 **NUMBER OF COURSES:**

When specified compacted thickness of the base is greater than six (6) inches, the base shall be constructed in two courses. The thickness of the first course shall be approximately one-half the total thickness of the finished base, or enough additional to bear the weight of the construction equipment without disturbing the subgrade.

105.5.3 **LIMEROCK BASE FOR SHOULDER PAVEMENT:**

Except as might be permitted otherwise by the Engineer for special cases, all operations of the constructing limerock base for shoulder construction at any particular location shall be done prior to the placing of the final course of pavement on the traveled roadway. In the construction of limerock base on the shoulders, the Contractor shall assure that the dumping of the limerock material shall be at such points, and in such a manner, that no significant material is allowed on significant material is allowed on the adjacent pavement, to scar or contaminate the pavement surface. Any limerock material which is deposited on the surface course for any reason shall be immediately swept off.

105.6 **COMPACTING & FINISHING BASE:**

105.6.1 **SINGLE-COURSE BASE:**

For single-course base, after spreading is completed the entire surface shall be scarified and then shaped so as to produce the required grade and cross section after compaction.

105.6.2 **DOUBLE-COURSE BASE:**

For double-course base, the first course shall be cleaned of foreign material and bladed and brought to surface cross section approximately parallel to that of the finished base. Prior to the spreading of any material for the upper course, the density test for the lower course shall be made and the Engineer shall have determined that the required compaction has been obtained. After the spreading of the material for the second course is completed, its surface shall be finished and shaped so as to produce the required grade and cross section after compaction, and free of scabs and laminations.

105.6.3 **MOISTURE CONTENT:**

When the material does not have the proper moisture content to insure the required density, wetting or drying will be required. When water is added it shall be uniformly mixed-in by disking to the full depth of the course which is compacted. Wetting or drying operations shall involve manipulation, as a unit, of the entire width and depth of the course which is being compacted.

105.7 **DENSITY REQUIREMENTS:**

105.7.1 As soon as proper conditions of moisture are attained the material shall be compacted to a density not less than 100% of the maximum density as determined by AASHTO T180. The minimum density which will be acceptable at any location outside the traveled roadway (Such as intersections, crossovers, turnouts, etc.) shall be 95% of such maximum. Limerock base for shoulder pavement shall be compacted to a density not less than 95% of the maximum density determined by AASHTO T180.

105.7.2 All limerock shall achieve a minimum of 75 L.B.R.

105.8 **DENSITY TEST:**

At least three density determinations shall be made on each day's final compaction operations on a each course, and the density

determinations shall be made at more frequent intervals if deemed necessary by the Engineer. During the final compacting operations, if blading of any areas is necessary to obtain the true grade and cross section, the compacting operations for such areas shall be-completed prior to making the density tests on the finished base.

105.9 **CORRECTION OF DEFECTS:**

105.9.1 **CONTAMINATION OF BASE MATERIAL:**

If, at any time, the subgrade material should become mixed with the base course material, the Contractor shall, without additional compensation, dig out and remove the mixture, reshape and compact the subgrade and replace the materials removed with clean base material, which shall be shaped and compacted as specified above.

105.9.2 **CRACKS AND CHECKS:**

If cracks or checks appear in the base, either before or after priming, which, in the opinion of the Engineer, would impair the structural efficiency of the base, the Contractor shall remove the cracks or checks by rescarifying, reshaping, adding base material where necessary, and recompacting.

105.9.3 **COMPACTION OF WIDENING STRIPS:**

For limerock base widening strips, where the trench width is not sufficient to permit the use of standard compaction equipment, compaction shall be to the extent directed by the Engineer and shall be obtained by vibratory compactors, trench rollers, or other type rolling equipment approved by the Engineer. Also, if so required by the Engineer in order to obtain adequate compaction, and where practicable, the hauling trucks (and other pneumatic-tired equipment) entering and leaving the site of the construction operations shall aid in the compaction operations by driving with one pair of wheels over the base widening. The loaded trucks, however, shall not be used until the widened section has reached the elevation of the existing pavement surface.

105.10 **TESTING SURFACE:**

The finished surface of the base course shall be checked with a templet cut to the required crown with a fifteen (15) foot straight edge laid parallel to the center line of the road. All irregularities greater than { inch shall be corrected by scarifying and removing or adding rock as required, after which the entire area shall be recompacted as specified hereinbefore. In the testing of the surface, the measurements will not be taken in small holes caused by individual pieces of rock having been pulled out by the grader.

105.11 **PRIMING & MAINTAINING:**

105.11.1 **PRIMING:**

The prime coat shall be applied only when the base meets the specified density requirements and the moisture content in the top half of the base does not exceed 90% of the optimum moisture of the

base material. At the time of priming, the base shall be firm, unyielding and in such condition that no undue distortion will occur.

105.11.2 MAINTAINING:

The Contractor will be responsible for assuring that the true crown and templet are maintained, with no rutting or other distortion, and that the base meets all the requirements, at the time the surface course is applied.

105.12 THICKNESS REQUIREMENTS:

105.12.1 MEASUREMENTS:

Thickness of the base shall be measured at intervals of not more than 200 feet. Measurements shall be taken at various points on the cross section, through holes not less than three (3) inches in diameter.

105.12.2 AREAS REQUIRING CORRECTION:

Where the compacted base is deficient by more than -1 inch from the thickness called for in the plans, the contractor shall correct such areas by scarifying and adding rock. The base shall be scarified and rock added to a distance of 100 feet in each direction from the edge of the deficient area. The affected areas shall then be brought to the required state of compaction and to the required thickness and cross section.

105.13 AUTHORIZED VARIABLE THICKNESS BASE:

Where the base is constructed to a compacted thickness other than the normal thickness as on a typical section in the Plans; as called for on the Plans or ordered by the Engineer for providing transitions to connecting pavements; the volume of such authorized variable thickness compacted base shall be calculated from authorized lines and grades, or by other methods selected by the Engineer, and shall be converted to equivalent square yards of normal thickness base for payment.

105.14 BASIS OF PAYMENT:

The quantity of limerock base, determined as provided above, shall be paid for at the contract unit price per square yard for Limerock Base, completed and accepted. Such price and payment shall be full compensation for all work specified in this Section, including correcting all defective surface and deficient thickness. The cost of removing cracks and checks, including additional limerock required for such crack elimination, shall not be paid for separately but shall be included in the contract unit price per square yard for the base.

SECTION 106
BITUMINOUS BASE COURSE

106.1 **SCOPE OF WORK:**

The work specified in this Section consists of constructing a hot-mixed, hot-laid bituminous base course, in accordance with these specifications and in conformity with lines, grades, width and thicknesses, shown in the plans. Specific requirements for hot-mix base widening construction are also contained in this Section.

106.2 **BASE COURSE MIXES:**

106.2.1 **TYPE OF MIX:**

In general, Sand-asphalt Hot Mix (Section 335 D.O.T. Specifications, Current Edition) will be specified for base and base widening courses, but in special cases, a mix with higher stability may be required.

106.2.2 **SUBSTITUTION OF MIX:**

The provisions of General Construction Requirements Section, pertaining to the substitution of other types of mixes for the mix specified, shall apply to base course mixes.

106.2.3 **MATERIAL REQUIREMENTS:**

The requirements for the materials, mixes, proportions and control, for the various types of mixes in these base courses shall be specified in Section 106, 113, or 114, as applicable.

106.3 **PLANT, METHODS & EQUIPMENT:**

The requirements for plant, methods and equipment, for hot bituminous mixtures, as specified in Section 111, shall apply to hot-mix base courses, with the following modifications.

106.3.1 **PAVING EQUIPMENT:**

Mechanical spreading and finishing equipment will not be required for the construction of base widening strips less than six (6) feet in width.

106.3.2 **COMPACTING EQUIPMENT:**

For compaction in areas too restricted to accommodate the standard rollers, vibratory rollers may be used and may be supplemented by the use of trucks, motor graders or other compaction equipment approved by the Engineer.

106.4 **CONSTRUCTION REQUIREMENTS:**

106.4.1 **GENERAL:**

The construction requirements for Hot Bituminous Mixtures, as specified in Section 110, shall apply to the construction

of hot bituminous base and widening courses, with modifications and specific requirements specified below.

106.4.2 LIMITATIONS FOR SPREADING:

The hot mix base material may be placed on the subgrade when the air temperature is at least 40 degrees F and rising, provided that the subgrade upon which it is to be placed is not frozen or noticeably affected by frost. Where the excavation for the subgrade has removed all such frozen or frost affected material, the base material may be placed under such temperature conditions.

106.4.3 PREPARATION OF SUBGRADE & UNDERLYING COURSES:

106.4.3.1 Subgrade: Before the initial layer of hot bituminous base material is placed, the subgrade shall be prepared and compacted as specified in Section 104. This requirement will not apply to base widening strips that are not to be stabilized and where underlying native material has not been disturbed.

106.4.3.2 Tack Coat between Layers: A tack coat shall be placed between each successive layer of base material. As an exception, the Engineer may authorize the elimination of the tack coat between successive layers when they have been laid on the same day and the initial layer has not become contaminated by sand, dust, etc.

106.4.4 PLACING THE MIXTURE:

106.4.4.1 Spreading & Finishing: The base course material shall be placed with a mechanical spreading and finishing machine meeting the requirements specified in Section 111 hereinafter. Prior to the placing of the surface course the Engineer may require the motor grader leveling, to bring the base into conformance with the plan grades and cross section. A motor grader may be used in spreading the first course of multiple-course base when the subgrade will not permit the use of a mechanical spreader.

106.4.4.2 Automatic Screed Control: For all machine-laid courses, the paver shall be equipped with automatic screed control of the ski or traveling string line type. The automatic joint matcher shall be used on the top course of the base after the first pass with the paving machine.

106.4.4.3 Thickness of Layers: Unless otherwise specified, the maximum compacted thickness of any layer of base course material shall be three (3) inches.

106.4.5 COMPACTING THE MIXTURE:

The requirements for compaction of Hot Bituminous Mixtures, as contained in Section 115, shall apply to the compaction of the base course mixture, with the following modifications or exceptions.

106.4.5.1 Equipment for Base Widening: When the width of the base widening strip prevents the use of the standard rollers the Contractor may use his choice of compaction equipment, subject to the approval of the Engineer.

106.4.5.2 Traffic Rollers: When the traffic roller begins to rut the base course the Contractor may reduce the weight by removing ballast or substitute a lighter traffic roller that will not distort the surface.

106.5 **BASIS OF PAYMENT:**

The compensation for hot bituminous base course shall be in accordance with the applicable requirements of Section 113, 114, or 115, for the particular type of bituminous mixture used in the base course.

**SECTION 110
BITUMINOUS MATERIALS**

110.1 **ASPHALT CEMENT:**

The grades of asphalt cement shall conform to the requirements given in the following table:

REQUIREMENTS FOR ASPHALT CEMENT

| Test | Viscosity Grade | | | |
|--|-----------------|-----|--------------|-----|
| | AC-5 | | AC-20 | |
| | Min | Max | Min | Max |
| Viscosity, 140°F (60°C), Poises | 500 +/- 100 | | 2000 +/- 400 | |
| Viscosity, 275°F (135°C), Cs | 175 | - | 300 | - |
| Penetration, 77°F (25°C), 100 gm, 5 sec. | 140 | - | 60 | - |
| Flash Point, COC, °F | 350 | - | 450 | - |
| Solubility in Trichloroethylene, per cent | 99.0 | - | 99.0 | - |
| Test on Residue from Thin Film Oven Test: | | | | |
| Visc. Ratio = $\frac{\text{Vise. 140°F after TFOT}}{\text{Vise. 140°F before TFOT}}$ | - | 4 | - | 4 |
| Ductility, 77°F (25°C) 5 Cm per Min, Cm | 100 | - | 80 | - |

Spot Test (when and as specified). (See Note Below):

Standard with Naphtha Solvent - Negative for all grades
 Naphtha-Xylene Solvent - percent Xylene - Negative for all grades
 Heptane-Xylene Solvent - percent Xylene - Negative for all grades

Note: The use of the spot test is optional. When it is specified the Engineer shall indicate whether the standard naphtha solvent, the naphtha-xylene solvent or the heptane-xylene solvent will be used in determining compliance with this requirement, and also, in the case of xylene solvents, the percentage to be used.

110.1.1 Certification as to viscosity shall be submitted for all viscosity-grade materials delivered to the project.

110.1.2 For Viscosity Grade AC-20, silicone shall be added to the asphalt cement at the rate of 25 cubic centimeters of silicone mixed to each 5,000 gallons of asphalt cement. If a dispersing fluid is used in conjunction with the silicones, the resultant mixture containing the full 25 cubic centimeters shall be added in accordance with the manufacturer's recommendation.

110.1.3 The blending of silicone mixture with the asphalt cement shall be done by the producer prior to shipment. The producer shall furnish a certificate indicating compliance with the above requirements.

110.2 **COT-BACK ASPHALT, RAPID-CORING TYPES:**

110.2.1 Rapid-curing cut-back asphalt shall conform with the requirements of AASHO M81 except that the penetration range shall be from 60-120 instead of 80-120.

110.2.2 For grade RC-3000, in addition to the requirements show in Table 1 of AASHO M81 the following values shall be added to the requirements for Distillation Test:

| <u>Distillate, percentage by volume of total distillate to 680°F</u> | <u>Grade RC-3000 Max.</u> |
|--|-------------------------------|
| to 320°F | 0 |
| to 374°F | 10 |
| to 437°F | 40 |

110.2.3 All other requirements for the distillation test (and for other properties included in the table) shall be shown in Table 1 of AASHO M81.

110.2.4 The penetration test will be made in accordance with AASHO T49.

110.3 **CUT-BACK ASPHALT, MEDIDM-CURING TYPES:**

These materials shall meet the requirements of AASHO M82.

110.4 **EMPLSIFIED ASPHALTS:**

These materials shall meet the requirements of AASHO M1 40 (for anionic) and M208 (for cationic).

110.5 **PRIME & TACK COAT MATERIALS:**

110.5.1 PRIME COAT:

The material used for prime coat shall be cut-back asphalt. Grade RC-70 or RC-250, meeting the requirements or other types and grades of prime material which may be specifically called for in the plans or by the special provisions. Unless otherwise indicated on the plans the use of RC-70 or RC-250 shall be at the Contractor's option.

110.5.2 COVER MATERIAL FOR PRIME COAT:

The cover material for the prime coat shall be either sand (either bare or hot-asphalt coated or screenings, at the Contractor's option.

110.5.2.1 The sand shall be nonplastic and free from any appreciable amount of silt, clay balls and root particles, and from any noticeable sticks, trash, vegetation or other organic matter. Screenings shall be Miami Oolitic rock screenings or other rock screenings approved by the Engineer for this use.

110.5.3 TACK COAT:

Unless specific type or grade of material is called for in the plans or special provisions, the material used for tack coat shall be Emulsified Asphalt, Grade RS-2, meeting the requirements of Section 110.4.

**SECTION 111
PLANT, METHODS & EQUIPMENT**

111.1 **GENERAL:**

This section specifies the plant and methods of operation for preparing all plant-mixed hot bituminous mixtures for surface courses and bases, and the requirements for the equipment to be used in the construction of the pavements and bases.

111.2 **REQUIREMENTS FOR ALL PLANTS:**

111.2.1 **OVERALL PLANT:**

The asphalt plant shall be designed, manufactured, coordinated and operated in a manner that will consistently produce a mixture within the job mix tolerances and temperatures specified.

111.2.2 **TRUCK SCALES:**

111.2.2.1 **Scale Requirement:** Plant-mixed hot bituminous mixture, whether from batch or continuous mix plants and regardless of the method of measurement for payment, shall be weighed on truck scales furnished by the Contractor. (Exception: When a fully automatic batch plant is equipped with an automatic recordation system approved by the Engineer, the automatic recordation system may be used at the Contractor's election to determine the net weight of each truck load). The scales shall be of the type which indicates directly the total weight of the loaded truck. The scales shall meet the requirements for accuracy, condition, etc., of the Division of Weights and Measures of the Florida Department of Agriculture and such fact shall be re-certified every six months, either by the Division of Weights and Measures or by a registered scale technician.

111.2.2.2 **Checking Truck Scales:** The accuracy of the truck scales shall be checked periodically as directed by the Engineer. For this purpose the Contractor shall load a truck with material of his choosing, weigh the loaded truck on his scales, and then weigh it on another set of certified truck scales. When the difference exceeds that allowed by the Division of Weights and Measures, the scales shall be adjusted and certified by the registered scale technician.

111.2.2.3 In addition to the periodic checks specified above, the scales shall also be checked at any time when the accuracy of the scales has become questionable. When such inaccuracy does not appear to be sufficient to seriously affect the weighing operations the Contractor will be

allowed a period of two (2) calendar days to effect the required check. In the event, however, that the indicated inaccuracy is sufficient to seriously affect the mixture the Engineer may require the immediate shut-down until the accuracy of the scales has been checked and any necessary corrections have been made.

111.2.3 TRUCK TALLY TICKETS:

Weighing shall be done under the supervision of a City Inspector or Laboratory Technician. Tickets shall be issued in sequence and any ticket not used shall be accounted for by proper explanation. The original of the three ticket set shall be retained in the tally book while the two duplicates of the set shall be given to the Inspector at the paving site and the Contractor. When payment is on a tonnage basis, the pay quantity will be computed from the truck tally tickets.

111.2.4 AUTOMATIC PRINTER SYSTEM:

In lieu of truck scales, the Contractor may provide an approved automatic printer system which will print the individual or accumulative weights of aggregate and liquid asphalt delivered to the pugmill and the total weight of the batches contained in a truck load. The automatic printer system shall be used only in conjunction with automatic batching and mixing control systems which have been approved by the Engineer. For the purpose of project recordation, the provisions of Subarticle 111.2.3 shall apply, with the following addition. The original weight tickets, tapes or digital records shall become the property of the City including the records of off-project mixes furnished during production runs for the City.

111.2.4.1 The batch scales and the accuracy of the automatic printer shall be certified at least once every three (3) months. Such certification shall be furnished by an approved certified scale technician and the Contractor will be responsible for obtaining this certification. The accuracy of batch scales and printer system shall be checked at the commencement of production and thereafter at least once a week during production for the City. The periodic check shall be made by weighing a load on a set of certified commercial truck scales. The allowable difference between the printed total weight and data obtained from the commercial* scales will be four (4) pounds per thousand (1000) pounds of load. If the check shows a greater difference, then a recheck must be made on the second set of certified scales. If the check and recheck indicated that the printed weight is out of tolerance, the Contractor must have a certified scale technician check the

batch scales and certify the accuracy of the printer. While the printer system is out of tolerance and before its adjustment, the Contractor may continue production only if he makes provisions to use a set of certified truck scales to determine the truck weights.

111.2.5 EQUIPMENT FOR PREPARATION OF BITUMINOUS MATERIAL:

Tanks for the storage of bituminous material shall be equipped for heating the liquid asphalt, under effective and positive control, to the temperatures required for the various mixtures. Heating shall be accomplished by hot-oil, steam, electricity or other means whereby no flame comes in contact with the tank. The circulating system shall be adequate size to insure proper and continuous circulation during the entire operating period. All pipelines and fittings shall be steam or hot-oil jacketed to prevent heat loss. A thermometer, reading 200' to 400'F, shall be located either in the storage tank or in the bituminous feed line. Prior to being used all bituminous storage tanks shall be calibrated by the City.

111.2.6 COLD FEED:

A separate cold bin shall be provided for each component of the fine and coarse aggregates required by the design mix. The cold bins shall be equipped with accurate mechanical means for feeding the aggregates uniformly into the dryer in the proportions required for the finished mix, so that uniform production temperatures will be maintained.

111.2.7 DRYER:

A dryer of any satisfactory design for heating and drying the mineral aggregates shall be provided. The dryer shall be capable of heating the aggregates to within the specified temperature range for any mix and shall be equipped with an electric pyrometer placed at the discharge chute to automatically register the temperature of the heated aggregates.

111.2.8 GRADUATION UNIT:

Plant screens capable of separating the fine and coarse aggregates, and of further separating the coarse aggregate into specific sizes, shall be provided. (The coarse aggregate shall be defined as the aggregate retained on the No. 10 screen). In addition, the gradation unit shall be equipped with a scalping screen to restrict the maximum size of the aggregates.

111.2.9 HOT BINS:

The plant shall include storage bins of sufficient capacity to supply the mixer when it is operating at full capacity. The hot bins shall be divided into compartments to insure separate and adequate storage of the appropriate fractions

of the aggregate. Each compartment shall have an overflow chute of suitable size and location to prevent any backing up of material into other bins.

111.2.10 BITUMINOUS CONTROL UNIT:

Satisfactory means, either by weighing, metering, or volumetric measurements, shall be provided to obtain the proper amount of bituminous material in the mix, within the tolerance specified for the job mix. Suitable means shall be provided either steam or hot-oil jacketing for maintaining the bituminous material at the specified temperature in the pipe lines, meters, weigh buckets, spray bars and other containers or flow lines.

111.2.11 PUGMILLS:

For all pugmills, the clearance between the paddle tips and the lining of the pugmill shall not exceed one inch. For pugmills with both long and short paddle arms, this requirement shall apply to the long arms only. When any paddle is worn more than three-quarters (3/4) inch from its original dimensions, it shall be replaced or restored to its original dimensions. The pugmills shall be operated in the manner recommended by the manufacturer.

111.2.12 SAMPLING OF HOT AGGREGATES:

Convenient and accurate means shall be provided for obtaining samples of hot aggregates from each bin before the material enters the pugmill.

111.2.13 HOT STORAGE OR SURGE BINS:

The use of hot storage or surge bins will be permitted with the approval of the Engineer.

111.3 SPECIAL REQUIREMENTS FOR BATCH PLANTS:

111.3.1 BATCH SCALES:

Scales for any weigh box or hopper may be either the beam type or the springless-dial type and shall be of a standard make and design, sensitive to one-half (1/2) of one (1) percent of the maximum load that may be required. The accuracy of the scales shall be certified every six (6) months, or as often as the Engineer may deem necessary to assure their continued accuracy, and such certification shall be provided by a registered scale technician. When the batch scales of a fully automatic plant are equipped with an automatic recordation system approved by the Engineer, the Contractor may use the automatic recordation system to record the individual batch weights and the net weight per truck load, in lieu of the use of truck scales.

111.3.2 HEIGH BOX OR HOPPER:

The batch plant shall be equipped with a means for accurately weighing each bin size of aggregate and the mineral filler into the weigh box or hopper. The weigh box or hopper shall be suspended on scales and shall be of ample size to hold a full batch without running over. It shall be supported on fulcrums and knife edges, so constructed that they will not be thrown out of alignment or adjustment during batching operations. The gates both on the hot bins and on the weigh box or hopper shall be constructed to prevent leakage.

111.3.3 VOLUMETRIC METER:

111.3.3.1 Design: When the bituminous material is to be measured volumetrically, the plant shall be equipped with an automatic volumetric meter. It shall be designed and constructed to automatically measure the required amount of liquid asphalt into each batch, with a tolerance of 0.4 of one (1) percent. The dial, which indicates the amount of bituminous material, shall have a sensitivity of at least 1-1/5 inches movement of the pointer per gallon, per 0.2 inch per pound. The meter shall have a capacity of at least ten (10) percent in excess of the volume of bituminous material used in any batch. The meter shall be constructed so that any dial setting may be locked and it will automatically reset after the addition of bituminous material to each batch. The dial shall be in full view of the mixer operator.

111.3.3.2 Arrangement: Any part of the meter which is part of the bituminous feed line shall be hot-oil or steam jacketed. The liquid asphalt shall be delivered to the mixer through one or more jacketed spray bars, whose individual lengths shall not be less than 3/4 the lengths of the pugmill. The spray bar openings shall be of a size and spacing which will provide a uniform application to the bituminous material for the full length of the spray bar.

111.3.3.3 Checking the Meter: The section of the feed line between the charging valve and the spray bar shall be provided with a valve and outlet. Platform scales with a capacity of 150 pounds shall be provided to check the delivery of the volumetric meter.

111.3.4 MIXER UNIT:

The plant shall have a batch mixer of the twin shaft pugmill type, hot-oil or steam jacketed, which shall be capable of producing a uniform mixture within the job mix tolerance specified. Paddles shall be set to produce a circular or "run around" action in the pugmill. The depth of the material in the pugmill shall not extend above the tips of

the paddles. The pugmill shall have a capacity of at least one (1) ton unless permission for a lesser capacity is granted by the Engineer.

111.3.5 CONTROL OF MIXING TIME:

The plant shall be equipped with a positive means to control the time of mixing and to insure the completion of the mixing cycle ordered by the Engineer. All timing devices and bypass switches shall be provided with a means for being locked into the desired position as directed by the Engineer.

111.4 SPECIAL REQUIREMENTS FOR CONTINUOUS-MIX PLANTS:

111.4.1 GRADATION CONTROL UNIT:

111.4.1.1 Aggregate: The plant shall include a means for accurately proportioning each bin size of aggregate by volumetric measurement, and shall include a feeder mounted under the bin compartments. Each bin shall have an accurately controlled individual gate which forms an orifice for volumetrically measuring the material drawn from each respective bin compartment. The orifice shall be rectangular, with one dimension adjustable by positive mechanical action, and shall be provided with a lock. Indicators shall be provided on each gate opening in inches and decimals of an inch. The aggregate proportioning feeder shall be equipped with a revolution counter, in satisfactory working condition.

111.4.1.2 Mineral Filler: Mineral filler (if needed) shall be proportioned separately from a suitable hopper equipped with an adjustable positive feed which shall be accurately and conveniently calibrated. The feeder equipment for the mineral filler shall be approved by the Engineer.

111.4.1.3 Interlocking: The mineral filler feed, the asphalt feed, and all aggregate feeds shall be interlocked, or calibrated so as to give the specified proportions uniformly.

111.4.1.4 Sampling Devices: Gradation units shall be equipped with sampling devices mounted as an integral part of the unit, for use in calibration and for obtaining hot bin samples.

111.4.1.5 Indicator Lights: The bins shall be equipped with lights which indicate when the material in any of the bins falls below the required level of accurate proportioning. The burning light shall be the signal that adequate material is in the bin. Whenever the material in any of the bins falls below the required level, mixing

operations shall be suspended until the bins are filled to the required level

111.4.2 WEIGHT CALIBRATION OF AGGREGATE FEED:

The plant shall include a means for calibration of gate openings by the use of weight test samples. The materials fed out of the bins through individual orifices shall be bypassed to a suitable test box and each compartmented material confined in a separate box section. The plant shall be equipped to handle test samples weighing up to 300 pounds and to weigh them on accurate platform scales.

111.4.3 SYNCHRONIATION OF AGGREGATE & BITUMEN FEED:

Satisfactory means shall be provided to afford positive interlocking control between the flow of aggregate from the bins and the flow of bitumen from the meter or other proportioning source. This control shall be accomplished by interlocking mechanical means or any positive method under the control of the Engineer.

111.4.4 MIXER UNIT:

111.4.4.1 General: The plans shall include a continuous mixer of the twin-shaft pugmill type, which shall be either hot-oil or steam-jacketed and capable of producing a uniform mix within the job mix tolerances specified. The pugmill shall be equipped with an adjustable dam or gate at the discharge end, to control the mixing time and the level of material passing through the pugmill. The drive mechanism of the shafts shall be provided with a clutch so that the action of the pugmill can be stopped when the flow of materials is stopped.

111.4.4.2 Paddles shall be adjustable and reversible, to retard the flow of mix through the pugmill. The paddle settings shall be as recommended by the manufacturer. Paddles in the discharge end of the pugmill shall be advanced by 90-degree intervals, for a distance of at least 3/4 the length of the shaft.

111.4.4.3 Discharge Hopper: The mixer unit shall have a discharge hopper equipped with bottom-dump gates. The mix shall not be dumped until the discharge hopper has been filled.

111.5 PAVING EQUIPMENT:

111.5.1 MECHANICAL SPREADING & SCREEDING EQUIPMENT:

111.5.1.1 General: The mechanical spreading & screeding equipment shall be of an approved type that is self-propelled and can be steered. It shall be equipped with a receiving and disbursing hopper

and a mechanical screed or strike-off member. The screed or strike-off shall be capable of adjustment to regulate the depth of material spread and to produce the desired cross section.

111.5.1.2 Automatic Screed Control: For use on all asphaltic concrete surfaces and final leveling courses, in widths of 20 feet or greater, the paving machine shall be equipped with automatic screed controls of either the skid type or traveling string line type. (The wire type automatic screed control will not be permitted). For pavements of less than 20 feet in width, the automatic screed control will not be required. When a pass is being made adjacent to a previously placed mat, the joint matcher may be used in lieu of the skid or string line type control.

111.5.1.3 Inflation of Tires: When the paving machine is equipped with pneumatic tires, the Engineer may require that the tires be ballasted.

111.5.1.4 Screed Width: Paving machines used on main roadways shall have a screed width greater than eight (8) feet. On widening strips, crossovers, ramps, etc., paving machines having a screed width of eight (8) feet or less may be used.

111.5.2 MOTOR GRADERS:

Two (2) motor graders shall be used for spreading leveling courses. They shall be equipped with a blade that is at least two (2) feet longer than the width of the lane being leveled. They shall be rated at not less than six (6) tons and shall be self-propelled and power-controlled. They shall be mounted on smooth tread or rib-type (no lug types allowed) and shall have a wheel base of at least fifteen (15) feet. The front motor grader shall be equipped with a spreader box capable of spreading the mix at the required rate.

111.5.3 ROLLERS:

111.5.3.1 Steel-wheeled Rollers: Steel-wheeled rollers shall be of the tandem type. For the seal rolling, these rollers shall weigh between five (5) and twelve (12) tons and for the final rolling, they shall weigh between eight (8) and twelve (12) tons.

111.5.3.2 Traffic Rollers: Traffic rollers shall be of the self-propelled, pneumatic-tired type, equipped with at least seven smooth tread, low pressure tires, with the tire pressure maintained between 50 & 55 pounds. They shall weigh between six (6) and ten (10) tons. The use of wobble-wheeled rollers will not be permitted.

111.5.3.3 Prevention of Adhesion: Adhesion of the mixture to the wheels of all rollers will not be permitted. The use of fuel oil or other petroleum distillates to prevent adhesion will not be permitted. No method shall be used which results in water being sprinkled directly onto the mixture.

111.5.4 TRUCKS:

Trucks used to transport the mix shall be of tight construction, which will prevent the loss of material and the excessive loss of heat. Each truck shall have a tarpaulin or other waterproof cover, mounted in such a manner that the entire load can be covered when required. When in place, the waterproof cover shall overlap all sides and be capable of being tied down. The trucks shall also be equipped with chains on the tail gates to limit the size of the opening while unloading into the paver.

111.5.5 CORING EQUIPMENT:

The contractor will be required to furnish on request, necessary labor and a suitable saw or drill for obtaining the required density cores.

111.5.6 HAND TOOLS:

The necessary hand tools such as rakes, shovels, etc., and a suitable means of keeping them clean shall be provided.

111.6 PRIME & TACK COAT EQUIPMENT:

111.6.1 PRESSURE DISTRIBUTOR:

The pressure distributor shall be equipped with pneumatic tires having a sufficient width of rubber in contact with the road surface to avoid breaking the bond or forming a rut in the surface. The distance between the centers of openings of the outside nozzles of the spray bar shall be equal to the width of the application required, within an allowable variation of two (2) inches. The outside nozzle at each end of the spray bar shall have an area of opening not less than 25% nor more than 75%, in excess of the other nozzles. All other nozzles shall have uniform openings. When the application covers less than the full width, the normal opening of the end nozzle at the junction line may remain the same as those of the interior nozzles.

111.6.2 SAMPLING DEVICE ON TRANSPORT TANKS:

All Transport tanks delivering bituminous materials for use on the City's projects shall be equipped with an approved spigot-type sampling device.

SECTION 113
TYPE S -I ASPHALTIC CONCRETE

113.1 **SCOPE OF WORK:**

This section specifies the materials, composition, the job-mix formula and the compensation for Type S-I Asphaltic Concrete pavement. The requirements for plant and equipment for this pavement are specified in the Plant & Equipment Requirements Section. General construction requirements for all asphaltic concrete pavements (including provisions for determination of thickness of pavement to be paid for) are specified in the General Construction Requirements Section.

113.2 **GENERAL COMPOSITION OF MIXTURES:**

The mineral aggregate shall be so graded, and the prescribed constituents shall be combined in such proportions to meet Type S-I as set forth in Section 331 of the Florida Department of Transportation, Current Edition, Standard Specifications, with the following added requirements:

| | |
|-------------------------|-------|
| Marshal Stability, lbs. | 1500 |
| Flow, .01 inches | 8-16 |
| Voids, % | 3-5 |
| Voids filled, % | 75-85 |

113.3 **FORMULA FOR JOB MIX:**

113.3.1 No work shall be started until the Engineer (Design Branch) has approved the job-mix formula and, unless specifically permitted by him, the maximum permissible tolerance from the job-mix formula shall be set forth in Section 331-5 of the Florida Department of Transportation, Current Edition, Standard Specifications.

113.3.2 The temperature of the mixture, at the plant, and at its destination shall be within plus or minus 30 degrees F of the temperature designated by the Engineer.

113.3.3 The laboratory compacted mixture shall have a density of not less than 95% nor more than 98% of the calculated theoretical density voidless mixture composed of the same materials in like proportions.

113.3.4 Samples of the mixture in use will be taken as many times daily as necessary in the opinion of the Engineer, and the mixture shall be maintained uniform throughout the project within the above tolerance. If an additional source of supply for materials is approved, the job-mix formula shall be re-adjusted as may be necessary.

113.3.5 Job materials found to have characteristics requiring a balanced mix, a content of bituminous material less than is indicated in the above prescribed formula, will be rejected or adjusted to form a blend which will produce a balanced mixture under the terms of the formula. Where job materials otherwise meeting specifications are found, on account of

highly absorptive or other special characteristics, to produce an acceptable balanced mix only if the bituminous material content is increased over the amount specified, the mixture may be accepted provided the job mix shall be adjusted to require the use of such additional bituminous material content.

113.3.5.1 Where job materials otherwise meeting specifications are found, on-job materials will be required for specific projects in accordance with the job mix formula as follows. No work shall be started on the specific project until the Contractor has submitted samples of all materials to be used to the Engineer, or designated Laboratory, for the preparation of trial mixtures and design job mix formula. After the job mix formula is established, the mixture on the project shall meet the approved formula for the project, within the following allowable job tolerances:

| <u>Passing Sieve</u> | <u>Retained on Sieve</u> | <u>Tolerances Percent by Weight</u> |
|----------------------|--------------------------|-------------------------------------|
| 1/2" | 3/8" | 5 |
| 3/8" | #4 | 5 |
| #4 | #10 | 5 |
| #10 | #40 | 4 |
| #40 | #80 | 3 |
| #200 | | 2 |
| Bitumen | | 0.4 |

113.4 **MATERIALS:**

The materials used shall conform with the requirements specified in Section 110 and the specific references are as follows:

113.4.1 Asphalt Cement shall meet the requirements of the AASHTO Standard Specifications, Designation M20, and shall be Penetration Grade 60-70.

113.4.2 Mineral Filler shall meet the requirements of AASHTO Standard Specifications, Designation M17.

113.4.3 A stone uniformly graded that when blended with other aggregates will meet the gradation specified. All coarse aggregate shall be washed and shall be free from disintegrated pieces, salt, alkali, vegetable matter and adherent coatings. The stone shall be composed of clean, durable rock, and when subjected to the Los Angeles Abrasion Test, the loss shall not exceed 40 percent.

113.4.4 Fine aggregate shall consist of local sand, stone screenings, slag screenings, or a combination thereof, composed of clean, tough, rough-surfaced grains, free from clay, loam and other foreign matter and shall meet the gradation requirements specified below:

MINERAL AGGREGATE COMBINATION

| Constituent | Passing Sieve | Retained on Sieve | Percent by Weight |
|---------------------------------|----------------------|--------------------------|--------------------------|
| Coarse Aggregate | 3/4" | 1/2" | 0-10 |
| | 1/2" | 3/8" | 4-16 |
| | 3/8" | #4 | 18-38 |
| | #4 | #10 | 11-31 |
| Total Coarse Aggregate | ---- | #10 | 50-65* |
| Fine Aggregate | #10 | #40 | 4-27 |
| | #40 | #80 | 5-20 |
| | #80 | #200 | 2-14 |
| Filler | #200 | ---- | 3-7 |
| Total Fine Aggregate and Filler | #10 | ---- | 35-50* |
| Total Mineral Aggregate | | | 100 |
| For Total Mix | | | |
| Total Mineral Aggregate | | | 91-95-1/2 |
| Asphalt Cement | | | 4--9** |
| Total Mix | | | 100 |

* For high specific gravity aggregates, the weight of the Total Course Aggregate may be raised and the weight of the Total Fine Aggregate and Filler may be lowered.

** For highly absorptive aggregates, the upper limit may be raised.

Mineral passing the No. 10 and retained in the No.200 Sieve shall, in laboratory tests and for the purpose of proportioning the paving mixture, be considered fine aggregate. In like manner, material passing the No. 200 Sieve shall be considered as mineral filler.

113.4.5 Should the coarse aggregate material and the fine aggregate material contain so little material between the No. 4 and No. 10 sieves that upon combination of the two, the resulting percentage of this fraction is less than the minimum specified, such deficiency shall be made up by the addition of stone screenings and course sand.

113.5 **BASIS OF PAYMENT:**

This work shall be paid for at the unit price bid per ton per square yard for "Asphaltic Concrete Surface Course, Type I" surface complete in place, as called for in the proposal, which price shall include the furnishing of all work, labor, equipment and materials necessary to complete the pavement as planned, together with all grading, excavating, stabilizing or hard surface work; or brooming sweeping and/or flushing with water on resurface work, and other work called for in the list of adjustments and/or as shown on the plans or called for in the Proposal.

**SECTION 114
TYPE II ASPHALTIC CONCRETE**

114.1 **SCOPE OF WORK:**

This section specifies the materials, the composition, the job-mix formula and the compensation for Type II Asphaltic Concrete pavement. The requirements for plant and equipment for this pavement are specified in the Plant and Equipment Requirements Section. General construction requirements for all asphaltic concrete pavement, including the methods of calculation for thickness of pavement to be paid for, are contained in the General Construction Requirements Section.

114.2 **COMPOSITION OF MIXTURE:**

The constituents of the mixture shall be combined in such proportions to meet the requirements of Type II as set forth in Section 332 of The Florida Department of Transportation, Current Edition, Standard Specifications, with the following modification:

Hubbard-Field Stability @ 140°F 1800 Min.

114.2.1 The aggregate actually used in the mix shall contain not more than 10 percent of material passing the No. 200 sieve.

114.2.2 Mineral filler will not be required unless the aggregate selected for use requires filler in order to produce the required stability. The mix proportions by weight shall be as follows:

| <u>Material</u> | <u>Percent of Total</u> |
|-------------------|-------------------------|
| Mineral Aggregate | 91-95 |
| Asphaltic Cement | 5-9 |

114.3 **FORMULA FOR JOB MIX:**

No work shall be started until the Engineer (Design Branch) has approved a job-mix formula and unless specifically permitted by him, the maximum permissible tolerance from the job-mix formula shall be as follows:

Bitumen plus or minus 0.3%

114.3.1 No work shall be started until the Contractor has submitted samples of all ingredients to be used in the mixture and has received approval of all the materials & job mix formula. These samples shall be subject to the Engineer or to the Laboratory designated by the City before plant operations begin. After the job mix formula has been approved it will not be changed without consent of the Engineer.

114.4 **BITUMINOUS MATERIAL:**

The bituminous material shall be Asphalt Cement, Penetration Grade 60-70, meeting the requirements of the AASHTO Standard Specification Designation M20.

114.5 **AGGREGATE:**

The aggregate shall consist of either crushed slag, crushed stone, coquina shell or oyster shell; or any combination of these aggregates with sand, that will meet the gradation requirements specified, D.O.T. Current Edition Specifications. The sand shall be sharp and non-plastic. It shall be composed of hard durable grains free from clay, loam, or other deleterious substances and shall be suitable for use in a bituminous mix as determined by laboratory tests. If the sand deposit consists of stratified layers of varying characteristics and gradation, the Contractor shall employ such means as may be necessary to secure a uniform material representative of the cross section of the depth of the deposit.

114.6 **MINERAL FILLER:**

The mineral filler (if used) shall conform with Section 917 of the D.O.T. Current Edition Specifications.

114.7 **PLANT. METHODS, ETC.:**

The plant, methods, etc., for construction of this surface shall conform to the requirements specified in the Plant, Methods & Equipment Section and to the General Construction Requirements Section.

114.8 **BASIS OF PAYMENT:**

The cost of this work shall be included in the unit bid price, per ton or per square yard of Type II Asphaltic Pavement as stated in the proposal and shall include the furnishing of all labor, materials, equipment and tools necessary to complete the work as planned.

**SECTION 115
GENERAL CONSTRUCTION REQUIREMENTS**

115.1 **DESCRIPTION:**

This section specifies the general construction requirements for all plant-mixed hot bituminous pavements, bases, tack coat and prime coat. (More specific requirements pertaining to hot bituminous base and base widening construction are contained in Bituminous Base Course, Section 106). This section also includes the method of determination of thickness of pavement to be paid for, when payment is on a square yard basis.

115.2 **SUBSTITUTION OF TYPES OF HOT BITUMINOUS MIXTURES:**

In isolated or small areas, or wherever it is appropriate, certain substitutions of types of hot bituminous mixtures will be allowed, as follows:

- (1) Type S-I Asphaltic Concrete may be allowed as a substitute for any other type of mixture.
- (2) Type II Asphaltic Concrete may be substituted for Sand-Asphalt Hot mix.

In each case, substitution may be made only when so permitted by the Engineer. The stability of the substituted mixture shall be at no additional cost to the City over that which would have accrued had the specified mixture been used.

115.3 **LIMITATION OF OPERATIONS:**

115.3.1 **WEATHER LIMITATIONS:**

Plant operations shall not begin unless all weather conditions are suitable for the laying operations.

115.3.2 **LIMITATIONS OF LAYING OPERATIONS:**

115.3.2.1 **General:** This mixture shall be spread only when the surface upon which it is to be laid has been previously prepared, is intact, firm and properly cured, and is dry. Unless otherwise approved by the Engineer, no mixture shall be spread that cannot be finished and compacted during daylight hours.

115.3.2.2 **Temperature:** The mixture shall be spread only when the air temperature (the temperature in the shade away from artificial heat) is above 40°F and there is no evidence of frozen base.

115.3.2.3 **Wind:** The mixture shall not be spread when the wind is blowing to such an extent that proper and adequate compaction cannot be maintained or when sand, dust, etc. are being deposited on the surface being paved, to the extent that the bond between layers will be diminished.

115.4 **PREPARATION OF ASPHALT CEMENT:**

The asphalt cement shall be heated in advance of the mixing operations, to within a range of 270°F to 350°F. Heating within these limits shall be constant and wide fluctuations of temperature during a day's production will not be permitted.

115.5 **PREPARATION OF AGGREGATES:**

115.5.1 **STOCKPILES:**

Each aggregate component shall be placed in an individual stockpile, which shall be separated from adjacent stockpiles, either by space or by a system of bulkheads. The intermingling of different materials in stockpiles shall be prevented at all times.

115.5.2 **PREVENTION OF AGGREGATION:**

In the event that the method used for stockpiling coarse aggregate results in segregation of the aggregate, the Engineer will require that the stockpiles be built up in layers not higher than four (4) feet, with each layer completely in place before the next is started. Stockpiles shall not be formed by depositing material in one place or by coning.

115.5.3 **BLENDING OF AGGREGATES:**

Blending or proportioning from railroad cars will not be permitted. All aggregates shall be stockpiled prior to blending or placing in the cold hoppers. All aggregates to be blended or proportioned shall be placed in separate bins at the cold hopper and proportioned by means of securely positioned calibrated gates or other approved devices.

115.5.4 **COLD BINS:**

115.5.4.1 **Adequacy of Bins:** The separate bin compartments the cold aggregate feeder shall be so constructed as to prevent any spilling or leakage of aggregate from one bin to another. Each bin compartment shall be of such capacity and design as to permit a uniform flow of aggregates. All of the bin compartments shall be mounted over a feeder of uniform speed, which shall deliver the specified proportions of the separate aggregates to the drier at all times. If necessary, the bins shall be equipped with vibrators to insure uniform flow of the aggregates at all times.

115.5.4.2 **Gates:** Each bin compartment shall be provided with a gate which is adjustable in a vertical direction. The gate shall be so designed that it can be held securely at any specified vertical opening. The gates shall be equipped with a

measuring device for measuring the vertical opening of the gates from a horizontal plane level with the bottom of the feeder.

115.5.5 MINERAL FILLER:

If mineral filler is required in the mix, it shall be fed or weighed-in separately from the other aggregates.

115.5.6 HEATING & DRYING:

The aggregates shall be heated and dried before screening. They shall be heated to within the temperature limits specified in Section 115.4. Any dried aggregates contaminated with fuel oil shall be wasted.

115.5.7 SCREENING UNIT:

115.5.7.1 Oversize Aggregate: Any oversized pieces of aggregate shall be removed by the use of a scalping screen. This oversized material shall not be returned to the stockpile for reuse unless it has been crushed and reprocessed into sizes that will pass the scalping screen.

115.5.7.2 Screening: Unless otherwise permitted by the Engineer, the quantity of aggregates being discharged onto the screens shall not be in excess of the capacity of the screens to actually separate the aggregates into the required sizes. A maximum of ten percent plus-ten material allowed in the plus-ten bins will be determined by the Engineer, in accordance with its effect on the uniformity of the mix.

115.6 PREPARATION OF THE MIXTURE:

115.6.1 BATCH MIXING:

115.6.1.1 Aggregates: The dried aggregates and mineral filler (if required), prepared in the manner previously described, and combined in batches to meet the job mix formula by weighing each separate bin size, shall be conveyed to the empty mixer.

115.6.1.2 Bitumen: The hot asphalt cement, accurately measured, shall be introduced into the mixer simultaneously with, or after, the hot aggregates. Mixing shall continue until the mixture is thoroughly uniform, with all particles fully coated.

115.6.1.3 Mixing Time: The mixing time shall begin when the measuring devices for both the asphalt and the aggregates indicate that all the material is in the mixer, and shall continue until the material begins to leave the mixing unit. The

mixing time will vary in relation to the nature of the aggregates and the capacity of the mixer and shall be as designated by the Engineer but in no case shall it be less than 35 seconds.

115.6.2 CONTINUOUS MIXING:

The dried aggregates and mineral filler (if required), prepared as specified and proportioned to meet the job mix formula by volumetric measurements, shall be introduced into the mixer in synchronization with the accurate feeding of the hot asphalt cement. The rate of flow of material to the pugmill shall be such that the maintained depth of the mix will not exceed the tips of the paddles when in the upright position. Mixing shall be sufficient to produce a thoroughly and uniformly coated mixture.

115.6.3 MIXING TEMPERATURE:

The ingredients of the mix shall be heated and combined in such a manner as to produce a mixture which shall be at a temperature, when discharged from the pugmill or hot storage (surge) bin, within 25°F of the temperature set by the Engineer, and within the temperature limits specified.

115.6.4 MAXIMUM PERIOD OF STORAGE:

The maximum time that any mix may be kept in a hot storage or surge bin is 72 hours.

115.6.5 CONTRACTOR'S RESPONSIBILITY FOR MIXTURE REQUIREMENTS:

The responsibility for producing a homogeneous mixture, free from moisture and with no segregated materials, and meeting all requirements of the specifications for the mixture, including compliance with the design limits, shall lie entirely with the Contractor. These requirements shall also apply to all mixes used from a hot storage or surge bin, both before and after storage.

115.6.6 TRANSPORTATION OF MIXTURE:

The mixture shall be transported in tight vehicles previously cleaned of all foreign materials and each load shall be covered with a water proof canvas cover of sufficient size to protect it from weather conditions. The inside surface of the truck bodies may be thinly coated with soapy water, or a mixture of water with not more than 10 percent of lubricating oil, but an excess of either shall not be used. After coating the bodies, they shall be raised so that all excess water will drain out before placing any mixture therein. Kerosene, gasoline or similar products shall not be used. No mixture shall be sent out so late in the day as to prevent spreading, finishing and compacting the mixture during daylight, unless authorized to by the City Engineer.

115.7 PREPARATION OF APPLICATION SURFACES:

115.7.1 CLEANING:

Prior to the laying of the mixture, the surface of the base or pavement to be covered shall be cleaned of all loose and deleterious material by the use of power brooms or blowers, supplemented by hand brooming where necessary.

115.7.2 PATCHING AND LEVELING COURSES: Where a surface course is constructed on an existing pavement or old base which is irregular, and wherever so indicated in the plans, the existing surface shall be brought to proper grade and cross section by the application of patching or leveling courses.

115.7.3 APPLICATION OVER SURFACE TREATMENT:

Where a surface course is to be placed over a newly constructed surface treatment, all loose material shall be swept from the paving area and disposed of by the Contractor.

115.7.4 COATING SURFACES OF CONTACTING STRUCTURES:

All structures which will be in actual contact with the asphalt mixture, with the exception of the vertical faces of existing pavements and curbs or curb and gutter, shall be painted with a uniform coating of asphalt cement to provide a closely bonded, watertight point.

115.7.5 TACK COAT:

115.7.5.1 Tack Coat Required: A tack coat, as specified below will be required on the following surfaces:

- (1) Between successive surface courses.
- (2) Between successive leveling courses.
- (3) Between the leveling and surface courses.
- (4) On old pavements to be patched or leveled.

115.7.5.2 A tack coat will be required in all cases. If the hot bituminous mix (paving) is to be applied immediately following the prime coat application, the tack coat may be omitted with approval by the Engineer. Some increase in the prime coat application rate may be required by the Engineer to adjust for existing conditions.

115.8 APPLICATION OF PRIME COAT:

The surface to be primed shall be clean and dry. For limerock bases, the glazed finish shall have been removed with power brooms or other approved equipment. The temperature of the prime material shall be between 100 degrees F. and 150 degrees F. The exact temperature shall be such as will insure uniform distribution and shall be designated by the Engineer. The material shall be applied by means of a pressure distributor. The amount to be applied will be dependent on the character of the surface and shall be sufficient to coat the surface

thoroughly and uniformly without having any excess to form pools or to flow off the base.

115.8.1 RATE OF APPLICATION:

For limerock bases, the rate of application shall be not less than 0.10 gallons per square yard. For sand-clay shell and soil stabilized bases, the rate of application shall be not less than 0.15 gallons per square yard.

115.8.2 APPLICATION OF SAND BITUMINOUS HOT MIX:

To facilitate the maintaining of traffic, the Contractor shall apply a sand bituminous hot mix over the primed surface. The mix shall consist of approximately 10 pounds of clean sand or screenings per square yard with two to four percent of asphalt cement, penetration grade 60-70 or 85-100. The hot sand mix shall be rolled with a traffic roller, with the entire area receiving at least ten passes of the roller.

115.8.3 WIDTH OF BASE TO BE PRIMED:

It warranted by traffic conditions, in the opinion of the Engineer, the application shall be made on only one-half the width of base at one time, care being taken to secure the correct amount of bituminous material at the joint.

115.8.4 WATERING BASE: If deemed necessary, the Engineer may require that the base be lightly sprinkled with water in advance of the application of the prime.

115.9 APPLICATION OF TACK COAT:

Where a bituminous surface is to be laid and a tack coat is required, it shall be applied as herein specified. On newly constructed base courses the application of the tack coat shall follow the application of the prime coat, immediately prior to placing the wearing surface

115.9.1 METHODS OF APPLICATION:

The tack coat shall be applied with a pressure distributor except that on small jobs, if approved by the Engineer, the application may be made by other approved mechanical methods or hand methods. The bituminous material shall be heated to a suitable consistency as designated by the Engineer. The bituminous material shall be applied in a thin uniform layer. The rate of application shall be between 0.05 and 0.15 gallons per square yard. The exact rate shall be designated by the Engineer. The Engineer shall designate the curing period for the tack coat. The tack coat shall be applied sufficiently in advance of the laying of the wearing surface to permit drying but shall not be applied so far in advance or over such an area as to lose its adhesiveness as a result of being covered with dust or other foreign material.

115.9.2 PROTECTION FROM TRAFFIC:

The tack coat surface shall be kept free from traffic until the wearing surface is laid.

- 115.9.3 Payment from Prime and/or Tack Coat shall be included in the unit bid price, per square yard of pavement or per ton of material as the case may be, as stated in the proposal and shall include the furnishing of all labor, material, equipment, and tools necessary to complete the work as planned.

115.10 **PLACING MIXTURE:**

115.10.1 REQUIREMENTS APPLICABLE TO ALL TYPES:

- 115.10.1.1 Alignment of Edges: All asphaltic concrete mixtures (including leveling courses), other than adjacent to curb and gutter or other true edges, shall be laid by the string line method, to assure the obtaining of an accurate, uniform alignment of pavement edge.
- 115.10.1.2 Temperature of Spreading: The temperature of the mixture at the time of spreading shall be within 25°F of the temperature set by the Engineer, which temperature shall be between 270°F and 350°F.
- 115.10.1.3 Rain, and Surface Conditions: Any mixture caught in transit by a sudden rain may be laid only at the Contractor's risk. Should such mixture prove unsatisfactory, it shall be removed and replaced with satisfactory mixture at the Contractor's expense. In no case shall the mixture be laid while rain is falling or when there is water on the surface to be covered.
- 115.10.1.4 Speed of Spreader: The forward speed of the asphalt spreader shall be as established by the Engineer.
- 115.10.1.5 Number of Crews Required: For each paving machine being operated, the Contractor will be required to use a separate crew; each crew operating as a full unit.
- 115.10.1.6 Checking Depth of Layer: The depth of each layer shall be checked at frequent intervals, not to exceed 25 feet. Any deviation from the required thickness, in excess of the allowable tolerance, shall be immediately corrected.
- 115.10.1.7 Hand Spreading: In limited areas where the use of the spreader is impossible or impracticable, the mixture may be spread and finished by hand.
- 115.10.1.8 Straightedging and Back-patching: Straight-edging and back-patching shall be done after

initial compaction has been obtained and while the material is still hot.

115.10.2 REQUIREMENTS APPLICABLE ONLY TO SURFACE COURSES:

115.10.2.1 Spreading and Finishing: Upon arrival, the mixture shall be dumped into the approved mechanical spreader and immediately spread & struck-off to the full width required and to such loose depth for each course that, when the work is completed, the required weight of mixture per yard, or the specified thickness, will be secured. An excess amount of mixture shall be carried ahead of the screed at all times. Hand raking shall be done behind the machine as required.

115.10.2.2 Thickness of Layers: Where a surface course is constructed to a thickness greater than two (2) inches, it shall be constructed in approximately equal layers and no layer shall be more than two (2) inches in thickness when compacted. Each layer shall be thoroughly compacted and shall conform to the requirements of these specifications before an additional layer is placed.

115.10.2.3 Laying Width: If necessary due to the traffic requirements, the mixture shall be laid in strips in such manner as to provide for the passage of traffic. Where the road is closed to traffic, the mixture may be laid to the full width, by machines traveling in echelon.

115.10.2.4 Correcting Defects: Before any rolling is started the surface shall be checked, any irregularities adjusted, and all drippings, fat sandy accumulations from the screed, and fat spots from any source shall be removed and replaced with satisfactory material. No skin patching shall be done. When a depression is to be corrected while the mixture is hot, the surface shall be well scarified before the addition of fresh mixture.

115.10.3 REQUIREMENTS APPLICABLE ONLY TO LEVELING COURSES:

115.10.3.1 Patching Depressions: Before any leveling course is spread, all depressions in the existing surface more than one (1) inch deep shall be filled by spot patching with leveling course mixture and then thoroughly compacted.

115.10.3.2 Work Adjacent to Bridge Ends: On resurfacing projects where the roadway joins an existing bridge and where necessary to insure that a bump will not be created by the overlay, before any surfacing is placed adjacent to the bridge, a

portion of the existing pavement shall be bladed off, in order that a smooth transition between the new surfacing and the bridge end may be effected.

115.10.3.3 Spreading Leveling Courses: The initial and intermediate courses of leveling shall be placed by the use of a spreader box, working in conjunction with two motor graders. The final course of leveling shall be placed by the use of a paving machine meeting the requirements of the paving equipment section of these specifications. However, if the total quantity of leveling to be applied is less than 150 pounds per square yard, the paving machine may not be required. Other types of leveling devices may be used, provided they are specifically approved by the Engineer prior to use.

115.10.3.4 Rate of Application: When the total amount of leveling course material to be applied exceeds 50 pounds per square yard, it shall be applied in separate courses, with the average spread not to exceed 50 pounds per square yard. As an exception, the average spread for each course of Type S-I leveling shall not exceed 75 pounds per square yard. Unless otherwise indicated the quantity shown in the plans for leveling represents the average for the entire job. The rate of application of leveling may be increased or decreased, as necessary, at locations designated by the Engineer. Where widening construction is specified in connection with leveling, the Engineer may require that approximately 50% of the leveling be placed prior to the widening operation.

115.10.3.5 Placing Leveling Over Existing Concrete Pavement: For leveling course to be applied over broken existing concrete pavement (with or without old asphaltic surface), the first course of the leveling shall be placed as soon after the cracking & reseating of the concrete as is practicable, but not later than two (2) days after the cracking operations on any section. The remainder of the surface shall follow the normal sequence of operations.

115.10.3.6 Removal of Excess Joint Material: Where leveling is placed over concrete pavement or concrete deck-slab bridges, all excess joint filler at the cracks and joints shall be removed flush with the existing concrete prior to placing the leveling course.

115.11 MANHOLE ADJUSTMENTS:

115.11.1 MANHOLES TO BE ADJUSTED:

The Contractor will be required to make adjustments of all manholes, valve boxes, and other like items within the limits of construction of the pavement except those belonging to the Southern Bell Telephone and Telegraph Company, the Western Union Telegraph Company, or Underground Electric (UGE, Jacksonville Electric Authority). Manholes belonging to these companies will be adjusted by, and at the expense of, the utility concerned.

115.11.2 RESPONSIBILITY FOR SAFEKEEPING OF CASTINGS:

The Contractor shall be responsible for the safekeeping of all castings for manholes, valve boxes, and like items until adjustments have been made and the work complete on each street. He will then be held liable for any such castings and shall pay for the cost of replacing same.

115.11.3 PAYMENT FOR MANHOLE ADJUSTMENT:

All manholes and valve jackets required to be adjusted will be done so in accordance with City Standards, all manholes and valve jackets greater than ten (10) inches in diameter required to be adjusted by the Contractor will be paid for at the unit price submitted in the proposal according to the type of adjustment used. All valve jackets ten (10) inches in diameter or less will be adjusted according to the specifications at the Contractor's unit price for pavement complete in place. No further compensation will be considered.

115.12 COMPACTING MIXTURE:

Provisions applicable to all types:

115.12.1 EQUIPMENT & SEQUENCE:

For each paving or leveling train in operation, the Contractor shall furnish a separate set of rollers with their operators. The rolling shall be done in the following sequence, with the equipment as shown, unless otherwise permitted by the Engineer.

115.12.1.1 Seal rolling, using tandem steel rollers weighing 5 to 12 tons, and following as close behind the spreaders as is possible without pickup, undue displacement or blistering of the material.

115.12.1.2 Rolling with self-propelled pneumatic-tired rollers, following as close behind the seal rolling as the mix will permit. The roller shall cover every portion of the surface with at least five bases.

115.12.1.3 Final rolling with 8 to 12 ton tandem steel roller, to be done after the seal rolling and pneumatic-tired rolling have been completed, but

before the pavement temperature has dropped below 140°F.

115.12.2 COMPACTION AT CROSSOVERS, INTERSECTIONS, ETC.:

When a separate paving machine is being used to pave the crossovers, the compaction of the crossovers may be done by one 8 to 10 ton tandem steel roller. If crossovers, intersections and acceleration and deceleration lanes are placed with the main run of paving, a traffic roller shall also be used in the compaction of these areas.

115.12.3 ROLLING PROCEDURES:

The initial rolling shall be longitudinal. Where the lane being placed is adjacent to a previously placed lane, the center joint shall be pinched or rolled, prior to the rolling of the rest of the lane. After the rolling or pinching of the center joint, the rolling shall continue across the mat by overlapping each previous roller path by at least one-half (1/2) the width of the roller wheel. The motion of the roller shall be slow enough to avoid displacement of the mixture, and any displacement shall be corrected at once by the use of rakes, and the addition of fresh mixture if required. Final rolling shall be continued until all roller marks are eliminated.

115.12.4 SPEED OF ROLLING:

Rolling with the self-propelled, pneumatic-tired rollers shall proceed at a speed of 6 to 10 miles per hour, and the area covered by each roller shall not be more than 4,000 square yards per hour, except that for Type S-I Asphaltic Concrete, this maximum rate of coverage shall be 3,000 square yards per hour.

115.12.5 NUMBER OF PNEUMATIC-TIRED ROLLERS REQUIRED:

A sufficient number of self-propelled pneumatic-tired rollers shall be used to assure that the rolling of the surface for the required number of passes will not delay any other phase of the laying operation nor result in excessive cooling of the mixture before the rolling is complete. In the event that the rolling falls behind, the laying operation shall be discontinued until the rolling operations are sufficiently caught up.

115.12.6 COMPACTION OF AREAS INACCESSIBLE TO ROLLERS:

Areas which are inaccessible to a roller (such as areas adjacent to curbs, headers, gutters, bridges, manholes, etc.) shall be compacted by the use of hand tamps or other satisfactory means.

115.12.7 ROLLING PATCHING & LEVELING COURSES:

Self-propelled pneumatic-tired rollers shall be used for the rolling of all patching and leveling courses. Where the

initial leveling course is placed over broken concrete pavement, the pneumatic-tired roller shall weigh at least 15 tons. For Type S-I Asphaltic Concrete leveling courses, the use of steel-wheeled roller, to supplement the traffic rollers, will be required. On other leveling courses, the use of a steel-wheeled roller will be at the Contractor's option.

115.12.8 CORRECTING DEFECTS:

The rollers shall not be allowed to deposit gasoline, oil or grease onto the pavement, and any areas damaged by such deposits shall be removed and replaced as directed by the Engineer. While rolling is in progress, the surface shall be tested continuously and all discrepancies corrected to comply with the surface requirements. All drippings, fat or lean areas and defective construction of any description shall be removed and replaced. Depressions which develop before the completion of the rolling shall be remedied by loosening the mixture and adding new mixture to bring the depressions to a true surface. Should any depression remain after the final compaction has been obtained, the full depth of the mixture shall be removed and replaced with sufficient new mixture to form a true and even surface. All high spots, high joints and honeycomb shall be corrected as directed by the Engineer. Any mixture remaining unbonded after rolling shall be removed and replaced. Any mixture which becomes loose or broken, mixed or coated with dirt or in any way defective, prior to laying the wearing course shall be removed and replaced with fresh mixture which shall be immediately compacted to conform with the surrounding area. Areas of defective surface may be repaired by the use of indirect heat. No method of repair involving open flame heaters shall be used.

115.12.9 PROVISIONS APPLICABLE TO SHOULDER PAVEMENT ONLY:

Shoulder pavements wider than 5-1/2 feet shall be compacted by the use of equipment of the type required for asphaltic concrete pavements. Compaction of the asphaltic concrete or sand-asphalt hot mix pavement, 5-1/2 feet or less in width, shall be done by the use of tandem steel rollers no exceeding 12 tons in weight. Other compaction in such restricted widths shall be by the use of any type of rubber-tired equipment the Contractor may elect to use. Where sand-asphalt shoulders are constructed within the limits of the curb & gutter, compaction shall be done by light weight rolling equipment, approved by the Engineer, which will not displace the previously constructed curb & gutter.

115.12.10 DENSITY REQUIRED FOR TYPE S-1 ASPHALTIC CONCRETE PAVEMENT:

After final compaction, the density shall be at least 95% of the laboratory compacted density of the paving mixture.

115.13 JOINTS:

115.13.1 TRANSVERSE JOINTS:

Placing of the mixture shall be as continuous as possible and the roller shall not pass over the unprotected end of the freshly laid mixture except when the laying operation is to be discontinued long enough to permit the mixture to become chilled. When the laying operation is thus interrupted, a transverse joint shall be constructed by cutting back on the previous run to expose the full depth of the mat.

115.13.2 LONGITUDINAL JOINTS: Where only a portion of the width of pavement is to be laid and opened to traffic, longitudinal joints shall be formed by rolling the exposed edge of the strip first laid. When the adjacent strip is constructed, the Engineer may require the edge of the mixture in place to be trimmed back to expose an unsealed or granular vertical surface. Where the strip first laid is closed to traffic, the edge shall not be sealed but shall be left vertical and the adjacent strip placed against it without trimming.

115.13.3 GENERAL:

When fresh mixture is laid against the exposed edges of joints (trimmed or formed as provided above), it shall be placed in close contact with the exposed edge so that an even, well-compacted joint will be produced after rolling.

115.14 SURFACE REQUIREMENTS:

115.14.1 CHECKING WITH ROLLING STRAIGHTEDGE:

The final surface course of all pavements will be required to be checked by the rolling straightedge, in accordance with the following provisions. As soon as the rolling has been completed and the surface hardened sufficiently to be walked on, the entire surface shall be checked with a rolling straightedge set to indicate any surface irregularities in excess of 3/16 inch. The rolling straightedge shall have an effective length of 15 feet and its design shall meet the approval of the Engineer. The rolling straightedge and labor for its operation shall be supplied by the Contractor. The straightedge shall be applied in lines parallel to the center line, at least twice for each pass of the spreader. Straightedging shall be extended across all joints. Any irregularities in excess of 3/16" shall be corrected by removing and replacing defective sections or by overlaying with surface material, as directed by the Engineer. Straightedging of paved shoulders will not be required unless so directed by the Engineer.

115.14.2 MANUAL STRAIGHTEDGE:

A 15 foot manual straightedge shall be furnished by the Contractor and shall be available at all times on the work. The Contractor shall designate an employee whose duty it is to handle the straightedge in checking the compacted surfaces under the direction of the Engineer.

115.14.3 PERMISSIBLE VARIATIONS FROM TRUE SURFACE:

The finished surface shall not vary more than 1/4 inch from the templet cut to the cross section of the road nor more than 3/16 inch from the straightedge applied parallel to the center line of the pavement. Any surface irregularities exceeding such limits shall be corrected in accordance with the requirements above.

115.14.4 TEXTURE OF FINISHED SURFACE:

The finished surface shall be of uniform texture and compaction. The surface shall have no pulled, torn or loosened portions, and shall be free of sand streaks, sand spots or ripples. (These requirements shall also apply to any areas where it is necessary to apply handwork). Any areas in which the surface does not meet the above requirements for texture, sand streaks, ripples, pulled or loosened portions, or for uniformity of compaction; or does not meet the straightedge requirements of 115.14.1 through 115.14.3 shall be corrected at the Contractor's expense. Such corrections may be made either by replacing the surface course (to full depth) or by overlaying with the type of asphaltic concrete mixture being placed. Within the longitudinal limits where such defective areas occur, such corrections shall be made for the full width of the roadway and for longitudinal distances in both directions beyond such defective areas in accordance with the following:

115.14.4.1 If the correction is made by the replacing of the full thickness, it shall extend to at least 50 feet each side of the defective area.

115.14.4.2 If the Contractor elects to effect the correction by overlaying, the overlay shall consist of at least 100 pounds of mixture per square yard, at the defective section and shall taper uniformly down from the full thickness of such weight, to zero thickness (featheredged) at the end of a minimum length of 50 feet each side of the defective area.

115.14.5 The transverse thickness at any section shall be as to provide the design cross section.

115.15 PROTECTION OF FINISHED SURFACE:

115.15.1 Sections of newly compacted asphaltic concrete which are to be covered by additional courses shall be kept clean until the successive course is laid.

115.15.2 Upon completion of the finished pavement, no dumping of any material directly on the pavement will be permitted. When shoulders are constructed after completion of the final surface, blade graders operating adjacent to the pavement during shoulder construction shall have a two inch by eight inch (or larger) board (or construction attachment providing essentially the same results) attached to their blades in

such manner that it extends below the blade edge, in order to protect the pavement surface from damage by the grader blades. Vehicular traffic shall not be permitted on any pavement which has not set sufficiently to prevent rutting or other distortion.

115.16 **CORRECTING DEFICIENT THICKNESS:**

115.16.1 **ALLOWABLE DEFICIENCIES:**

The thickness shall be determined from the length of the core borings. The maximum allowable deficiency from the specified thickness shall be as follows:

115.16.1.1 For pavement of a specified thickness of 2-1/2 inches or more: 1/2 inch.

115.16.1.2 For pavement of a specified thickness of less than 2-1/2 inches: 1/4 inch.

115.16.2 **PAVEMENT EXCEEDING ALLOWABLE DEFICIENCY IN THICKNESS:**

115.16.2.1 **When deficiency is seriously in excess:** Where the deficiency in thickness is (1) in excess of 3/8 inch, for pavement of less than 2-1/2 inches in specified thickness, or (2) in excess of 3/4 inch, for pavement of specified thickness of 2-1/2 inches or more, the Contractor shall correct the deficiency either by replacing the full thickness for a length extending at least 50 feet from each end of the deficient area, or (when permitted by the Engineer) by overlaying as specified in 115.16.2.3.

115.16.2.1.1 As an exception to the above, pavement outside the main roadway area (acceleration and deceleration lanes and crossovers) may be left in place, without compensation (except for payment for the bituminous material), when so permitted by the Engineer, even though the thickness deficiency exceeds the tolerance specified above.

115.16.2.1.2 The Contractor will receive no compensation for any pavement removed, nor for the work of removing such pavement.

115.16.2.2 **WHEN DEFICIENCY IS NOT SERIOUSLY IN EXCESS:** When the deficiency in the thickness of the pavement is over 1/4 inch but not more than 3/8 inch, for pavement of specified thickness less than 2-1/2 inches; or when the deficiency in thickness is over 1/2 inch but not more than 3/4 inch, for

pavement of specified thickness of 2-1/2 inches or greater; the Contractor will be allowed to leave such pavement in place, but without compensation other than the bituminous material contained therein. The areas of such pavement for which no square yard payment will be made shall be the product of the total distance between acceptable cores, multiplied by the width of the lane which was laid at the particular pass in which deficient thickness was indicated. To determine the extent of the deficiencies, additional cores will be taken as required.

115.16.2.3 CORRECTING DEFICIENCY BY ADDING NEW SURFACE MATERIAL: For any case of excess deficiency of the pavement, the Contractor will be permitted, if approved by the Engineer for each particular location, to correct the deficient thickness by adding new surface material and compacting to the same density as the adjacent surface. The area to be corrected and the thickness of new material added shall be as specified in 115.14.4. All costs of the overlaying and compacting shall be borne by the Contractor.

115.17 CLEAN UP:

The Contractor shall clean up and remove from the right-of-way and adjacent property all surplus materials, wind-rowed or excess soil, rubbish and temporary structures required to be removed; restore in an acceptable manner all property, both public and private, which has been damaged during the progress of the work; and re-adjust the grade and trim or backfill disturbed in the area adjacent to construction. The Engineer may, upon failure of the Contractor to comply, employ labor and equipment necessary to cleanup the property, charging cost of said labor and equipment against the Contractor and deduct such costs from the monies due him.

115.18 METHOD OF MEASUREMENT:

The quantities to be paid for under this section shall be measured in tons or square yards as called for in the Proposal. The pay quantities shall include only the weight of the pavement complete in place and accepted. In determining the tonnage to be paid for, the weight of the mixture shall be determined from batch weights, truck scale weights, or other methods approved by the Engineer. The Contractor shall furnish all scales and other equipment, meeting the approval of the Engineer, as may be necessary for the proper determination of the weights. No deduction shall be made for the weight of the bituminous material in the mixture.

115.19 CALCULATIONS FOR THICKNESS OF PAVEMENT:

(Applicable only where the pavement is to be paid for by the square yard):

115.19.1 CORE BORINGS:

The thickness of the pavement shall be determined from the length of cores, at least two (2) inches in diameter, taken at random points on the cross section and along the roadway. Each core shall represent a section not longer than 200 feet. The average thickness shall be determined from the measured thickness, and in accordance with the procedure and criteria specified herein. If the Contractor believes that the number of cores taken by the City is sufficient to properly indicate the thickness of the pavement, he may request the City to make additional borings at locations designated by him. The cost of these additional borings shall be deducted from any sums due the Contractor unless such borings indicate that the pavement within the questioned area is of specified thickness.

115.19.2 CRITERIA FOR CALCULATIONS:

115.19.2.1 Average thickness shall be calculated for the total length of project.

115.19.2.2 When the thickness is measured by the cores is more than 1/2 greater than the specified thickness, it shall be considered in the calculation as the specified thickness plus 1/2 inch.

115.19.2.3 Areas of deficient-thickness pavement which are left in place and no compensation (as specified) shall not be taken into account in the calculations.

115.19.2.4 Where areas of defective surface or deficient thickness are corrected by overlaying with additional material, the thickness used in the calculations shall be the specified thickness for such areas.

SECTION 124
ASPHALT HEAT PLANING

124.1 **SCOPE OF WORK:**

The work under this section shall consist of planing the existing asphalt surface with equipment meeting the requirements hereinafter specified, which shall plane or shave the surface irregularities out of the existing bituminous pavements such as to produce a smooth surface and, in some cases, to cut the pavement down to predetermined grades. The planed and finished surface shall be free from gouges, grooves, ridges, sooting, oil film, and other imperfections of workmanship.

124.2 **EQUIPMENT PERFORMANCE:**

The planing work shall be performed with a pavement planing machine of a type that has operated successfully on a considerable mileage of work comparable to that proposed to be done under this specification.

124.3 **EQUIPMENT OPERATION:**

124.3.1 The planing machine to be used for this work shall be designed and built for this type of work, self propelled, having in combination the means for heating, planing & cutting the old surface, blading the cutting into one windrow, picking up, elevating & discharging the cutting into a truck in one operation, to insure minimum traffic congestion. An optional method of removing windrowed material is the furnishing of loaders and dump trucks if in the view of the City Engineer, the traffic congestion would be minimal.

124.3.2 Either Propane or Butane will be used for heating fuel to prevent detrimental sooting or oil coating of aggregate or asphaltic materials and to fully meet all clean air standards.

124.3.3 The temperatures at which the work is performed, the nature and condition of the equipment, the manner of performing the work shall be such that the pavement is not torn, gouged, shoved, broken, sooted, oil coated or otherwise injured by the planning operation. Sufficient passes, or cuts, shall be made such that all irregularities or high spots are eliminated, and that 100% of the surface area has been planed, or to the satisfaction of the Engineer.

124.4 **MEASUREMENT & PAYMENT:**

124.4.1 The contractor shall provide all necessary labor, materials, and equipment to load the asphalt and aggregate cuttings into dump trucks supplied by him and hauled to a disposal area designated by the Engineer.

124.4.2 Asphalt pavement planing performed and provided above shall be measured by one (1) inch depth per square yard for the work performed. Payment for the planing of pavement shall be made at the price bid per square yard planed, which price

shall include all labor, equipment, materials, supplies, mobilization, compensation insurance, and equipment repairs.

SECTION 125
ASPHALT RECYCLING

125.1 **SCOPE OF WORK:**

The work under this section shall consist of heating and scarifying existing pavement, leveling and relaying recycled materials and in the same operation overlaying the hot recycled material with approximately seventy-five (75) pounds per square yard of Type II asphaltic concrete.

125.2 **EQUIPMENT PERFORMANCE:**

The repaving machine to be used under this specification shall be designed & built for this type of work. This is defined as a continuous, multi-step, heated process of reworking & recycling the existing asphalt pavement at the rate of from 10 to 25 feet per minute over a minimum 10 foot width. The machine shall have successfully performed considerable mileage of work comparable to that described herein.

125.3 **EQUIPMENT OPERATION:**

125.3.1 The entire pavement surface shall be heated by radiant heating which evenly emits radiant heat over the entire surface for enough time to soften the existing pavement, allowing for the scarifying of the mix. The scarified mix shall be heated by radiant heaters long enough to raise the temperature of the scarified surface to at least 200°F. There shall be no burning or over-heating of the scarified mix. A transverse blade assembly shall gather the loosened, heated, recycled mix and distribute this mix in a uniform layer over the road surface. The leveling blade is to be preceded by a reversible auger which will remove the reclaimed mix in a transverse direction to provide for profile correction and leveling and will use the reclaimed mix to install uniform surface.

125.3.2 In addition to the heaters & scarifiers the machine shall be equipped with a receiving and dispersing asphalt mix hopper and a mechanical spreader. The screed or strike-off member shall be capable of adjustment to regulate the depth of the new material to produce the desired cross section. The depth of the mix shall be as specified by the Engineer for each road on which this process is used. The finished surface shall be of a uniform texture and compaction. There shall be no pull, torn or loosened portions allowed.

125.3.3 The tack coat used in this operation only shall be emulsified asphalt meeting the Florida Department of Transportation specifications. The City Engineer shall review the proposed prime coat for approval before any work is started.

125.4 **MEASUREMENT & PAYMENT:**

Compensation for the above described work shall be at the unit price established in the bid proposal for 1" of depth per square yard of

pavement recycled and shall include all labor, equipment and materials necessary to perform that work.

**SECTION 130
PORTLAND CEMENT CONCRETE**

130.1 **DESCRIPTION:**

This section specifies the requirements for the materials for all classes of concrete, and includes methods and equipment for the handling and storing of materials and mixing and transporting of the concrete to the site.

130.2 **COMPOSITION:**

The concrete shall be composed of a mixture of Portland cement, fine aggregate, coarse aggregate and water, and where specified or allowed by the specifications, shall include approved admixtures.

130.3 **MATERIALS:**

130.3.1 **CEMENT:**

Cement used will comply with the AASHTO Specifications Designation M85 on Portland Cement. Unless otherwise specified, Normal Portland Cement will be used. (Type I)

130.3.2 **COARSE AGGREGATE:**

Coarse aggregate shall consist of clean, tough, durable gravel (quartz), or stone (rock). When subjected to Los Angeles Abrasion Test (AASHTO T96) the loss shall not be more than 50% for gravel or not more than 45% for stone. All coarse aggregate shall be washed and shall be free from disintegrated pieces, salt, alkali, vegetable matter and adherent coatings. The weight of extraneous substances shall not exceed the following percentages:

| | |
|--------------------------|--------|
| Coal & lignite..... | 1.00% |
| Clay lumps..... | 0.05% |
| Soft fragments..... | 10.00% |
| Cinders & clinkers..... | 0.50% |
| Free shells..... | 1.00% |
| Sticks (wet)..... | 0.03% |
| Loss by decantation..... | 1.125% |

The sum of the percentages of all materials noted in the above table shall not exceed ten (10).

130.3.2.1 Percent by weight of coarse aggregate passing square opening sieves:

| GRADE | 2" | 1-1/2" | 1" | 3/4" | 1/2" | 3/8" | N0. 4 |
|--------------|-----|--------|--------|--------|-------|------|-------|
| Fla DOT No.5 | 100 | 95-100 | 85-100 | 60-90 | 30-60 | | 0-10 |
| Fla DOT No.9 | | 100 | 95-100 | 75-100 | 35-70 | 5-30 | 0-10 |

130.3.3 **FINE AGGREGATE:**

130.3.3.1 Fine aggregate shall consist of sand composed only of hard, strong, durable, uncoated grains

of quartz, and reasonably free from lumps of clay, soft or flaky particles, salt, alkali, organic matter, loam or other extraneous substances.

130.3.3.2 The weight of extraneous substances shall not exceed the following percentages:

Loss by decantation.....3.0%
 Shale.....1.0%
 Coal or Lignite.....1.0%
 Clay lumps.1.0%
 Cinders & clinkers.....0.5%

The sum or the percentages of all materials in the above table shall not exceed five (5).

130.3.3.3 Test Requirements: The fine aggregate shall be subjected to the colorimetric test for organic impurities, and if the color produced is darker than the standard solution, the aggregate shall be rejected unless it can be shown by appropriate tests that the impurities causing the color are not of the type that would be detrimental to the concrete. Such tests shall be in accordance with AASHTO T71 and M6.

130.3.3.4 Gradation: The fine aggregate shall be reasonably well graded, from coarse to fine and when tested by means of laboratory sieves, it shall meet the following requirements, in percent of total weight:

TOTAL RETAINED ON:

| Sieve | Percent |
|--------------|----------------|
| No. 4..... | 0 to 5 |
| No. 8..... | 0 to 15 |
| No. 16..... | 3 to 35 |
| No. 30..... | 30 to 75 |
| No. 50..... | 65 to 95 |
| No. 100..... | 93 to 100 |

130.3.4 Water for Concrete: Water for use with cement shall be clean and practically free of oil, acid, alkali, chlorides, organic matter, and other deleterious substances. Water from city water supplies or other sources which are approved by the Public Health Department may be accepted without being tested. Water from all other sources shall be tested and approved before use and shall not contain impurities in excess of the following limits:

Acidity or alkalinity calculated
 in terms of calcium carbonate.....0.05%
 Total organic solids.....0.05%
 Total inorganic solids.....0.08%
 Total chlorides as sodium chloride.....0.05%

130.3.5 ADMIXTURES:

130.3.5.1 Air-entraining admixtures not already approved by the City may be tentatively approved for use providing they meet the requirements of AASHO M154. Water reducing and retarding admixtures shall meet the requirements of AASHO M194.

130.3.5.2 Air-entraining admixtures: Air entrainment will be required in all paving concrete, and in all structural concrete except counterweight concrete, and the amount of air entrained shall be from four (4) to seven (7) percent. Air entrainment shall be produced by the addition of the air-entraining admixture to the mixing water, during batching, air-entraining cement will not be permitted. The amount of the admixture to be used per batch shall be determined in the field by trial.

130.4 CLASSIFICATION OF CONCRETE:

The class or type of concrete shall be designated as to the specific minimum psi compressive strength at 28 days.

MAXIMUM PERMISSIBLE WATER - CEMENT RATIOS FOR CONCRETE (PCA Standard)

| Specified compressive strength at 28 days, psi fc | <u>Maximum permissible water cement ratio</u> | |
|---|---|-----------------------------|
| | <u>Non air-entrained</u> | <u>Air-entrained</u> |
| | Absolute ratio by weight | Absolute ratio by weight |
| 2500 | 0.67 | 0.54 |
| 3000 | 0.58 | 0.46 |
| 3500 | 0.51 | 0.40 |
| 4000 | 0.44 | 0.35 |
| 4500 | 0.38 | |

130.5 ACTUAL PROPORTIONS TO BE USED:

130.5.1 The Contractor will be required to designate the actual proportions to be used, in order to produce concrete of the strength required.

130.5.2 Prior to mixing any concrete the Contractor shall submit his design mix for approval, on a form as shown herein (At the end of this Section), and only mixes approved by the City shall be incorporated into the work.

130.5.3 The City will exercise control over the concrete by rigid inspection of the consistency, yield strength of the concrete, and of the air content where applicable.

130.6 CERTIFICATION (For Ready-Mixed Concrete):

130.6.1 The manufacturer of concrete shall furnish the City Inspector with each batch of concrete before unloading at

the site, a delivery ticket on which is printed, stamped or written, the following information:

- (1) Name of ready-mix batch plant
- (2) Serial number of ticket
- (3) Date & truck number
- (4) Name of contractor
- (5) Job number
- (6) Specific class or designation of concrete
- (7) Quantity of concrete (cubic yards)
- (8) Time loaded, or of first mixing of cement & aggregates
- (9) Water added by receiver of concrete (if any), and his initials
- (10) Type & name of admixture & amount of same
- (11) Mixing time, or reading of revolution counter at beginning and end of mixing period
- (12) Signature or initials of ready-mix representative
- (13) Type and brand of cement
- (14) Amount of cement
- (15) Total water content by producer (or W/C ratio)
- (16) Maximum size of aggregate
- (17) Weight of fine and coarse aggregate
- (18) Indication that all ingredients and mix proportions are certified as being previously approved
- (19) Amount of water added at job site (gals.)
- (20) Signature of inspector authorizing the additional water

A copy of every delivery ticket shall be forwarded to the Chief of the Design Activity involved in the project.

130.7 **TEST REQUIREMENTS:**

130.7.1 **TEST SAMPLES:**

130.7.1.1 The Contractor shall furnish the City sufficient concrete of the design mix as required for test specimens. The number and frequency of test samples which are for the purpose of determining the strength of the concrete placed shall be in accordance with the following requirements or as required by the Construction Inspector.

- (1) One set of four test cylinders shall be made for each class of concrete for each 30 cubic yards or fraction thereof, placed each day. As an exception, for seal concrete, only one set of four test cylinders will be required for each pour.
- (2) One set of four test cylinders shall be made for each 1000 square yards or fraction thereof.
- (3) The number and frequency of test samples as required above shall apply to each design mix and each batch plant, separately.

The Contractor shall bear the cost of testing and include it in his bid.

130.7.2 TEST FOR STRENGTH OF CONCRETE:

130.7.2.1 The method of determining the strength of the concrete shall be in accordance with the following procedures.

- (1) One cylinder from the set of four cylinders shall be tested for compressive strength on the seventh (7th) day. The results of this test shall be used to determine the probable strength that will be obtained from the 28-day test.
- (2) Two of the remaining three cylinders of the set of four cylinders shall be tested for compressive strength on the 28th day.
- (3) The compressive strength of the quantity of concrete placed and represented by one set of four cylinders shall be determined from the highest test result of two cylinders tested on the 28th day.
- (4) The fourth cylinder shall be retained by the testing lab if required.
- (5) The sequence of test for the 4 test cylinders described above are minimum requirements for all concrete. Additional samples may be cast to determine strengths at other time intervals, as required for prestress work or other considerations.

130.7.2.2 If the seven-day test cylinder indicates probable low-strength concrete, the Project Engineer may request that another cylinder be tested and if the second cylinder is within the required limits, the Contractor may proceed to the 28-day test at his option, or if the 28-day test cylinders indicate low strength concrete, the Contractor, may, at his option, elect to drill core samples from the actual concrete placed. If the Contractor elects to drill core samples from the hardened concrete, the costs of obtaining the cores and repairing the core holes shall be borne by him.

130.7.2.3 The cores shall be drilled as directed by the Engineer, at the same approximate locations from which the test cylinder concrete was obtained. The locations of the drilled cores shall be selected so that the remaining structure will not be impaired or sustain permanent damage after the holes are repaired by the Contractor.

When the Contractor elects to supply drilled core samples, three (3) will be required. The three drilled samples shall be tested for compressive strength, and the equivalent 28-day strength of the concrete placed and represented by the drilled core samples shall be determined from the highest test result of the three drilled cores tested. When the Contractor elects to supply drilled cores and submits acceptable drilled core samples to the City for testing, both the Contractor and the City will accept the results of the tests of the drilled cores in lieu of the results of the tests on the test cylinders.

130.7.3 METHODS OF SAMPLING AND TESTING:

- 130.7.3.1 Test cylinders cast to determine acceptability for minimum strength requirements shall be made and cured in accordance with AASHTO T23 and tested in accordance with AASHTO T22. Test cylinders cast to determine when a precast unit or structure may be put into service or to determine when a tensioning load may be transferred shall be cured by methods identical to those used in curing the concrete member, and tested in accordance with AASHTO T22.
- 130.7.3.2 Drilled core samples shall be taken and tested in accordance with AASHTO T24.
- 130.7.3.3 Test beams shall be made and cured in accordance with AASHTO T23 and tested in accordance with AASHTO T97.
- 130.7.3.4 Slump shall be determined in accordance with AASHTO T119 on the job site during each placement.
- 130.7.3.5 The amount of air entrained shall be determined by pressure or volumetric meters of approved design and in accordance with AASHTO Method T152 or AASHTO Method T196, except that AASHTO Method T199 may be used after the accuracy of the Chace Air Indicator has been determined by comparison tests.

130.8 CONCRETE FAILING TO MEET STRENGTH REQUIREMENTS:

- 130.8.1 For concrete which has been mixed and placed in accordance with these specifications, and which fails to meet the minimum 28-day strength requirements shall be removed and disposed of by the Contractor, at his expense, unless specifically authorized by the Engineer, in writing, to remain in place. The removal shall be in such manner as will not cause damage to the remaining concrete or to other structural units or other facilities and property.

130.8.2 The Engineer may, at his discretion, allow concrete which fails to meet the minimum strength requirement to remain in place. Payment for this concrete will be at a reduced price, to compensate the City for loss of durability. The amount of the reduction shall be determined by negotiation and shall be based on the particular circumstances.

130.9 **PLACING OF CONCRETE:**

130.9.1 To avoid impairing the quality of concrete, its temperature during placement should be above 35' and below 90' F as is economically feasible. Do not use cement with a temperature exceeding 170'F. The free fall distance while placing concrete shall not exceed 5 feet.

130.9.2 Set-retarding admixtures counteract the accelerating effect of high temperature and lessen the need for increase in mixing water. Their use should be considered when the weather is so hot that the temperature of concrete being placed is consistently above 75' F.

130.9.3 Before concrete is cast in hot weather, forms, reinforcing, and subgrade shall be sprinkled with cool water. Concrete shall be speedily placed and finished, to minimize slump loss. For temperatures below 99' the time limit from mix to placing shall not exceed 1 hour 30 minutes.

130.9.4 Continuous water curing gives best results in hot weather. Curing shall be started as soon as the concrete has hardened sufficiently to withstand surface damage. Water shall be applied to formed surfaces while forms are still in place. Surfaces without forms shall be kept moist by wet curing for at least 24 hours. If moist curing is discontinued after the first day, the surface shall be protected with a curing compound.

130.9.5 Before pouring any concrete, the sub-grade shall be saturated to a depth of one (1") inch. The availability of water or the lack of it shall be taken into consideration by prospective bidders. The responsibility for furnishing the necessary water belongs solely to the Contractor.

130.9.6 The Contractor will notify the Project Engineer or the Construction Inspector forty-eight (48) hours prior to the placing of ANY concrete. The Project Engineer or the Construction Inspector will notify the Design Activity twenty-four (24) hours prior to the placing of ANY concrete.

130.9.7 If the Contractor elects to place concrete that has been in the mixer (truck) more than the specified time (1-1/2 hours), he will provide an independent testing company with cylinders to be tested at the Contractors expense. If the cylinders do not test at the ultimate strength called for, the Contractor will replace the concrete at his expense.

130.9.8 The water tank on the mixer shall be topped out before leaving the plant. All water utilized on the job site will be recorded on the delivery ticket with the signature of the

inspector. If water is added or there is a delay in placing the concrete the Contractor will perform additional slump tests to the satisfaction of the construction inspector.

130.10 **COKING:**

130.10.1 The concrete shall be continuously cured for a period of at least 72 hours. Curing shall be commenced after finishing has been completed and as soon as the concrete has hardened sufficiently to permit application of the curing material without marring the surface. Any curing material removed or damaged during the 72 hour period shall be replaced immediately. Curing may be done in accordance with any of the methods described below except that machine-laid concrete shall be cured with the wet burlap method up until joints are sawed, or for at least 12 hours if joints are constructed in conjunction with placing of concrete.

130.10.2 After forms are removed, the surfaces exposed shall be cured by placing a berm of moist earth against them or any of the methods described below, for the remainder of the 72-hour curing period.

130.10.3 The curing concrete shall not be exposed to vehicular traffic during the 72 hour curing period. If necessary, the concrete shall be poured and cured in sections so as to facilitate reasonable ingress and egress to commercial establishments.

130.10.3.1 Wet Burlap Method: Burlap shall be placed over the entire exposed surface of the concrete, with sufficient extension beyond each side to insure complete coverage. Adjacent strips shall be overlapped such that it will be in continuous contact with the concrete at all times and no earth shall be permitted between the burlap surfaces at laps or between the burlap and the concrete. The burlap shall be saturated with water before being placed and shall be kept thoroughly wet throughout the curing period.

130.10.3.2 Membrane Curing Compound Method: Clear membrane curing compound or white-pigmented curing compound, shall be applied by a hand sprayer in a single-coat continuous film at a uniform coverage of at least one gallon to each 200 square feet. Any cracks, checks or other defects appearing in the coating shall be recoated immediately. The curing compound shall be thoroughly agitated in the drum prior to application, and during application as necessary to prevent settlement of the pigment.

130.10.3.3 Polyethylene Sheeting Method: Polyethylene sheeting shall be placed over the entire exposed surface of the concrete, with sufficient extension beyond each side to insure complete coverage. Adjacent strips shall be overlapped a

minimum of six inches. The sheeting shall be held securely in place such that it will be in continuous contact with the concrete at all times. The sheets, as prepared for use, shall be of such dimensions that each unit as laid will extend beyond the edges of the slab by at least twice the thickness dimensions of the pavement edge, and the sheets shall overlap by at least 18 inches. No sheet may be reused except after individual inspection and approval by the Engineer. Any sheets determined by the Engineer to be so damaged as to not afford the protection to the concrete in preventing moisture loss during the curing period will be rejected.

130.11 **CURING MATERIALS FOR CONCRETE:**

130.11.1 **BURLAP:**

Burlap for curing concrete shall consist either of two layers, weighing 10 to 18 ounces per ten square feet, or of four layers of 6 to 7 ounces each. Burlap which has been used as a container for sugar shall not be used. Burlap that is being used for the first time shall be thoroughly washed in order to remove starches used in sizing the material. Burlap shall be furnished in strips of at least three feet and not more than six feet in width, and it shall be at least three feet longer than the width of surface to be covered.

130.11.2 **MEMBRANE CURING COMPOUND:**

130.11.2.1 Membrane curing compound shall conform to the requirements of AASHTO M 148 (Type 1 for clear compound and Type 2 for white-pigmented compound), and the following additional requirements. The membrane curing compound shall be of a consistency suitable for spraying at temperatures prevalent at the time of construction operations, and which forms a continuous uniform film. It shall be free from precipitated matter caused by conditions of storage or temperature. The compound shall be relatively nontoxic.

130.11.2.2 At least one sample representing each 40 drums or fraction thereof shall be taken for testing. Each sample shall be at least one quart. If the compound has been pretested, only an information card need be submitted. Fourteen days shall be allowed after arrival of the sample at the laboratory for completion of the tests. The curing compound shall be delivered to the job in the manufacturer's original container, labeled with the manufacturer's name, plant location, grade designation of compound, lot number and quantity, and no material will be acceptable unless all such requirements are complied with.

130.11.3 SHEET MATERIALS:

130.11.3.1 Waterproof paper, polyethylene film and white burlap-polyethylene sheet, for curing concrete shall meet the requirements of AASHO M 171, with the additional requirements for waterproof paper and for polyethylene film as shown below. The paper as prepared for use shall be in such dimensions that each unit as laid will extend at least 18 inches beyond the edges of the slab. If laid longitudinally, paper not manufactured in sizes which will provide this width shall be securely sewed or cemented together; the joints being sealed in such manner that they do not open up or separate during the curing period.

130.11.3.2 At the option of the Contractor, instead of the single longitudinal strip specified above, the blanket may be furnished in three strips; one strip being the neat width of the pavement, with two side strips. The sheets, as prepared for use, shall be of such dimensions that each unit as laid will extend beyond the edges of the slab by at least twice the thickness dimension of the pavement edge, and the sheets shall overlap by at least 18 inches. No sheet may be reused except after individual inspection and approval by the Engineer. Any sheets determined by the Engineer to be so damaged as to not afford the protection to the concrete in preventing moisture loss during the curing period will be rejected.

130.12 RECREATIONAL PROJECTS:

130.12.1 Recreational projects shall have the class or type of concrete shown on the plans and/or specified in the Special Conditions.

130.13 QUALITY ASSURANCE:

130.13.1 Concrete shall be obtained from only those plants that have been approved and identified by the Florida Department of Transportation. A list of these plants may be obtained from the D.O.T. A plant owner or manager may submit a request for approval by writing to:

State Materials and Research Engineer
Florida Department of Transportation
Office of Materials and Research
Post Office Box 1029
Gainesville, Florida 32602

Concrete delivered to the job site in transit mixers having no D.O.T. identification and approval card shall be rejected.

130.14 **PAYMENT:**

130.14.1 Payment shall be at the unit and price established in the proposal for the concrete item called for unless specified otherwise in the Special Conditions.

**SECTION 131
CONCRETE CURB AND GUTTER**

131.1 **DESCRIPTION:**

The work specified in this section consists of the construction of Portland cement concrete curb and gutter, concrete traffic separator, valley gutter, special concrete gutter, and any other types of concrete curb not specified in other sections. The various items shall be constructed in accordance with these specifications and in conformity with the lines, grades, dimensions and notes shown in the plans.

131.2 **MATERIALS:**

All work under this section shall be of 2,500-lb. concrete as set forth previously in the City Standard Specifications. Preformed joint filler shall meet the requirements of AASHO M153 or AASHO M213.

131.3 **FORMS:**

131.3.1 **FORM MATERIALS:**

Forms for this work shall be made of either wood or metal. They shall be straight, free from warp or bends and of sufficient strength, when staked, to resist the pressure of the concrete without deviation from line and grade. For all items constructed on a radius, the Contractor will be required to use flexible forms, unless otherwise permitted by the Engineer.

131.3.2 **DEPTH OF FORMS:**

Forms shall have a depth equal to the plan dimensions for the depth of concrete being deposited against them.

131.3.3 **MACHINE PLACEMENT:**

Placing of these items by machine methods may be allowed with the approval of the Engineer provided that an acceptable finished product, true to line, grade and cross section, is consistently produced.

131.4 **EXCAVATION:**

Excavation shall be to the required depth and the foundation material compacted to 95% of AASHO T180 prior to the placing of the concrete.

131.5 **PLACING CONCRETE:**

The concrete shall be placed in the forms and tamped and spaded until mortar entirely covers its surface. The top of the structure shall be floated smooth and the edges rounded to the radius shown in the plans.

131.6 **JOINTS:**

131.6.1 **CONTRACTION JOINTS:**

Except for machine placed items, at the option of the Contractor, joints may be formed by the use of dummy joints (either formed or sawed) or by the use of sheet metal templets. If sheet metal templets are used they shall be of the dimensions, and shall be held firmly during the placing of the concrete and shall be left in place until the concrete has set sufficiently to hold its shape but shall be removed while the forms are still in place.

131.6.1.1 For machine placed items, unless an alternate method is approved by the Engineer, contraction joints shall be sawed. The joints shall be sawed as soon as the concrete has hardened to the degree that excessive raveling will not occur and before uncontrolled shrinkage cracking begins.

131.6.1.2 Contraction joints shall be spaced at intervals of ten (10) feet except where a lesser interval is required for closure, but no section shall be less than four (4) feet in length.

131.6.2 EXPANSION JOINTS:

Expansion joints shall be constructed at all radius points, and at other locations indicated in the plans. They shall be located at intervals of 500 feet between other expansion joints, ends of a run and between truck loads that exceed the time limits as previously specified. The joints shall be 1/2 inch in width.

131.7 FINISHING:

131.7.1 REPAIR OF MINOR DEFECTS:

The forms shall be removed within 24 hours after the concrete has been placed, and minor defects then filled with mortar composed of one part Portland cement and two parts fine aggregate. Plastering will not be permitted on the face of the curb, and any rejected curb, curb & gutter, or valley gutter shall be removed and replaced without

131.7.2 FINAL FINISH:

All exposed surfaces shall be given a finish while the concrete is still green. In general, only a brush finish will be required. For any surface, areas, however, which are too rough or where other surface defects make additional finishing necessary, the Engineer may require that the curb be rubbed to a smooth surface with a soft brick or wood block, with water used liberally. Also, if necessary, further to provide a suitable street surface, the Engineer may require additional rubbing, using a thin gout or mortar.

131.8 CORING:

See Section 130, Portland Cement Concrete.

131.9 **BACKFILLING & COMPACTION:**

After the concrete has set sufficiently, but not later than three (3) days after pouring, the spaces in front & back of the curb shall be refilled to the required elevation, with suitable material, which shall be placed and thoroughly compacted in layers not thicker than six (6) inches.

131.10 **SURFACE REQUIREMENTS:**

The gutter section or curb and gutter shall be tested with a ten (10) foot straightedge laid parallel to the center line of the roadway, and while the concrete is still plastic. Straightedging shall be done along the edge of the gutter adjacent to the pavement or along other lines on the gutter cross section, as directed by the Engineer. Irregularities in excess or 1/4 inch shall be immediately corrected.

131.11 **METHOD OF MEASUREMENT:**

The quantities to be paid for under this section shall be in lengths of feet of, but not necessarily limited to, concrete curb, concrete curb & gutter, concrete traffic separator, special concrete gutter, concrete valley gutter and concrete shoulder gutter as determined by plan dimensions, completed and accepted. Measurement of curved sections shall be made along the face of the curb.

131.12 **BASIS OF PAYMENT:**

The quantities, determined as provided above, shall be paid for at the contract unit prices per linear foot for concrete curb, concrete curb and gutter, concrete traffic separator, special concrete gutter, concrete valley gutter, concrete shoulder gutter and any other form of curb and/or gutter specified on plans or in special conditions. Such prices and payments shall be full compensation for all the work and materials specified in this section.

SECTION 132
SIDEWALKS AND DRIVEWAYS

132.1 **DESCRIPTION:**

The work specified in this section consists of construction of concrete sidewalk, in accordance with these specifications, and in conformity with the lines, grades, dimensions and notes shown in the plans.

132.2 **MATERIALS:**

132.2.1 **CONCRETE:**

All work under this section shall be of 2,500 lb. concrete, as previously specified.

132.2.2 **REINFORCEMENT:**

Where the plans call for steel reinforcement to be placed in the sidewalk, such reinforcement shall conform to the requirements specified in Section 415, Florida Department of Transportation, Standard Specification for Road and Bridge Construction, 1973 Edition.

132.3 **FORMS:**

132.3.1 Forms for this work shall be made of either wood or metal and shall have a depth equal to the plan dimensions for the depth of concrete being deposited against them. They shall be straight, free from warp or bends, and of sufficient strength, when staked, to resist the pressure of the concrete without deviation from line and grade. Forms shall be cleaned each time they are used and shall be oiled or saturated with water prior to placing the concrete.

132.4 **FOUNDATION:**

132.4.1 Excavation shall be made to the required depth, and the foundation material upon which the sidewalk is to be set shall be compacted to a firm, even surface, true to grade and cross section, and shall be moist at the time that the concrete is placed.

132.5 **JOINTS:**

132.5.1 The pavement shall be cut into sections by expansion, contraction and construction joints as specified herein, or as shown on the plans.

132.5.2 Expansion joints shall be preformed joint fillers meeting the requirements of AASHTO M153 or AASHTO 213 and cut to the true shape of the cross section, set to line and grade and held true while the concrete is being placed. The joint shall be edged and finished in a workmanlike manner as required by the Engineer. These strips shall be left in place and shall appear every 18 feet, unless otherwise shown on plans or specified by the Engineer. On driveways, these

strips shall be placed adjacent to the paving, curb and driveway aprons or as specified by the Engineer. These strips shall also be placed between truck loads of concrete that exceed the time limits specified in the City Standard Specifications.

132.5.3 Contraction and construction joints shall be placed and formed by means of an approved jointer template. The stem of the jointer shall be pressed into the freshly finished concrete forming a groove one-half inch deep. The edges of the groove and adjacent surface shall be neatly finished in a workmanlike manner with proper tools in the hands of skillful workmen. Unless otherwise shown on the plans or designated by the Engineer, these joints shall appear at 6 foot intervals between expansion joints.

132.6 **PLACING:**

The concrete shall be placed in the forms to the required depth, and shall be tamped and spaded until mortar entirely covers its surface.

132.7 **FINISHING:**

132.7.1 **SCREENING:**

The concrete shall be struck-off by means of a wood or metal screed, used perpendicular to the forms, in order to obtain the required grade and remove surplus water and laitance.

132.7.2 **SURFACE REQUIREMENTS:**

The concrete shall be given a broom finish. The surface variations shall not be more than 1/4 inch under a ten foot straightedge, nor more than 1/8 inch on a five foot transverse section. The edge of the sidewalk shall be carefully finished with an edging tool having a radius of 1/2 inch.

132.8 **THICKNESS:**

Concrete sidewalks shall be not less than four inches (4") thick in any residential area or less than five inches (5") thick in all business and/or commercial districts or as specified by the City Engineer.

132.9 **DRIVEWAYS AND WALK ADJUSTMENTS:**

Driveways and walk adjustments shall be built of one course of monolithic construction according to plans prepared by the City Engineer. Driveways shall be not less than five inches (5") thick and a minimum width of eight feet (8') at the walk. The apron shall have a maximum width of 30' and a minimum width of 14' at the curb. Driveway aprons larger than 30' at the curb shall be considered as exceptions. Walks shall be not less than four inches (4") thick. Both shall show a strength of not less than 2,500 pounds in twenty-eight (28) days. Expansion joints shall be placed adjacent to the paving curb and/or as otherwise directed by the Engineer.

132.10 **COKING:**

Shall be as specified in the City Standard Specifications.

132.11 **HEDGE OR LARGE SHRUBBERY:**

The contractor will remove, with care, any hedge of large shrubbery which is found to encroach upon the area of construction. Such hedge or large shrubbery shall be replanted in the immediate vicinity outside the construction area. Root structures must be protected to insure plant life.

132.12 **FENCES OR WALLS:**

The Contractor will remove and replace to the correct line any fence or wall which encroaches upon the area where sidewalks are to be constructed. The work will be performed to the satisfaction of the Engineer.

132.13 **REMOVAL OF TILE WALK:**

The Contractor will be required to remove and if necessary to haul to a" specified location within a two mile radius any tile walk which may be encountered during the process of construction.

132.14 **TREES:**

The Contractor will be required to remove all trees that in the opinion of the Engineer are detrimental to the sidewalk to be constructed. This work will be paid for at such prices as may be agreed upon in writing between the Contractor and the Engineer, or in lieu thereof the Engineer may either ask for bids on the removal of said trees or remove same with City forces.

132.15 **STUMPS AND ROOTS:**

All stumps and/or roots in sidewalk space whether above or below ground, and visible or not, will be removed by the Contractor.

132.16 **METHOD OF MEASUREMENT:**

The quantity to be paid for under this section shall be the area in square yards of concrete, measured in place, completed and accepted. No deduction will be made for the area occupied by ornamental trees left within the area of the sidewalk. No deduction will be made for any areas occupied by manholes, inlets or other drainage structures or by public utility appurtenances with the normal sidewalk area.

132.17 **BASIS OF PAYMENT:**

The quantity, determined as provided above, shall be paid for at the contract unit and price for concrete sidewalk, which price and payment shall be full compensation for all the work specified in this section.

SECTION 135
RIGID PAVEMENT

135.1 **SCOPE OF WORK:**

Rigid pavement consists of constructing a specified cement concrete paving on a prepared base. The utilities and other items in and beneath the street must be properly coordinated with the construction of the rigid pavement to avoid all conflicts. The work to be done shall include the furnishing of all supervision, labor, materials, equipment and incidentals necessary for the proposed rigid pavement construction in accordance with the approved drawings & specifications.

135.2 **SUBGRADE PREPARATION FOR RIGID PAVEMENT:**

135.2.1 **GENERAL:**

The bottom of the excavation for the pavement or top of the earth fill will be known as the pavement subgrade and shall conform to the lines, grade, and cross-sections shown on the Plans.

Prior to placing the concrete, the subgrade shall be tested for conformity with the cross-section shown on the Plans. If necessary material shall be removed or added as required to bring all portions of the subgrade to the correct elevation. It shall be thoroughly compacted to meet the requirements of Section 103, Excavation & Fill, Roadway. Concrete shall not be placed on any portion of the subgrade which has not been tested for correct elevation. The subgrade shall be cleared of all loose material. At any time that trucks, construction equipment or slip forming machines cause rutting or displacement of the subgrade materials, the subgrade shall be reshaped and compacted. The subgrade shall be in a moist condition at the time the concrete is placed.

135.2.2 **SUBGRADE MATERIAL:**

The top six (6) inches shall be composed of granular or gravelly soils that are predominantly sandy with no more than a moderate amount of silt or clay. It shall have a minimum limerock bearing ratio (LBR) of 12.5 and a minimum Florida Bearing Value (FBV) of 25.

135.3 **MATERIALS FOR RIGID PAVEMENTS:**

135.3.1 **PROPORTIONING:**

The materials and acceptance of concrete shall be in accordance with Florida Department of Transportation's Current Edition Standard Specifications for Road & Bridge construction.

135.3.2 **MATERIALS:**

Materials used In this work shall conform to the following:

1. Concrete Class I.....Section 345
2. Curing Materials.....Section 925
3. Embedded Items.....Section 931
4. Materials for Forming & Sealing Joints...Section 932

135.3.3 TESTING & INSPECTION:

The Contractor should provide for services of an independent testing laboratory to perform specified services and report findings to the Engineer. Test requirements shall conform to Section 345 and 345-8 of the Florida Department of Transportation Current Edition Standard Specifications for Road & Bridge construction.

135.4 EQUIPMENT:

135.4.1 GENERAL:

All equipment necessary for the proper preparation of the subgrade, placing, finishing, and curing of the concrete pavement shall be on the project in good working condition before the Contractor will be permitted to begin placing concrete. Throughout the construction of the project, the Contractor shall maintain the equipment in good working condition to assure the proper prosecution of the work.

135.4.2 FORMS:

Unless special provision is made for the use of wood, all side forms for this work shall be of metal of a depth equal to the edge thickness of the pavement, except that it is permissible to increase the depth of forms by fastening boards under the forms. The sections shall have a length of at least ten (10) feet, except on curves of less than 150-foot radius, where other materials may be used as provided in 135.4.3. Forms with a height of eight (8) or more inches shall have a base width of at least eight (8) inches. Other forms shall have a minimum base width of six (6) inches. When set to grade and staked in place, the maximum deviation of the top surface of any section from a straight line shall not exceed 1/8 inch.

The method of connection between sections shall be such that the joint formed shall be free from play or movement in any direction. The bracing and support must be ample to prevent deflection of the forms under the pressure of the concrete or the weight or thrust of the machinery operating on the forms.

135.4.3 FLEXIBLE FORMS

Flexible steel or wood forms may be used only when specifically provided for on the Plans or in Special Provision with the exception that their use is herein approved for all curves having a radius of less than 150 feet. Wood forms shall be equal in depth to the edge thickness of the pavement. Forms shall be held by stakes and securely braced at any point where necessary so that no

movement will result from pressure of the concrete or the weight or thrust of machinery operating on the forms.

135.4.4 READY MIXED PLANTS:

The plant shall be in accordance with Section 345 as written in the Florida Department of Transportation Standard Specifications, Current Edition, for Road & Bridge Construction.

135.4.5 ON-SITE CENTRAL MIX PLANTS:

Either the plant shall be certified to the satisfaction of the responsible testing agency and shall conform to the Current Standards of the Concrete Plant Manufacturer's Bureau, or the plant shall be in accordance with Section 345 as written in the Florida Department of Transportation, Current Edition, Standard Specifications for Road & Bridge Construction. The trucks used to transport the concrete shall be so constructed to prohibit segregation of the mix and shall meet the approval of the Engineer in all respects.

135.4.6 FINISHING EQUIPMENT:

Unless otherwise approved by the Engineer in writing, the Contractor shall provide mechanical equipment of either the slip form or form paving type which will strike off, consolidate, and finish the pavement to the required cross-section.

135.4.7 VIBRATORS:

When required, approved vibrators for consolidating concrete along the faces of forms and adjacent to joints shall be provided.

135.4.8 CONCRETE SAWS:

The concrete saws shall be capable of cutting hardened concrete neatly to the dimensions specified in the Plans. The saw shall be equipped with a suitable guard.

135.4.9 JOINT SEALING EQUIPMENT:

Sealing equipment shall be capable of installing the sealant in joints in accordance with the manufacturer's recommendations.

135.4.10 MEMBRANE SPRAYER:

A pressure sprayer capable of applying a continuous uniform film will be required.

135.5 MIXING & PLACING FOR RIGID PAVEMENT:

135.5.1 GENERAL:

Concrete pavement shall be constructed on the prepared subgrade in accordance with these specifications and in reasonably close conformity with the lines, grades, thickness, and typical cross-sections shown on the Plans.

135.5.2 MIXING CONCRETE:

Concrete mixed in truck mixers shall be at the speed designated as mixing speed by the manufacturer for a total of 75-100 revolutions of the drum, unless additional water is added in conformance with part 135.5.3. Time of mixing in a central mix plant shall be a minimum of sixty (60) seconds.

135.5.3 TRANSPORTING CONCRETE:

Concrete may be transported any distance providing it is discharged on the grade with the slump within the required slump range and meets time requirements of 135.5.3.1. If additional water is required to maintain the specified slump of concrete transported in truck mixers, it may be added with the permission of the Engineer. In this case, a minimum of 20 additional revolutions of the mixer drum at mixing speed shall be required before discharging the concrete.

135.5.3.1 Concrete Time Limits: The length of time that the concrete can be held in the truck shall conform to the following:

1. Air Temperature 45°F to 80°F....90 minutes
2. Air Temperature over 80°F
with retarder added to mix.....90 min. max.
3. Air Temperature over 80°F
without retarder added to mix...60 min. max.

135.5.4 PLACING CONCRETE:

The concrete shall be deposited on the grade in such a manner as to require little rehandling as possible. It shall be deposited in successive batches in a continuous operation. The concrete shall be consolidated by suitable means so as to preclude the formation of voids or honeycomb pockets.

135.5.5 PLACING IN COLD WEATHER:

The Contractor shall be responsible for protecting concrete placed in cold weather and any concrete damaged by frost action shall be removed and replaced at his expense.

135.5.6 PLACING ON FROZEN SUBGRADE: No concrete shall ever be placed on a frozen subgrade.

135.6 FINISHING FOR RIGID PAVEMENTS:

135.6.1 GENERAL:

The concrete shall be struck-off, consolidated, and finished with mechanical equipment in such a manner that after final finishing, it shall conform to the pavement cross-section shown on the Plans. Hand finishing will be permitted in narrow widths, areas of irregular dimensions, and in the event of breakdown of the mechanical equipment only to finish the concrete already deposited on the grade.

135.6.2 FINAL SURFACE FINISH:

The final surface of the pavement shall have a uniform, skid-resistant texture. The method of texturing shall be approved by the Engineer, and he may require changes in the final finishing procedure as required to produce the desired final surface texture. A burlap drag finish is recommended for residential, collector and minor arterial streets. Major arterial and rural roads may require an overlapping stiff bristled broom or steel comb finish at the Engineer's option.

135.6.3 PAVEMENT EXPOSED TO RAIN DURING CONSTRUCTION: The Contractor shall always have materials available to protect the surface of the plastic concrete against rain. Areas of the pavement surface that exhibit a smooth sandy appearance after the rain ceases shall be textured and cured. An attempt shall be made to impart the specified texture on these areas before applying the membrane curing material. Areas that have suffered some surface erosion and have coarse aggregate exposed shall be reworked by hand methods or with the finishing machine when the form paving method is used. Fresh concrete containing the same materials and properties as the pavement concrete shall be added to maintain an adequate supply in front of the screeds or machine to assure replacement of the concrete eroded from the surface. The surface shall then be textured and cured as specified.

If pavement edges have been severely eroded and the concrete has not set, the edges shall be repaired by setting side forms and replacing eroded concrete. After the side forms are set, fresh concrete shall be placed and finished prior to texturing and curing. After the pavement has hardened, remedial work shall not be permitted. Areas that do not comply with the specifications shall be corrected after the curing period has terminated.

135.7 CORING FOR RIGID PAVEMENTS:

135.7.1 GENERAL:

After finishing operations have been completed and immediately after the free water has left the surface of the slab and, for slip formed pavements, the sides of the slab shall be coated and sealed in a uniform layer of membrane curing compound applied at the rate of not less than one (1) gallon per 200 square feet of surface. When the forms are removed, curing compound shall be applied to the sides of the slab. Areas in which the curing membrane is damaged

within a period of three (3) days shall be re-sprayed with curing compound.

Curing compound may be omitted when, in conjunction with protection of the pavement from inclement weather, a polyethylene film or other acceptable material is applied over the pavement and maintained intact for three (3) days.

135.7.2 CRACKS:

Concrete rigid pavement will not be accepted with excessive uncontrolled cracks. The Contractor must avoid shrinkage cracks which occur when evaporation exceeds the rate at which bleed water rises to the surface. Some suggestions to avoid plastic shrinkage cracks include: Dampen subgrade and forms; Erect windbreaks, if doing so will reduce evaporation; Erect sunshades; Protect with wet coverings; Reduce time between placing and start of curing; and apply light fog spray for first few hours after placing concrete. Cracks due to settlement or other structural faults must be avoided by adequate base construction.

135.8 JOINTS IN RIGID PAVEMENTS:

135.8.1 GENERAL:

Transverse and longitudinal joints shall be constructed to the dimensions and at the spacing shown on the Plans.

Transverse joints shall extend the entire width of the pavement and through the curbs. Joints may be formed in the plastic concrete or sawed after the concrete has hardened.

Formed joints may be constructed by installing a parting strip to the left in place or by depressing an approved tool into the plastic surface.

Sawing of joints shall begin as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling and before uncontrolled cracking occurs. If necessary, the sawing operations shall be carried on both day and night, regardless of weather conditions.

135.8.2 CONSTRUCTION JOINTS:

All longitudinal joints may be construction joints at the Contractor's option. Transverse construction joints shall be installed whenever the placing of concrete is suspended a sufficient length of time for the concrete to begin to harden.

135.8.3 JOINT SEALING:

Where required, joints shall be sealed before the pavement is exposed to traffic, including construction traffic. Prior to sealing, all foreign material shall be removed from the joints and the joints shall be thoroughly dry.

135.9 **FINAL ACCEPTANCE FOR RIGID PAVEMENTS:**

135.9.1 **GENERAL:**

Before the pavement will be considered for acceptance, all items shall be completed in substantial accordance with the Plans and Specifications. Equipment, surplus materials, and construction debris shall be removed from the project.

135.9.2 **OPENING TO TRAFFIC:**

The pavement shall be closed to traffic after the concrete is placed until it reaches a compressive strength of 2500 PSI under ordinary field conditions. This does not include the sawing and sealing equipment or other light miscellaneous equipment.

135.9.3 **TOLERANCE IN PAVEMENT THICKNESS:**

Before the final acceptance of the pavement, at the option of the Owner, its thickness may be determined by coring at random locations at various points on the cross-section in each poured strip so that a core represents an area not exceeding 2,500 square yards and determining the depth of each core by average measurements of the core in accordance with AASHTO T148.

When the measurement of the core is not deficient by more than 5% from the Plan thickness, full payment for the unit will be made. Pavement deficient in thickness by more than 5% but not more than 10% from the specified thickness shall be subject to an adjustment in the contract unit price in accordance with the schedule in Part 135.9.3.1. No additional compensation will be allowed for pavement placed in excess of the specified thickness.

135.9.3.1 **Cores:** When the measurement of the core is deficient in thickness by more than 5% but not more than 10% from the Plan thickness, two additional cores will be taken at 25-foot intervals from the original core. If the core deficient in thickness is from a two-lane pour unit, each lane will be cored separately. If the average thickness of the three cores is not deficient by more than 5% from the Plan thickness, full payment for the unit will be made. If the average thickness of the three cores is deficient by more than 5% but not more than 10% from the Plan thickness, an adjusted unit price will be applied for the area represented by these cores as shown in the following table for thickness less than 6-1/2 inches. For thicker pavements, use AASHTO Guide Specifications.

| <u>Deficiency in Thickness Determined by Cores</u> | <u>Proportional Part of Contract Price Allowed</u> |
|--|--|
| 0 - 5% | 100% |

| | |
|-----------|-----|
| 5.1 - 6% | 98% |
| 6.1 - 7% | 94% |
| 7.1 - 8% | 88% |
| 8.1 - 9% | 80% |
| 9.1 - 10% | 70% |

Where the thickness of the pavement is deficient by more than 10% and it is the judgment of the Engineer that the area of such deficiency should not be removed and replaced, payment will be 50% of the Contract Price.

The Owner will pay for the initial cores or tests. The Contractor shall pay for the extra or exploratory cores or tests to determine the extent of areas deficient in thickness.

135.9.4 MEASUREMENT:

The quantity of Rigid Pavement constructed shall be the number of square yards measured in place by the Engineer and verified by the Contractor.

**SECTION 140
GRASSING
SEEDING OR SODDING**

140.1 **SCOPE OF WORK:**

The work specified in this section consists of the establishing of a stand of grass within the areas called for and maintaining such areas until completion and final acceptance of the project. The methods specified herein are grassing by seeding and grassing by sodding.

140.2 **PREPARATION OF GROUND:**

Final grading and cleaning shall be completed prior to the preparation of ground for grassing. The areas to be grassed shall be scarified or-loosened to a depth of at least six (6) inches. All areas shall be smooth and free of large clods, roots and other materials which may interfere with the work or future mowing and maintenance operation. No subsequent operations shall be commenced until the Engineer has approved the condition of prepared areas.

140.3 **FERTILIZER:**

Commercial fertilizer shall be spread uniformly over the area to be grassed by machine spreading at the rate of 20 pounds per 1,000 square feet. Immediately after the fertilizer is spread, it shall be raked and thoroughly mixed with the soil to a depth of approximately two inches. The fertilizer shall be designated 8-8-8 which has a chemical analysis as follows:

Total nitrogen.....not less than 8%
Available phosphoric acid...not less than 8%
Water-soluble potash.....not less than 8%

All fertilizer shall comply with state laws and regulations and shall be fully labeled at the time of delivery to the job site.

140.4 **GRASSING BY SEEDING:**

When called for in the plans or special conditions, grass seed shall be furnished and placed in the areas to be grassed and maintained to assure a healthy stand of grass.

140.4.1 **PLACEMENT OF SEED:**

Seeding shall be done immediately after fertilizing, while the soil is still loose and moist. The seed shall be scattered uniformly over the area to be grassed by a mechanical hand spreader or other approved type of spreader. The rate of spreading shall be 5 pounds per 1,000 square feet unless otherwise designated.

140.4.2 **SEED MIXTURE:**

Unless other types of seed are called for, seed shall be a mixture of 20 parts of hulled Bermuda seed and 80 parts Argentina Bahia seed thoroughly dry mixed immediately before sowing. Seed which has become wet or moldy shall not be

used. The Bahia seed shall be scarified seed, having a minimum active germination of 40 percent and a total germination of 85 percent. During the period, October 15 to February 15, rye grass seed shall be added and thoroughly dry mixed with the regular mixture at the rate of 20 pounds rye seed per 100 pounds of regular seed mixture.

140.4.3 CERTIFICATION OF SEED:

All seed shall meet the requirements of the State Department of Agriculture and Consumer Services and all applicable state and local laws. The Contractor shall submit to the Engineer a certification tag for each type of seed used prior to sowing of seed. The certification tag shall have the following information:

- 140.4.3.1 Grass Type and Variety
- 140.4.3.2 Percent of Inert Matter
- 140.4.3.3 Germination Percentage
- 140.4.3.4 Percent of Weed Seed

140.4.4 MULCH:

Immediately after completion of seeding, dry mulch shall be uniformly applied over the seeded area approximately two (2) inches, loose thickness. The mulch shall then be cut uniformly into the soil so as to produce a loose mulched thickness of three (3) to four (4) inches and rolled with a cultipacker, traffic roller or other suitable equipment. The mulch shall consist of oat, rye or wheat straw or of pangola, peanut, coastal Bermuda or Bahia grass hay. Other types of mulch may be used only when approved by the Engineer. After seeding and mulching is completed, the entire area shall be watered so as to provide optimum growth conditions for establishment of the grass.

140.4.5 PAYMENT FOR SEEDING & MULCHING:

Payment for seeding and mulching including preparation of ground, fertilizing, watering and maintenance shall be determined by the contract unit price per square yard as established in the proposal. Final quantities shall be determined by field measurements of acceptable seeded areas.

140.5 GRASSING BY SODDING:

When called for in the plans and special conditions, grass sod shall be furnished and placed in the areas to be grassed and shall be maintained to assure a healthy stand of grass.

140.5.1 SODDING MATERIALS:

Unless a particular type of sod is called for, sod may be either centipede or Bahia grass, at the Contractor's option. It shall be well matted with roots. Where sodding will adjoin, or be in sufficiently close proximity to private lawns other types of sod may be used if desired by the affected property owners and approved by the Engineer.

- 140.5.1.1 The sod shall be taken up in commercial-size rectangles, preferably 12 inch by 24 inch or larger, except where 6 inch strip sodding is called for. The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh, and uninjured, at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be reasonably free of weeds and other grasses. It shall be planted as soon as possible after being dug and shall be shaded and kept moist from the time it is dug until it is planted. The sources of the sod may be inspected and approved by the Engineer prior to being cut for use in the work. After approval, the area from which the sod is to be harvested shall be closely mowed and raked as necessary to remove excessive top growth and debris.
- 140.5.1.2 Approved devices, such as sod cutters, shall be used for cutting the sod and due care shall be exercised to retain the native root soil intact.

140.5.2 PLACEMENT OF SOD:

Sodding shall be incorporated into the project at the earliest practical time in the life of the contract. No sod which has been cut for more than 72 hours shall be used unless specifically authorized by the Engineer after his careful inspection thereof. Any sod which is not planted within 24 hours after cutting shall be stacked in an approved manner and maintained properly moistened.

- 140.5.2.1 Sodding shall not be performed when weather and soil conditions are, in the Engineer's opinion, unsuitable for proper results.
- 140.5.2.2 The sod shall be placed on the prepared surface, with edges in close contact, and shall be firmly and smoothly embedded by light tamping with appropriate tools or rolled with approved rollers.
- 140.5.2.3 Where sodding is used in drainage ditches, the setting of the pieces shall be staggered, such as to avoid a continuous seam along the line of flow. Along the edges of such staggered areas the offsets of individual strips shall not exceed six (6) inches. In or order to prevent erosion caused by vertical edges at the outer limits, the outer pieces shall be tamped so as to produce a featheredge effect.
- 140.5.2.4 On areas where the sod may slide, due to height and slope, the Engineer may direct that the sod be pegged, with pegs driven through the sod

blocks into firm earth, at suitable intervals. Any pieces of sod which, after placing, show an appearance of extreme dryness shall be removed from the work.

140.5.3 CERTIFICATION OF SODDING MATERIALS:

The Contractor shall comply with all current restrictions in regard to movement of sod, into or within areas which are outside of QUARANTINE BOUNDARIES for the white fringed beetle and the imported fire ant, as issued by the Division of Plant Industry, Florida Department of Agriculture and the Animal and Plant Health Inspection Service, United States Department of Agriculture. Prior to placement of sod, the Contractor shall submit to the Engineer a certification tag from each type of sod used stating the type and variety of sod and the date of cutting.

140.5.4 PAYMENT FOR SODDING:

Payment for sodding including preparation of ground, fertilizing, watering, and maintenance shall be determined by the contract unit price per square yard as established in the proposal. Final quantities shall be determined by field measurements of acceptable sodded areas.

140.6 WATERING OF GRASSED AREAS:

The grassed areas shall be watered for the duration of the contract so as to provide optimum growth conditions for the establishment of the grass. In no case, however, shall the period of maintaining such moisture be less than two weeks after planting. The water used may be obtained from any approved spring, pond, lake, stream or municipal water system. The water shall be free of excess and harmful chemicals, acids, alkalies, or any substance which might be harmful to plant growth or obnoxious to traffic. Salt water SHALL NOT be used. The Contractor shall make all arrangements for obtaining and transporting water to the job site.

140.7 MAINTENANCE OF GRASSED AREAS:

The Contractor shall, at his expense, maintain the planted areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include the filling, leveling, and repairing of any washed or eroded areas, as may be necessary. The Engineer, at any time, may require replanting of any areas in which the establishment of the grass stand does not appear to be developing satisfactorily. If a planted area must be replanted due to the Contractor's negligence, carelessness, or failure to provide routine maintenance of such area, such replacement shall be at the Contractor's expense. If replanting is necessary due to the factors determined to be beyond the control of the Contractor, payment for the replacement will be made under the appropriate contract pay items.

SECTION 141
REPLACEMENT OF PAVEMENT, WALKS & DRIVEWAYS

141.1 **GENERAL:**

Work under this section includes the furnishing of all labor, material and equipment required to provide replacement pavement, curb & gutter, walkways, and driveways as required for the work as specified hereinafter.

141.2 **GENERAL REQUIREMENTS:**

Where construction requires removing pavement or where existing paving is damaged by the Contractor's operation, it is the intent of these specifications that due care be exercised in cutting pavement, backfilling trenches, and replacing pavement so that where no further settlement of trenches will occur and the paved surfaces will be restored to a condition equal to that existing before construction began.

141.2.1 Except as otherwise provided herein, materials & methods of operations required to install new and replacement pavement shall be in accordance with the applicable requirements of the Florida Department of Transportation, Standard Specifications for Road & Bridge Construction, Current Edition.

141.2.2 No paving work shall be accomplished until all heavy construction equipment is permanently removed from the site.

141.2.3 Where construction work requires removal of the brick pavement, it shall be replaced with asphalt pavement as shown on the drawings and as specified hereinafter.

141.2.4 **TRENCH SURFACE:**

The surface of backfilled trenches when dry shall be finished without needless delay. The surface of trenches in unpaved roadways and unpaved sidewalk areas shall conform to the adjacent surfaces and shall be in every respect be equal in quality, character, materials, and workmanship to the surface existing immediately previous to making the excavation. The surface of backfilled trenches in paved areas shall be finished with Type S-I or Type II Asphaltic Concrete, or Portland Cement Concrete as specified hereinafter.

141.2.5 All surfaces which have been injured by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately before the work was begun. Suitable materials and methods shall be used in such restoration.

141.2.6 The Contractor shall be responsible for controlling the widths of excavation for installing underground pipelines and appurtenant work. Unauthorized removal of pavement, curbs, etc., will not be included for payment under the

Contract but shall be replaced in accordance with these specifications at no expense to the Owner.

141.3 **REMOVAL OF PAVEMENT, WALKS & DRIVEWAYS:**

141.3.1 Bituminous Pavement shall be removed to clean continuous straight lines by sawcutting. Where bituminous pavement adjoins a trench, the edges adjacent to the trench shall be trimmed to neat straight lines before pavement repair to insure that all areas to be repaired are accessible to rollers used to compact the subgrade or paving materials.

141.3.2 Concrete Pavement shall be removed to neatly sawed edges. Sawcuts shall be made to a minimum depth of one and one-half (1-1/2) inches. If a sawcut in concrete pavement falls within three (3) feet (10 feet for state & federal highways) of a construction joint, expansion joint or edge, the concrete shall be removed to the joint or edge. The edges of existing concrete pavement adjacent to trenches, where damaged subsequent to sawcutting or the pavement, shall again be sawcut to neat straight lines for the purpose of removing the damaged pavement areas. Such sawcuts shall be parallel to the original sawcuts or shall be cut on an angle which departs from the original sawcut not more than one (1) inch in each six (6) inches.

141.3.3 Concrete Curb, Walkways, Gutters & Driveways shall be removed to neatly sawed edges with sawcuts to a minimum depth of one and one-half (1-1/2) inches. Concrete sidewalk or driveway to be removed shall be neatly sawed in straight lines parallel to the curb or at right angles to the alignment of the sidewalk. No section to be replaced shall be smaller than thirty (30) inches in either length or width. If sawcut in walkway or driveway would fall within 30 inches of a construction joint, expansion joint, or edge, the concrete shall be removed to the joint or edge except where the sawcut would fall within twelve (12) inches of a score mark, the sawcut shall be made in an along the score mark. Where a paved concrete driveway return apron is cut, the complete return apron shall be replaced from the street roadway back to the approved cut furthest from the roadway beyond the tangent point of the return radius. The finished return radius shall be at least as large as that on the original driveway apron. Curb & gutter shall be sawed to a depth of one and one-half (1-1/2) inches on a neat line at right angles to the curb face.

141.4 **PAVEMENT SUBGRAPHS:**

141.4.1 **STABILIZATION:**

Roadbed stabilization, when authorized by the Engineer in writing or shown on the Contract Plan/Profile Drawing, shall extend to a depth of twelve (12) inches below the bottom of the base. All stabilized areas shall have a minimum limerock bearing ratio (LBR) of 30. All materials, equipment and workmanship shall be in accordance with Section 160 of the Florida Department of Transportation Standard Specifications

for Road & Bridge Construction, Current Edition, except that paragraphs 160-12 and 160-13 shall be omitted. Type B stabilization, as specified in paragraphs 160-6 of the D.O.T. Specifications, shall be used.

141.4.2 BASE COURSE:

The base course for the paved areas shall be limerock constructed to the thickness shown on the drawings for the case involved. All materials, equipment and workmanship shall be in accordance with the Section 200 of the Florida Department of Transportation, Standard Specifications, Current Edition, except that paragraphs 200-12 and 200-13 shall be omitted.

141.5 ASPHALT PAVEMENT:

Provide asphalt pavement where indicated on the drawings, or where new work has required removal of existing asphalt pavement.

141.5.1 PRIME COAT:

A prime coat consisting of a bituminous material hereinafter specified shall be applied at the rate of fifteen hundredths (0.15) gallons per square yard to the previously prepared base course. All materials, equipment and workmanship shall be in accordance with Section 300 of the Florida Department of Transportation Standard Specifications, Current Edition, except that paragraphs 300-8 and 300-9 shall be omitted.

141.5.2 ASPHALTIC CONCRETE SURFACE COURSE:

The paving shall have a wearing surface of either Type II or Type S-I Asphaltic Concrete with a thickness of one and one-half (1-1/2) inch or equal to the thickness of the existing surface course, whichever is greater. All equipment, materials, workmanship and methods employed in construction of the wearing surface shall be in accordance with Section 320, 330, 331, and 332 of the aforementioned Florida Department of Transportation Standard Specifications, Current Edition, except that paragraphs 331-6 and 332-5 shall be omitted.

141.5.3 ORDER OF WORK:

Work shall be accomplished in the following order:

141.5.3.1 Stabilizing and compacting of sub-base, when required.

141.5.3.2 Limerock Base Course

141.5.3.3 Prime coat.

141.5.3.4 Asphaltic concrete surface course.

141.6 ASPHALTIC CONCRETE OVERLAY:

Provide asphalt pavement overlay with tack coat where indicated on the drawings. Feather edges to meet existing grade at limits shown on the drawings.

141.6.1 TACK COAT:

Materials and application of the tack coat shall be in accordance with Section 300 of the Florida Department of Transportation Standard Specifications for Road & Bridge Construction, Current Edition.

141.6.2 ASPHALTIC CONCRETE OVERLAY:

Asphaltic Concrete overlay shall be applied to a thickness of one (1) inch and in accordance with the requirements of subparagraph 141.5.2. Asphaltic Concrete Surface Course, of this specification.

141.7 TESTS:

Where reference is made to the Florida Department of Transportation Standard Specifications for design mixes, tests of materials, or work performed, or where in the opinion of the Engineer, tests are required to ascertain compliance with the Specifications, the Contractor will have such tests made by an independent testing laboratory. All testing expenses shall be borne by the Contractor as specified in the section of the specifications entitled, General Conditions.

141.8 CONCRETE PAVEMENT:

141.8.1 CONCRETE PAVEMENT:

Provide replacement concrete pavement in roadways where shown on the drawings and as required where new work necessitates cutting existing concrete pavement. Concrete pavement shall conform to the requirements of Section 350 of the Florida Department of Transportation Standard Specifications, Current Edition, with specific applicability of the requirements of paragraph 350-312 for paving of small or narrow areas, except that paragraphs 350-20 and 350-21 shall be omitted.

141.8.2 Concrete shall be 4,000 PSI concrete, as specified in Section 130, Portland Cement Concrete, with the exception that 3,000 PSI high-early-strength concrete shall be used for State and Federal Highways.

141.8.3 Contraction, expansion and construction joints shall be formed and installed in conformance with Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Current Edition, Section 350.12.

141.8.4 Newly placed concrete pavement sections shall be properly barricaded and lighted by the Contractor to exclude traffic during the curing period.

141.9 CURB AND GUTTER:

- 141.9.1 Existing curbs and curb & gutter sections shall be cut out as necessary to permit construction of the work as authorized by the Engineer.
- 141.9.2 Replacement curbs or curb & gutter shall be constructed of cast-in-place 3,000 PSI concrete, as specified under Section 130, Portland Cement Concrete and shall conform to the existing type of construction unless directed otherwise. If the limits of the area to be repaired fall within thirty (30) inches of the nearest joint, replacement shall be made to such joint.
- 141.9.3 Where Florida Department of Transportation Standard Curb & Gutter has been removed, such shall be replaced with similar construction in accordance with Florida Department of Transportation Standard Specifications, Current Edition.
- 141.9.4 All curbs & gutters outside the limit of construction which are willfully or negligently destroyed, broken or otherwise defaced shall be removed, disposed of and replaced in accordance with these specifications at no additional cost to the Owner.

141.10 **REPLACEMENT WALKWAYS & DRIVEWAYS:**

- 141.10.1 Where damaged or required to be cut by the Contractor's operations, walkways & driveways shall be repaired to conform to the existing type construction. Walkways & driveways other than concrete shall be restored by approved methods and materials, equal to or better than original condition.
- 141.10.2 For the restoration of concrete walkways & driveways, the existing adjacent concrete shall be cut back with a masonry saw or removed to the nearest dummy expansion joint, to remove undermined concrete and provide square edges, per paragraph 141.3.3, this Section.
- 141.10.3 The area over which the concrete is to be placed shall be filled to the proper grading and width. The bed shall be thoroughly compacted by approved mechanical compaction equipment to 100 percent of maximum density as determined by the Laboratory Standard Compaction Test (ASTM Designation D698-70). In all cases where fill is required to bring the subgrade to the required elevation, the filling shall be made in layers not to exceed six (6) inches in depth before tamping and each layer shall be thoroughly compacted. Filling shall be at +/- two (2) percent of optimum moisture content at the time of compaction. A tolerance of minus two (2) percent (-2%) will be allowed in the compaction effort.
- 141.10.4 An approved type of expansion joint shall be inserted across walkways at intervals not exceeding eighteen (18) feet with dummy groove joints at six (6) foot intervals. Where walkways & driveways must be replaced where they intersect, expansion joints shall be provided on all four (4) sides of the repair.

- 141.10.5 The thickness of concrete walkways & driveways shall be equal to or greater than existing, but not less than four (4) inches for walkways and five (5) inches for driveways. Concrete walkways & driveways shall be monolithic construction and shall be 3,000 PSI Concrete as specified under Section 130, Portland Cement Concrete.
- 141.10.6 When the subgrade has been prepared it shall be moistened sufficiently to prevent rapid leaching of water from the concrete and the concrete spread on the moist subgrade for the full width and depth. It shall be brought to the required grade by means of an approved template and thoroughly compacted and finished by floating and troweling until the surface is dense and smooth, true to grade, free from lumps and depressions, and then given a broom finish.
- 141.10.7 After the concrete has thoroughly hardened but not more than twenty-four (24) hours after same is placed, it shall be covered with a layer of clean sand or burlap and thoroughly wet, and maintained for a period of seven (7) days and then removed. Membrane curing compound may be used with the Engineer's approval.
- 141.10.8 Where walks are poured against walls or structures, approved type expansion joints shall be installed between the walks and the wall or structure.

141.11 **MANHOLE ADJUSTMENTS:**

- 141.11.1 In accordance with paragraph 115.11, Manhole Adjustment, the Contractor will be required to make adjustments of all manholes, valve boxes and other like items with the limits of construction, and owned and maintained by the Department of Public Works of the City of Jacksonville, Florida, where such adjustments are necessary. Adjustment of all other such facilities shall be by, and at the expense of, their respective owners in coordination with project construction.
- 141.11.2 There are two methods of adjustment that meet both City and State Standards, as directed below:
- 141.11.2.1 One: Raise the ring by a concrete collar using 4,000 PSI concrete, as shown.
- 141.11.2.2 Two: By using an adjust-to-grade ring casting (or approved equal). This is manufactured by

National Utility Products Company
29355 Ranney Parkway
Cleveland, Ohio, 44145

These adjusting rings are available in six different styles to fit openings from 20 to 38-1/2 inches and five (5) different types of manhole covers. They can be adjusted from 1 to 2-1/8 inches above existing manhole casting without disturbing surrounding paving.

141.12 **MEASUREMENT** :

141.12.1 **PAVEMENT MEASUREMENT - CASES I-V & CASES IX-XI** :

Measurement for pavement removed and replaced under Cases I-V and IX-XI shall be the lineal footage cut measured on the horizontal plane, along the center line of the trench. Measurement shall be from the edge of pavement cut at the beginning of the trench to edge of pavement cut at the end of the trench. Only that pavement located directly over the center line of the trench will be considered eligible for payment. There shall be no duplication of measurement; i.e., pavement replacement measured along the longitudinal axis of a trench can not be measured again for payment along an intersecting trench. In the event an asphalt overlay is specified in conjunction with any of these cases, it shall be measured separately on a square yard basis according to the limits specified in the contract documents, the FDOT permit document, or as established in the field by the Engineer.

141.12.2 **PAVEMENT MEASUREMENT - CASES VI-VIII & CASES VI A-VIII A** :

Measurement of pavement placed for Cases VI thru VIII and Cases VI A thru VIII A shall be on a per square yard basis, and shall be divided into two categories; (1) lime rock base and (2) asphaltic concrete surface course.

141.12.2.1 Limerock Base for Cases VI thru VIII shall be the number of square yards of limerock base in place, eight (8) inches compacted thickness, measured from curb to curb, or edge to edge of pavement replaced, and between the limits shown on the drawings. At road or street intersections, measurement shall be to the projected edge of the roadway being repaired, across the intersection.

141.12.2.2 Asphaltic Concrete Surface Course for Cases VI thru VIII shall be the number of square yards of Type S-I or Type II Asphaltic Concrete in place, of one and one-half (1-1/2) inches minimum compacted thickness, measured from curb to curb, or edge to edge of pavement replaced, and between the limits shown on the drawings. At road or street intersections, measurement shall be to the projected edge of the roadway being repaired, across the intersection.

141.12.2.3 Limerock Base for Cases VI A thru VIII A shall be the number of square yards of limerock base in place, twelve (12) inches compacted thickness, measured from curb to curb, or edge to edge of pavement replaced, and between the limits shown on the drawings. At road or street intersections, measurement shall be to the

projected edge of the roadway being repaired, across the intersection.

141.12.2.4 Asphaltic Concrete Surface Course for Cases VI A thru VIII A shall be the number of square yards of Type S-I or Type II Asphaltic Concrete in place, of two (2) inches minimum compacted thickness, measured from curb to curb, or edge to edge of pavement replaced, and between the limits shown on the drawings. At road or street intersections, measurement shall be to the projected edge of the roadway being repaired, across the intersection.

141.12.3 Curb & Gutter Measurement shall be accomplished separately on a lineal footage basis according to the limits of replacement established in the contract documents, the City Standard Specifications and Details, or as may be established in the field by the Engineer.

141.12.4 Driveway & Walkway Measurement shall be accomplished separately on a square yard basis according to the limits specified in the contract documents, these City Standard Specifications and Details, or as may be established in the field by the Engineer.

141.12.5 Grassing; Seeding, Mulching, and/or Sodding Measurement will be separately on a square yard basis according to the provisions and limits established in the contract documents, except in the case of Water & Sewer line construction, replacement, or repair, payment will be made in accordance with the applicable water & sewer specifications.

141.12.6 Manhole/Valve Box Adjustment Measurement: Manholes/Valve boxes adjusted shall be on a per unit, or each, basis. Manholes/Valve boxes not owned and maintained by the City of Jacksonville, Department of Public Works will not be measured. Of those owned by the City of Jacksonville, Department of Public Works, only those which measure in excess of ten (10) inches in diameter will be counted.

141.12.7 Work Not Allowed for Measurement shall include (but not limited to) any existing pavement, curb & gutter, driveway, walkway, or grassed area damaged or destroyed by the Contractor's operations and beyond the above specified limits. Such damaged or destroyed facilities shall be repaired to original condition or replaced as required by and to the satisfaction of the Engineer at no additional cost to the owner.

141.13 **PAYMENT:**

Except as stated, no separate payment will be made for the work specified in this section. All costs therefore are included in the unit prices set forth in the Contract for items to which such work is incidental or appurtenant.

141.13.1 **PAYMENT FOR CASES I-V & CASES IX-XI:**

Payment for pavement replaced, measured as defined above, shall be at the respective unit prices set forth in the contract. The respective unit prices shall be payment in full for the total work, including replacement traffic markings/reflectors, according to the performance specified in Cases I-V and Cases IX-XI and shown in the City Standard Details.

141.13.2 PAYMENT FOR CASES VI-VIII & CASES VI A-VIII A:

Payment for pavement replaced, measured as defined above, shall be at the respective unit prices set forth in the contract. The respective unit prices shall be payment in full for the total work, including replacement traffic markings/reflectors, according to the performance specified in Cases VI-VIII and Cases VI A-VIII A and shown in the City Standard Details.

141.13.3 PAYMENT FOR CURB & GUTTER:

Payment for curb & gutter, measured as defined above, shall be made according to the unit price established in the contract. The unit price established shall be payment in full for the performance specified, shown and detailed in the City Standard Specifications & Details.

141.13.4 PAYMENT FOR DRIVEWAY & WALKWAY:

Payment for driveways and walkways, measured as defined above, shall be made according to the unit prices established in the contract. The unit price established shall be payment in full for the performance specified, shown and detailed in the City Standard Specifications & Details.

141.13.5 PAYMENT FOR GRASSING; SEEDING, MULCHING AND/OR SODDING:

Payment for grassing, seeding, mulching and/or sodding, measured as defined above, shall be made according to the unit prices established in the contract. The unit price established shall be payment in full for the performance specified, shown and detailed in the City Standard Specifications & Details.

141.13.6 PAYMENT FOR MANHOLES/VALVE BOXES ADJUSTED:

No payment will be made for manholes or valve boxes adjusted which are ten (10) inches in diameter or smaller, or for any manholes/valve boxes adjusted which are not owned and maintained by the City of Jacksonville, Department of Public Works. The cost of this work will be included in the overlay or new surface item which necessitated the adjustment. Manholes and valve boxes over ten (10) inches in diameter shall be paid in accordance with the unit price established by the Contract. Those owned by the JEA, SET & T, or private utilities shall be adjusted by the respective utility company.

141.13.7 PAYMENT NOT ALLOWED:

No payment shall be made for work performed outside the measurement limits defined above, or for work performed or materials supplied to repair or replace damage caused by the Contractor (See paragraph 141.12.7 above).

SECTION 142
FENCING

142.1 **SCOPE OF WORK:**

The work under this section includes furnishing all labor, material, equipment, and the erection of chain link fencing complete with all appurtenances as indicated in the Contract Documents or as specified herein. All references to ASTM Specifications shall mean the latest edition published prior to Contract Bid Date.

MATERIALS:

142.1.1 **BASE METAL:**

The base metal of the fabric shall be a good commercial quality of steel of the gauges specified herein or on the Plans. The wire shall withstand the following breaking loads: No. 6 gauge, 2170 lbs.; No. 9 gauge, 1,290 lbs.; No. 11 gauge, 850 lbs. The break strength of the wire shall be determined in accordance with the method described in ASTM Designation E8 Tension Testing of Metallic Materials. Unless specified otherwise in the Special Conditions, the fabric for City Standard fencing shall be No. 9 gauge with 2-inch mesh.

142.1.2 **ZINC COATING:**

Zinc coating shall be Class I, hot dipped galvanized with a coating of 1.2 ounces per square foot of fabric, per ASTM A392. The weight of zinc coating on the fabric shall be determined in accordance with the method described in ASTM Designation A90.

142.1.3 **ALUMINUM COATING:**

Aluminum coating when specified in the Special Conditions, shall conform to ASTM A491. The weight of aluminum coating on the fabric shall be determined in accordance with the method described in ASTM A428.

142.1.4 **VINYL COATED FABRIC:**

Class 2, bonded PVC-coated wire shall have the PVC coating thermally fused and bonded to a primer which is thermally cured onto galvanized steel core wire. Galvanized steel core wire shall have been coated with zinc as per ASTM A641:

6 gauge - 0.40 oz. per square foot of fabric
9 gauge - 0.30 oz. per square foot of fabric
11 gauge - 0.30 oz. per square foot of fabric

The weight of the zinc coating shall be determined by the method contained in ASTM A90. The PVC Coating shall be evenly applied and free of blisters. The vinyl shall be plasticized and thoroughly compounded so there are no undispersed pigments, stabilizers or other discrete particles present. The bond shall exhibit equal or greater

strength than the cohesive strength of the vinyl. The minimum PVC coating- shall be 7 mils (.007"). The color shall be dark green unless otherwise specified in the Special Conditions.

142.1.5 CITY STANDARD FENCING:

Unless stated otherwise in the Special Conditions, all City Standard Fencing shall be zinc or aluminum coated.

142.2 SELVAGE:

Fabric 60 inches high and under shall be furnished with knuckling on both selvages. Fabric 72 inches high and over shall be furnished with knuckling on one selvage and twisting on the other. All 1-3/4 inch mesh fabric shall be furnished with knuckling at both selvages.

142.3 FABRIC CONNECTIONS:

The chain link fabric shall be securely fastened to all terminal posts using 3/16 inch by 3/4 inch tension bars. Posts with a 2-1/2 inch O.D. and under shall use 14 gauge tension bands and posts from 2-1/2 inches to 8 inches shall use 12 gauge tension bands. All connections shall have a finish applied which matches the fabric.

142.4 POSTS:

142.4.1 ZINC COATING:

All steel and iron parts shall be zinc coated by the hot-dipped method, using zinc Grade "E." The weight of zinc coat on the rail, post and brace shall have not less than 1.8 ounces per square foot. Zinc weight shall be determined in accordance with ASTM A90.

142.4.2 REQUIREMENTS:

All posts shall be of sufficient length to extend thirty-six (36) inches into concrete footings. All posts and rails shall meet the following minimum bending moment requirements:

| <u>Fence Industry O.D.</u> | <u>Min. Bending Moment - In. Lbs.</u> |
|----------------------------|---------------------------------------|
| 1-5/8" (Top Rail) | 8,225 |
| 2" | 11,410 |
| 2-1/2" (Line Post) | 19,635 |
| 3" (Corner Post) | 37,100 |
| 3-1/2" | 60,200 |
| 4" | 83,650 |
| 6-5/8" | 297,500 |

In situations where the fence to be constructed is higher than ten feet (10'), there shall be a corresponding increase in the size of the corner (terminal) and line posts. They shall be of the size shown on the Plans.

142.4.3 INTERMEDIATE POSTS:

The tubular intermediate posts (line posts) shall have a minimum bending moment of 19,635 inch pounds.

142.4.4 TERMINAL (End, Corner, Pull) POSTS:

All tubular end, corner, and pull posts shall have a minimum bending moment of 37,100 inch pounds.

142.4.5 OPTION 1:

Type 1 round post shall be hot dipped, galvanized to conform with ASTM A120 standard weight (Schedule 40).

142.4.6 OPTION 2:

Steel pipe manufactured from steel conforming to ASTM A569, cold-rolled and coated with a minimum of 0.9 ounces of zinc per square foot, a minimum of 15 micrograms of zinc chromate per square inch and a minimum of 3 mils cross link polyurethane acrylic exterior coating may be furnished in lieu of above posts, when approved by the Designer. Steel pipe shall be of the same external dimensions as round posts specified above for the respective uses and provided the minimum bending moments specified above are met.

142.4.7 OPTION 3:

Posts formed in "C" or "H" shapes which are galvanized per ASTM A123 and meet the bending requirements may be used when approved by the Designer.

142.5 INSTALLATION:

Posts shall be spaced equidistant in the fence line on a maximum of ten (10) foot centers. The distance between pull posts shall not exceed 500 feet. Posts shall be plumb with the tops of the posts and properly aligned. Pull posts shall be installed at breaks in vertical grades of fifteen (15%) percent or more. The maximum interval may be reduced by the Engineer where the degree of break is greater than three (3) degrees. Corner posts are to be installed at all horizontal breaks in fence of fifteen (15) degrees or more. Gate posts shall be spaced as required for walk and roadway openings. All posts shall be set in concrete. Post holes shall be bell shaped.

Line posts shall be forty (40) inches deep below finished grade, with a minimum diameter of nine (9) inches at the top. Terminal, corner and gate post holes shall be forty (40) inches deep below finished grade with a minimum diameter of twelve (12) inches at the top. All posts shall be set thirty-six (36) inches in the hole with four (4) inches of concrete below the end of the post. The top exposed surface of the concrete footing shall be sloped to shed water and provide a neat appearance when completed. Barbed wire supporting arms (when specified) shall be firmly seated on the top of the posts, set outside at a 45 degree angle up and perpendicular to the fence line.

142.6 TOP RAILS:

Top rails shall be in lengths not less than 18 feet, and shall be fitted with couplings or swedged for connecting the lengths into a continuous run. The couplings shall be not less than six (6) inches long, with .070 minimum wall thickness, and shall allow for expansion and contraction of the rail. Open seam outside sleeves shall be permitted only with a minimum wall thickness of .100 inches. Suitable ties or clips shall be provided in sufficient number for attaching the fabric securely to the top rail at intervals not exceeding two (2) feet. Means shall be provided for attaching the top rail to each gate, corner, pull and end post. All fencing shall have a 1-5/8 inch O.D. top rail, unless specified otherwise in the Special Conditions.

142.7 **POST BRACES:**

Post Braces shall be provided for each gate, corner, pull, and end post for use when top rail is omitted or with fabric 6 feet or more in height, and shall consist of a 1-5/8" O.D. round tubular brace extending to each adjacent line post at approximately mid-height of the fabric, and a truss consisting of a rod not less than 5/16" nominal diameter from the line post back to the gate, corner, pull or end post, with a turnbuckle or other equivalent provision for adjustment. Truss rods may be eliminated in any line of fence where there is a continuous center rail. The braces and truss rods shall have the same finish as the posts.

142.8 **POST TOPS:**

Post tops shall consist of ornamental tops or combination tops with barbed wire supporting arms, if specified in the Special Conditions. The top shall be provided with a hole suitable for the through passage of the top rail. The post tops shall fit over the outside of posts and shall exclude moisture from posts.

142.9 **GATES:**

Gates shall be swing or sliding as specified, complete with latches, stops, keepers, hinges or rollers and roller tracks, and when so specified, with provision for three strands of barbed wire above the fabric.

142.9.1 **GATES FRAMES:**

Gate frames shall be constructed of tubular members welded at all corners or assembled with fittings. On steel, welds shall be painted with zinc-based paint. Where corner fittings are used, gates shall have truss rods of 5/16" minimum nominal diameter to prevent sag or twist. Gate leaves shall have vertical intermediate bracing as required, spaced so that no members are more than eight feet apart. Gate leaves ten feet or over shall have a horizontal brace or one 5/16" minimum diagonal truss rod. When barbed wire top is specified, the end members of the gate frames shall be extended one foot above the top horizontal member to which 3 strands of barbed wire, uniformly spaced, shall be attached by use of bands, clips or hook bolts.

142.9.2 **GATE FABRIC:**

Gate Fabric shall be of the same type used in the fence construction. The fabric shall be attached securely to the gate frame at intervals not exceeding 15 inches.

142.9.3 GATE HINGES:

Gate hinges shall be of adequate strength for gate, and with large bearing surfaces for clamping in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.

142.9.4 GATE LATCHES:

Gate latches, stops and keepers shall be provided for all gates. Latches shall have a plunger-bar arranged to engage the center stop, except that for single gates of openings less than ten (10) feet wide, a forked latch may be provided. Latches shall be arranged for locking. Center stops shall consist of a device arranged to be set in concrete and to engage a plunger bar of the latch of double gates. No stop is required for single gates. Keepers shall consist of a mechanical device for securing the free end of the gate when in the full open position.

142.9.5 GATE POSTS:

Posts for swing gates shall be pipe of the following nominal sizes for each gate leaf:

| Gate Leaf Size | Minimum Post Size | Minimum Bracing Required |
|---------------------------------------|----------------------|---|
| Gate Leaf up to 6 ft wide | 3" O.D. | (None) |
| Gate Leaf over 6 ft to 13 ft wide | 4" O.D. | 1 Cross Brace and 1 Truss Rod |
| Gate Leaf over 13 ft to 18 ft wide | 6-5/8" O.D. | Vertical Bracing at 1/3 points & 3 Truss Rods |

142.10 TENSION WIRE:

Tension wire shall be Marcellled (spiraled or crimped) #7 gauge (.177 in.) plus or minus 0.005 inches in diameter. Zinc Coated tension wire shall be Class III (0.80 oz. of zinc per square foot of uncoated wire surface). Aluminum tension wire shall have 0.40 oz. of aluminum per square foot of wire surface. Tension wire shall have the same surface as the fabric.

142.11 BARBED WIRE:

When barbed wire is specified, it shall conform to ASTM M21 for wire of 12-1/2 gauge. The individual barb shall be 14 gauge points spaced approximately five (5) inches (maximum spacing of six (6) inches), unless otherwise specified. Separate combination caps and barbed wire supporting arms with a hole suitable for passage of top rails shall be provided for pressed steel extension arms to accommodate the

number of strands specified: Three barb style to extend at a 45 degree angle; Six barb style to extend three strands outward and three strands inward. The six strand arm shall be of the "V" type. Strand arms shall be capable of supporting a minimum of 200 pounds vertical dead load suspended from the tip of the strand arm. Zinc-coated barbed wire shall conform to ASTM A121. Aluminum-coated barbed wire shall conform to ASTM A585. The barbed wire shall have the same surface as the fabric.

142.12 **RECREATIONAL FENCING:**

Baseball fields, softball fields, etc., shall be six (6) foot high fencing. Tennis courts shall have ten (10) foot high fencing with the center & bottom rails on the ends of the courts only. Top & center rails with a bottom tension wire shall be installed on the sides. Tennis court fencing shall be No. 11 gauge wire with a one and three-fourths (1-3/4) inch mesh. Tennis court fence details are shown on City Standard tennis court plan. Baseball/Softball backstops shall be of the dimensions shown on the City Standard Drawing. Backstop fabric shall be 9 gauge with two (2) inch mesh. Copies of both are available from the City Engineer's Office for the cost of reproduction. Couplings & fittings used in connection with recreational fencing (parks, tennis courts, etc.) shall be heavy pressed steel.

142.13 **ELECTRICAL GROUNDS:**

Wherever a power line passes over the fence, a ground shall be installed directly below the point of crossing. The ground rod shall consist of a "Copperweld" or equal rod (with connections of suitable metal if required), or of other appropriate material with a minimum height of eight (8) feet in length and at least five-eighths (5/8) inch in diameter. The rod shall be driven vertically until the top of the rod is approximately six (6) inches below the ground surface. A No. 6 conductor shall be used to connect the rod and all fence elements. The conductor shall be connected to each fence element and the ground rod by means of electrical-type clamps which will prevent electrolysis or other corrosion. The grounding system so installed shall be tested and demonstrate a maximum of 15 ohms resistance. Additional grounding rods shall be added as needed to achieve the maximum 15 ohms resistance.

142.14 **METHOD OF MEASUREMENT & PAYMENT:**

The method of measurement and payment shall be established in the Bid Proposal or the Special Conditions.

142.15 **SHOP DRAWINGS:**

Shop drawings and material descriptions (catalogue cuts) shall be submitted for approval at the preconstruction conference.

Revised 8/26/83

SECTION 160
TENNIS COURT CONSTRUCTION
FEATURES COMMON TO ALL TYPES OF TRACKS

160.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the performance of the following requirements common to all types of tennis courts. Net and accessories, wind curtains and court divider nets in the following specifications and other equipment necessary to the complete performance of tennis courts, shall be "Tru-Tops Deluxe" or an approved equal. Details are shown on City Standard drawing No. 1681, a copy of which is made available with the Contract Drawings for any Contract involving this work. Individual copies may be obtained from the City Engineer's Office, City Hall at a cost of \$0.75 per copy.

160.2 **SITE PREPARATION:**

In addition to provisions in the City Standard Specifications, all vegetation including root systems to a depth of not less than twelve (12) inches shall be removed from the site and the soil treated with sterilant, "Triox", manufactured by Chevron Chemical Company, or an approved equal, that will effectively inhibit future plant growth. Excavated areas shall be compacted to the same density required for the fill material specified in the City Standard Specifications. The subgrade shall be shaped to a line and grade as shown in the drawings.

160.3 **DRAINAGE:**

In addition to the system designed for the given site, any trench backfill areas occurring under or adjacent to the track and field event areas shall be composed of suitable earth material compacted to the same density as the surrounding soil and shall meet the existing City Standards.

160.4 **SLOPE REQUIREMENTS:**

All excavating, filling, compacting, grading and leveling work required shall be performed so that beginning at the subgrade, the slope shall be one (1) inch in ten (10) feet on a true plane from side to side, end to end, or corner to corner as indicated on the drawings.

160.5 **NET POST FOUNDATIONS:**

Post foundations shall be not less than twelve (12) inches in diameter at the top, not less than sixteen (16) inches in diameter at the bottom, and not less than forty (40) inches in depth. Foundations shall be so situated as to provide a clear distance between posts of forty-two (42) feet. Concrete for foundations shall attain a compressive strength of not less than two thousand five hundred (2,500) pounds per square inch at the twenty-eighth (28th) day after pouring. Foundations shall be so designed and poured and the posts so set as not to cause cracking or other damage to the finished court surface.

160.6 **NET POSTS AND SLEEVES:**

Net posts shall be galvanized steel having an outside diameter of not less than three (3) inches and shall be equipped with lever or racket-type net tightening devices for non-metallic nets, post caps with pulley, heavy duty reel, cleat pins and eyebolts. Galvanized pipe sleeves three and one-half (3-1/2) inches in diameter shall be set one (1) inch above the finished court surface to receive the net posts. Posts shall be set plumb and true in order to support the net at a height of thirty-six (36) inches above the court surface at the net posts.

160.7 **NET:**

A tennis net measuring forty-two (42) feet long and three and one-fourth (3-1/4) feet wide and otherwise conforming to the regulations of the United States Lawn Tennis Association shall be provided for each court. The netting portion shall be synthetic netting material with a black synthetic treatment to maintain a tensile strength of not less than two hundred seventy-five (275) pounds. The top binding of the net shall have a double thickness and the outer thickness thereof shall be fabricated of white synthetic material treated for resistance to sunlight and mildew. Bottom and end tapes of the net shall be fabricated of black synthetic material treated to prevent deterioration from sunlight. The net when erected shall be suspended from its top binding upon a vinyl-coated wire cable having a diameter of seven thirty-seconds (7/32) inch, forty-seven (47) feet in length, and having a tensile strength of not less than one thousand three hundred (1,300) pounds. Each corner of the net shall have a tie string for securing net to posts. The tie strings shall be synthetic material having a tensile strength of not less than one thousand seven hundred (1,700) pounds.

160.8 **CENTER STRAPS:**

Adjustable center straps shall be provided to hold the net three (3) feet above the surface at the center of the net, fastened into a metal anchor set into the court.

160.9 **WIND CURTAINS:**

Calite, or an approved equal, shall be installed as shown on the drawings consisting of green fabric of woven polypropylene six (6) feet high, with reinforced edges, and grommets every twenty-four (24) inches along perimeter with fittings for quick-release to reduce damage during removal.

160.10 **COURT DIVIDER NETS:**

If required, court divider nets for separating teaching courts from playing courts shall be made of green nylon twine, knotless construction, mesh size one and one-half (1-1/2) inches or less, in maximum lengths of 50 to 60 feet per panel, with accessories to hang the curtain: netting cable, cable fasteners, netting snaps and wedged two-piece center pole.

160.11 **PLAYING LINES:**

Base lines shall not be more than four (4) inches wide and playing lines not more than two (2) inches wide accurately positioned in accordance with the regulations of the United States Lawn Tennis Association and City Standard Sheet No. 1681.

160.12 **FENCES:**

Fencing shall be installed along with all equipment, hardware and gates as shown on City Standard drawing No. 1681 and in accordance with Section 142 of the Specifications.

160.13 **PAYMENT:**

Payment for the type of tennis court to be built or reconstructed shall be established in the Bid Proposal or Special Conditions.

SECTION 161
TENNIS COURT CONSTRUCTION
CONCRETE

161.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the installation of a concrete court as indicated in Section 160 of the specifications, City Standard Sheet No. 1681 and in the following specifications.

161.2 **BASE CONSTRUCTION:**

The base course shall be compacted to 95% of maximum density with an L.B.R. of 30 within the limits of the tennis court, and six (6) inches outside the court on all sides.

161.3 **CONCRETE CONSTRUCTION:**

Concrete and reinforcement shall be furnished in accordance with the City Standard Specifications as shown on City Standard Sheet No. 1681.

161.4 **COLOR FINISH COURSE:**

If the Special Conditions call for color finishing of the concrete, this section shall apply. In all other cases, no color finish will be required.

161.4.1 **COLORING MATERIALS:**

The color finish materials for the surface course shall be concrete sealer Radon 500-20 and Vynatex 23 as manufactured by Maintenance, Inc., Wooster, Ohio, or an approved equal product. The manufacturer shall guarantee the material for one (1) year from date of finished application against checking, fading, chalking discoloration, or other adverse effects from ultra violet rays of the sun, from weather moisture, or from weather temperatures. The material shall be delivered to the site in its original unopened containers clearly labeled with the trade name and name of manufacturer.

161.4.2 **APPLICATION:**

Over a clean and cured surface, apply one (1) coat of concrete sealer Radon 500-20 or equal. After dry, one (1) sand slurry coat of Vynatex 23 or approved equal consisting of six (6) Lbs., gradation size 30-65, per gallon of material for texture and slower court performance. On the following day, finish with one (1) straight coat of Vynatex 23 or approved equal, free of sand. The application work shall be performed by skilled mechanics in a workmanlike manner in accordance with the manufacturer's standard printed instructions.

161.5 **PLAYING LINES:**

Forty-eight (48) hours minimum after completion of construction, playing lines are to be painted with green rubberized concrete paint if no color finish is used. If a color surface is applied, playing lines shall be white. The use of oil or alkyd traffic paints or solvent vehicle type paints is prohibited. The painting shall be done by skilled mechanics in a workmanlike manner in accordance with the manufacturer's standard printed instructions.

SECTION 162
TENNIS COURT CONSTRUCTION
FASTDRY

162.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the installation of a fastdry court as indicated in Section 160 of the specifications, City Standard Sheet No. 1681 and in the following specifications.

162.2 **SUB-GRADE CONSTRUCTION:**

The sub-grade shall be stabilized to a depth of twelve (12) inches in accordance with the City Standard Specifications. This stabilization shall extend six (6) inches outside the outer edge of the brick curbing.

162.3 **BASE-COURSE:**

A drainage stone course of crushed-run mixed-size and washed screenings shall be installed over the subgrade as indicated on City Standard Sheet No. 1681 and the Specifications. The maximum stone size shall be three-fourths (3/4) inch with mixed sizes down to dust, with the finished base at least three and one-half (3-1/2) inches after compaction. The stone material shall be installed in two layers; the bottom layer consisting of coarser particles, three and one-half (3-1/2) inches loose, three (3) inches compacted; the finish layer of finer sizes, three-eighths (3/8) inch maximum stone size down to dust. Finished surface of the base course shall be not more than one-eighth (1/8) inch above or below the subgrade elevation shown on the drawings.

162.4 **BRICK CURB:**

A floating type curb of standard brick set in cement mortar, designed to give with frost, as detailed in the drawings shall be installed around the entire perimeter of the court area. Sections may be left open to allow trucks and other equipment to enter and leave the court area until other work has been completed. The finished curb elevation shall be one-half (1/2) inch below the finished grade level and the court's surface coarse shall be tapered from six (6) inches out to meet it.

162.5 **SURFACE COURSE:**

A surface course of natural green or red stone, crushed, screened and blended with a gypsum binder, Tru-Top Filler and Surface Finish or an approved equal product, to form a homogeneous mixture having an affinity for water shall be installed over the base course at the uniform rate of one hundred (100) pounds per square yard to a loose thickness of one and one-fourth (1-1/4) inches, one and one-eighth (1-1/8) inches compacted. Application shall be in successive bays twelve (12) feet wide, using accurately set screed strips and striking off with a straightedge. The surface course material shall be watered to its full depth immediately after laying, allowed approximately 15 minutes to soak, and then rolled and compacted with a tandem roller weighing approximately six hundred (600) pounds.

Finished voids left by screed strips shall be filled as each bay is completed. Before proceeding with posts or lines the courts shall be watered and rolled until finished surface of the surface course shall not vary from the specified grade more than one-eighth (1/8) inches in ten (10) feet measured in any direction.

162.6 **PLAYING LINES:**

Playing lines shall be heavy duty fabric type held in place by 10d aluminum nails (20 lbs. per court). Tape shall be stretched tight and then rolled into the surface to assure proper embedment.

SECTION 163
TENNIS COURT CONSTRUCTION
NON-CUSHIONED ASPHALT

163.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the installation of an asphalt court as indicated in Section 160 of the specifications, City Standard Sheet No. 1681 and in the following specifications.

163.2 **SUB-GRADE CONSTRUCTION:**

The sub-grade shall be stabilized to a depth of six (6) inches in accordance with the City Standard Specifications. This stabilization shall extend six (6) inches outside the limit of the court.

163.3 **BASE CONSTRUCTION:**

The base course shall consist of four (4) inches of limerock placed and compacted in accordance with the City Standard Specifications, and shall extend six (6) inches outside the limit of the court.

163.4 **BASE-COURSE:**

The leveling course shall consist of either Type II Asphalt or emulsified asphalt as required by the plans & specifications. The maximum aggregate size shall be three-fourths (3/4) inch. Where Type II Asphalt is specified, the City Standard Specifications shall apply. Where emulsified asphalt is specified, it shall be "Chevron Laykold Tennis Court Binder" or an approved equal and applied according to the manufacturer's technical requirements. The leveling course shall be a compacted thickness of one and one-half (1-1/2) inches not varying from the specified grade more than one-fourth (1/4) inch in ten (10) feet when measured in any direction.

163.5 **SURFACE COURSE:**

The surface course shall consist of either Type II Asphalt or emulsified asphalt as required by the plans & specifications. The maximum aggregate size shall be three-eighths (3/8) inch. The finished surface shall not vary from the specified grade more than one-eighth (1/8) inch in ten (10) feet when measured in any direction. Where Type II Asphalt is specified, the City Standard Specifications shall apply. Where emulsified asphalt is specified, it shall be "Chevron Laykold Tennis Court Binder" or an approved equal and applied according to the manufacturer's technical requirements. Immediately prior to starting to lay the surface course a tack coat of emulsified asphalt binder, one (1) part binder to four (4) parts water shall be applied to the leveling course by brooming at the rate of one-tenth (1/10) gallon per square yard. The compacted thickness shall be one-half (1/2) inch.

163.6 **COLOR FINISH COURSE:**

Color finish course shall consist of "Chevron Laykold 200 and 100", or an approved equal product. The color finish course shall not be applied until all areas of the underlying surface are thoroughly

cured. The manufacturer shall guarantee the material for one (1) year from the date of finished application against chalking, checking, fading, discoloration, or other adverse effects from ultra violet rays of the sun, from weather moisture, or from weather temperatures. The material shall be delivered to the construction site in its original unopened containers clearly labeled with trade name and name of manufacturer. The color finish material shall be applied to the surface course areas in multiple applications in the selected and approved colors so as to form a true, uniform texture and color. Application work shall be performed by skilled mechanics in a workmanlike manner in accordance with the manufacturer's standard printed instructions.

163.6.1 Laykold Colorcoat 200 shall be applied to the clean, dry underlying surface in multiple applications to obtain a total quantity of not less than 11 nor more than 18 gallons per 1,000 square feet of area (.10 to .16 gallons per square yard), based on the material prior to any dilution. No application shall be covered by a succeeding application until thoroughly cured. Dilution with water to obtain proper application consistency is permitted up to a maximum of 3 parts Colorcoat 200 to 2 parts water. The diluted material shall be homogeneous. Segregation before or during application will not be permitted. The finished surface shall have a uniform appearance and be free from ridges and tool marks.

163.6.2 Laykold Colorcoat 100 shall be applied to the clean, dry underlying surface in multiple applications to obtain a total quantity of 4 to 8 gallons per 1,000 square feet of area (.04 to .07 gallons per square yard), based on the material prior to any dilution. No application shall be covered by a succeeding application until thoroughly cured. Dilution with water to obtain proper application consistency is permitted up to a maximum of 4 parts Colorcoat 100 to 1 part water. The diluted material shall be homogeneous. Segregation before or during application will not be permitted. The finished surface shall have a uniform appearance and be free from ridges and tool marks.

163.7 **PLAYING LINES:**

No sooner than forty-eight (48) hours after completion of the surfacing, lines shall be painted with "Chevron Laykold Line Paint" or an approved equal in accordance with Section 160 of the City Standards & Specifications. The color of the playing lines shall be white unless otherwise specified. Use of traffic, oil, alkyd, or solvent vehicle type paints is prohibited. The painting shall be done in a workmanlike manner in accordance with the manufacturer's standard technical instructions.

SECTION 164
TENNIS COURT CONSTRUCTION
CUSHIONED ASPHALT

164.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the installation of an asphalt court as indicated in Section 160 of the specifications, City Standard Sheet No. 1681 and in the following specifications.

164.2 **SUB-GRAPE CONSTRUCTION:**

The sub-grade shall be stabilized to a depth of six (6) inches in accordance with the City Standard Specifications. This stabilization shall extend six (6) inches outside the limit of the court.

164.3 **BASE CONSTRUCTION:**

The base course shall consist of four (4) inches of limerock placed and compacted in accordance with the City Standard Specifications, and shall extend six (6) inches outside the limit of the court.

164.4 **LEVELING COURSE:**

The leveling course shall consist of either Type II Asphalt or emulsified asphalt as required by the plans & specifications. The maximum aggregate size shall be three-fourths (3/4) inch. Where Type II Asphalt is specified, the City Standard Specifications shall apply. Where emulsified asphalt is specified, it shall be "Chevron Laykold Tennis Court Binder" or an approved equal and applied according to the manufacturer's technical requirements. The leveling course shall be a compacted thickness of one and one-half (1-1/2) inches not varying from the specified grade more than one-fourth (1/4) inch in ten (10) feet when measured in any direction.

164.5 **SURFACE COURSE:**

164.5.1 Material for the surface course shall be cold applied cushion material similar to "Chevron Laykold Grasstex" or an approved equal and shall be mixed and installed over the leveling course as indicated on the drawings in strict accordance with the manufacturer's standard technical specifications.

164.5.2 A tack coat of "Chevron Laykold Tennis Court Binder" or an approved equal diluted to 1 to 3 with water shall be applied, at the rate of .15 to .20 gallons per square yard, to the underlying surface and allowed to cure prior to the placement of the surface course.

164.5.3 The surfacing shall be applied at a rate of not less than 2 gallons per square yard, based on the material prior to any dilution. Minimal amounts of water may be added to the surfacing to obtain workability, but in no case shall it be sufficient to cause segregation or lack of uniformity. Blending of the necessary water and surfacing shall be

accomplished in such a way that the resultant mixture shall be homogeneous and shall remain so through placement.

- 164.5.4 Surfacing shall be allowed to dry to a maximum moisture content of 6% after which it shall be thoroughly rolled with a powered, steel-wheeled tandem roller, weighing from 2 to 4 tons; the thickness of the surface course after compaction shall be not less than one-fourth (1/4) inch.
- 164.5.5 The finished surface shall not vary from the specified grade more than one-eighth (1/8) inch in ten (10) feet when measured in any direction.

164.6 **COLOR FINISH COURSE:**

- 164.6.1 Color finish course shall consist of "Chevron Laykold Resurfacer and Colorcoat 100", or an approved equal product. The manufacturer shall guarantee the material for one (1) year. The finish course shall not be applied until the surface is thoroughly cured.
- 164.6.2 Resurfacer shall be applied to the clean underlying surface in multiple applications to obtain a total application rate of 30 to 40 gallons per 1,000 square feet of area (.25 to .35 gallons per square yard), based on the material prior to any dilution. No application shall be covered by a succeeding application until thoroughly cured. Dilution with water to obtain workability is permitted. The diluted material shall be homogeneous and segregation shall not be tolerated. Prior to application, water-fogging of hot surfaces is permitted but free standing water is prohibited. After the Resurfacer has thoroughly cured, the entire area shall be rolled with a 2 to 4 ton steel wheel tandem roller, and water flooded. Any areas holding over one-sixteenth (1/16) inches depth of water shall be leveled with Resurfacer and allowed to thoroughly cure, then rolled with a 2 to 4 ton steel tandem roller. The finished surface shall have a uniform appearance and be free from ridges and tool marks.
- 164.6.3 "Chevron Laykold Colorcoat 100", or an approved equal shall be applied to the clean, dry underlying surface in multiple applications to obtain a total application rate of 4 to 8 gallons per 1,000 square feet of area (.04 to .07 gallons per square yard), based on the material prior to any dilution. No application shall be covered by a succeeding application until thoroughly cured. Dilution with water to obtain proper application consistency is permitted up to a maximum of 4 parts Colorcoat 100 to 1 part water. The diluted material shall be homogeneous. Segregation before or during application will not be permitted. The finished surface shall have a uniform appearance and be free from ridges and tool marks. No parts or construction involving Laykold materials or asphaltic base courses shall be conducted during rainfall or when rainfall is imminent, or unless the air temperature is at least 50°F and rising.

164.7 **PLAYING LINES:**

No sooner than forty-eight (48) hours after completion of the surfacing, lines shall be painted with "Chevron Laykold Line Paint" or an approved equal in accordance with Section 160 of the City Standards & Specifications. The color of the playing lines shall be white unless otherwise specified. Use of traffic, oil, alkyd, or solvent vehicle type paints is prohibited. The painting shall be done in a workmanlike manner in accordance with the manufacturer's standard technical instructions.

SECTION 165
RECONSTRUCTION OF TENNIS COURTS

165.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the construction of new wearing surfaces to be installed over existing courts in need of repair, as indicated in Section 160 of the specifications, City Standard Sheet No. 1681 and in the following specifications.

165.2 **EXISTING ASPHALT COURT:**

Leveling course not required.

165.2.1 The work to be done consists of the application of a cushion surface, color surfacing, and sealing materials with the purpose of obtaining a new resilient and durable surface on an existing asphalt court which has an even surface, sound base, good drainage, free of cracks, and no leveling course required. The surface variation should not exceed one-fourth (1/4) inch in ten (10) feet when measured in any direction and the slope is a minimum of one (1) inch in fifteen (15) feet, all in one plane.

165.2.1.1 Prior application of the new surface materials, the entire area shall be flooded with water and any depressed areas holding water marked by outlining with chalk. The depressed areas shall be primed with "Chevron Laykold Tennis Court Binder", or an approved equal product, diluted with an equal volume of water. All puddles shall be broomed clean and the following patching mix shall be used to level depressed areas:

- | | | | |
|-----|----------|-------------------------------|--------------------|
| (1) | 2 gals. | Plaster Sand | |
| (2) | 2 gals. | "Laykold Resurfacer" | or approved equal |
| (3) | 1/2 gal. | "Laykold Tennis Court Binder" | or approved equal. |

165.2.1.2 The surface material shall be as specified in Section 164.5, except the surface course is not applied over a leveling course.

165.2.1.3 The color finish course shall be as specified in Section 164.6.

165.2.1.4 The playing lines shall be as specified in Section 164.7.

165.2.2 The work to be done consists of patching minor irregularities and the application of color surfacing and sealing material, with the purpose of obtaining a new non-cushioned wearing surface with improved texture on an existing asphalt court which has an even surface, sound base, good drainage, free of cracks, and no leveling course required. The surface variation should not exceed one-fourth

(1/4) inch in ten (10) feet when measured in any direction and the slope is a minimum of one (1) inch in fifteen (15) feet, all in one plane.

165.2.2.1 The surface to be coated must be sound, smooth and free from loose dirt or oily materials. Prior to the application of surfacing materials, the entire surface should be checked for minor depressions or irregularities. Before patching and under patches only a tack coat shall be applied, made up of one (1) part "Chevron Laykold Tennis Court Binder" or approved equal, to three (3) parts water and the diluted material should be applied at the rate of 0.15 to 0.20 gallons per square yard and allowed to thoroughly cure prior to patching with a mix of:

- (1) 2 gals. Plaster Sand
- (2) 2 gals. "Laykold Resurfacer" or approved equal
- (3) 1/2 gal. "Laykold Tennis Court Binder" or approved equal

After patching, the surface shall not vary more than one-eighth (1/8) inch in ten (10) feet measured in any direction.

165.2.2.2 The color finish course shall be as specified in Section 163.6.

165.2.2.3 The playing lines shall be as specified in Section 163.7.

165.3 **EXISTING ASPHALT COURT:**

Leveling course required.

165.3.1 Work to be done consists of the application of a new leveling course, a cushion surface, color surfacing, and sealing materials with the purpose of obtaining an even, resilient and durable surface on an existing asphalt court that has rough or uneven surfaces but has good drainage and free of cracks.

165.3.1.1 Existing court shall be thoroughly cleaned and a leveling course of Type II Asphalt as specified in Section 164.4, shall be applied.

165.3.1.2 Surface course shall be as specified in Section 164.5.

165.3.1.3 Color surface finish shall be as specified in Section 163.6.

165.3.1.4 Playing lines shall be as specified in Section 163.7.

165.3.2 Work to be done consists of the application of a new leveling course, a non-cushioned surface, color surfacing, and sealing materials with the purpose of obtaining a new, even and durable surface on an existing asphalt court that has rough or uneven surfaces but has good drainage and is free of cracks.

165.3.2.1 Existing court shall be thoroughly cleaned and a leveling course of Type II Asphalt as specified in Section 163.4, shall be applied.

165.3.2.2 Surface course shall be Type II Asphalt as specified in Section 163.5.

165.3.2.3 Color surface finish shall be as specified in Section 163.6.

165.3.2.4 Playing lines shall be as specified in Section 163.7.

165.4 **CRACKS OR PAVEMENT FAILURE:**

Asphalt courts which have cracks or pavement failure must be constructed as specified in Section 165.3.

165.5 **EXISTING CONCRETE COURT:**

When an existing concrete court is in bad repair from cracking, chipping, or spalling problems, a new concrete surface shall be applied over the existing. The existing pavement shall be cleaned and all loose material removed. All holes shall be filled with concrete and all cracks and small chips filled with grout. The entire court area shall be overlaid with felt (30 lbs., not lapped). The new court, four (4) inches thick shall be installed in accordance with Section 161, with the addition of one layer of 6 X 6 wire mesh.

SECTION 180
RUNNING TRACK CONSTRUCTION
FEATURES COMMON TO ALL TYPES OF TRACKS

180.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the performance of the following requirements common to all types of running track & field events pavements. Details are shown on City Standard drawing No. 1778, Sheets 1 through 6.

180.2 **SITE PREPARATION:**

In addition to provisions in the City Standard Specifications, Excavation & Fill, all vegetation including root systems to a depth of not less than twelve (12) inches shall be removed from the site and the soil treated with sterilant, "Triox", manufactured by Chevron Chemical Company, or an approved equal, that will effectively inhibit future plant growth. Excavated areas shall be compacted to the same density required for the fill material specified in the City Standard Specifications. The subgrade shall be shaped to a line and grade as shown in the drawings.

180.3 **DRAINAGE:**

In addition to the system designed for the given site, any trench backfill areas occurring under or adjacent to the track and field event areas shall be composed of suitable earth material compacted to the same density as the surrounding soil and shall meet the existing City Standards.

180.4 **SLOPE REQUIREMENTS:**

All excavating, filling, compacting, grading and leveling work required shall be performed so that beginning at the subgrade, the slope shall be one (1) foot in each one hundred (100) feet in a lateral direction and one (1) foot in each one thousand (1,000) feet in the running or throwing direction. The top course shall be shaped with a crown equivalent in height to 1% slope from center line to edges. Concrete pads for throwing events shall slope 1% in the throwing direction or the nearest drain.

180.5 **REMOVABLE CURB:**

A removable curb shall be installed around the entire inside perimeter of the track. The curb shall be two (2) inches square section with top edges rounded, one-fourth (1/4) inch radius, of treated hardwood in ten (10) feet units with two (2) galvanized studs per unit, six (6) inches long and one-half (1/2) inch diameter, five (5) feet on center to fit in galvanized sleeves, five (5) inches long and one (1) inch diameter, flush with the track surface, opening to a crushed stone bed for drainage as shown in the drawings. At least one (1) galvanized washer shall be provided per stud in order to raise the bottom of the curb one-eighth (1/8) inch above the track surface for drainage. This curb is indispensable for the recognition of world record performance, but it is not required for tracks intended for meets below collegiate level.

180.6 **TRACK & FIELD EVENTS MARKINGS:**

Lane lines, start and finish lines and field event markings all shall be accurately positioned and marked in accordance with the current rules of the International Track & Field Federation. Prior to the application of any lines on the track surface a drawing showing the proposed line layout shall be prepared and upon completion of the marking of the track the contractor shall furnish the owner's representative with five (5) copies of the drawing showing all lines that have been applied, signed and sealed by a professional engineer or land surveyor certifying that the lines as marked are in accordance with the rules of the International Track & Field Federation and City Standard drawing No. 1778, Sheet No. 3.

180.7 **FENCES:**

Fencing shall be installed along with all equipment, hardware and gates as shown on City Standard drawing No. 1681 and in accordance with Section 142 of the Specifications.

**SECTION 181
RUNNING TRACK CONSTRUCTION
CUSHIONED AND NON-CUSHIONED ASPHALT**

181.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the installation of asphalt running track & field event areas as indicated on the construction drawings and in the following specifications, Section 180 of the Specifications and as detailed on City Standard drawing No. 1778, Sheets 1 through 6.

181.2 **SUB-GRADE CONSTRUCTION:**

The sub-grade shall be stabilized to a depth of six (6) inches in accordance with Section 180 and the City Standard Specifications. This stabilization shall extend six (6) inches outside the limit of the track & field event areas.

181.3 **BASE CONSTRUCTION:**

The base course shall consist of four (4) inches of limerock placed and compacted in accordance with Section 180 and the City Standard Specifications, and shall extend six (6) inches outside the limit of the track & field event areas.

181.4 **NON-CUSHIONED ASPHALT TRACK:**

181.4.1 **SURFACE COURSE:**

The surface course shall consist of Type II asphalt; the City Standard Specifications shall apply. The maximum aggregate size shall be three-eighths (3/8) inch. The compacted thickness shall be one and one-half (1-1/2) inches. The finished surface shall not vary from the specified grade more than one-eighth (1/8) inch in ten (10) feet measured in any direction.

181.4.2 **COLOR FINISH COURSE:**

The color finish course shall consist of "Allied Chemical Tech-Tone System" (Surfix, Filler Kote & Top Kote) of colored coatings or an approved equal. The color finish course shall not be applied until all areas of the underlying surface are thoroughly cured. The manufacturer shall guarantee the material for one (1) year from the date of finished application against chalking, checking, fading, discoloration, or other adverse effects from ultra violet rays of the sun, from weather moisture, or from weather temperatures. The material shall be delivered to the construction site in its original unopened containers clearly labeled with the trade name and name of manufacturer. The color finish material shall be applied to the surface course areas in multiple applications in the selected and approved colors so as to form a true, uniform texture and color. Application work shall be performed by

skilled mechanics, in a workmanlike manner in accordance with the manufacturer's standard printed instructions.

181.4.2.1 If any areas of the surface to be colored needs to be patched or evened, "Surfix" mix shall be applied at the rate of 15-20 gallons per 1,000 square feet per coat in two coats, in strict accordance with manufacturer's instructions.

181.4.2.2 Filler Kote shall be applied on the clean, dry underlying surface at a rate of one gallon per 7-10 square yards per coat, in two coats. The second coat shall be applied in a direction perpendicular to the first one after thoroughly cured. The finished surface shall have a uniform appearance and be free from ridges and tool marks.

181.4.2.3 Top Kote shall be applied on the clean, dry underlying surface at a rate of 15-20 square yards per gallon per coat, in two coats. The second coat shall be applied in a direction perpendicular to the first one after thoroughly cured. The finished surface shall have a uniform appearance and be free from ridges and tool marks.

181.4.3 USE LIMITATION:

Only soft rubber shoes should be used on tracks surfaced according to these specifications. Spikes will destroy the color and weather coating, canceling the manufacturer's warranty for material performance due to "misuse of the track."

181.4.4 TRACK & FIELD EVENT MARKINGS:

No sooner than forty-eight (48) hours after completion of the surfacing all lines shall be accurately located, marked and painted with "Teck-Tone Stripe Kote" or an approved equal in accordance with the City Standard Specifications. Use of traffic, oil, alkyd or solvent vehicle type paints is prohibited. The painting shall be done by skilled mechanics in a workmanlike manner in accordance with the manufacturer's printed instructions. No parts of the construction involving painting of lines shall be conducted during rainfall, or when rainfall is imminent or unless the air temperature is at least 50°F and rising. Favorable weather conditions should be anticipated for at least eight (8) hours after application of paint. Allow paint to cure for at least twenty-four (24) hours under good drying conditions before opening the area to regular traffic.

181.5 CUSHIONED ASPHALT TRACK:

181.5.1 LEVELING COURSE:

The leveling course shall consist of Type II Asphalt Concrete with a maximum aggregate size of three-fourths (3/4) inches. The City Standard Specifications shall apply. The leveling course shall be a compacted thickness of one and one-half (1-1/2) inches not varying from the specified grade more than one-fourth (1/4) inch in ten (10) feet when measured in any direction.

181.5.2 SURFACE COURSE:

Material for the surface course shall be cold applied cushion course material similar to "Chevron Grasstex - Rubberized" or an approved equal and shall be mixed and installed over the leveling course as indicated on the drawings in strict accordance with the manufacturer's standard technical specifications. A tack coat of "Chevron Laykold Tennis Court Binder" or an approved equal diluted to 1 to 3 water shall be applied, at the rate of .15 to .20 gallons per square yard, to the underlying surface and allowed to cure prior to placement of the surface course. The surfacing shall then be applied at a rate of not less than 3 gallons per square yard, based on the material prior to any dilution. Minimal amounts of water may be added to the surfacing to obtain workability, but in no case shall it be sufficient to cause segregation or lack of uniformity. Blending of the necessary water and surfacing shall be accomplished in such a way that the resultant mixture shall be homogeneous and shall remain so through placement. Surfacing shall be allowed to dry to a maximum moisture content of 6% after which it shall be thoroughly rolled with a powered, steel-wheeled tandem roller, weighing from 2 to 4 tons; the thickness of the surface course after compaction shall not be less than one-fourth (1/4) inch.

181.5.3 COLOR FINISH COURSE:

181.5.3.1 The color finish course shall consist of "Chevron Laykold Weathercoat-Track Grade", or an approved equal. The manufacturer shall guarantee the material for one (1) year. The finish course shall not be applied until the surface is thoroughly cured.

181.5.3.2 Prior to the color finish course, a tack coat of "Chevron Laykold Tennis Court Binder" or an approved equal shall be applied at the rate of 0.15 to 0.20 gallons per square yard to the clean underlying surface and allowed to thoroughly cure.

181.5.3.3 "Chevron Laykold Weathercoat Track Grade" shall be applied to the clean, dry tack coat in one or more applications, to obtain a total application rate of 40 to 50 gallons per 1,000 square feet of area (.35 to .45 gallons per square yard), based on the material prior to any dilution. No application shall be covered by a succeeding application until thoroughly cured.

181.5.3.4 Dilution of Weathercoat-Track Grade with water is permitted to obtain workability. The diluted material shall be homogeneous and segregation shall not be tolerated. After the Weathercoat-Track Grade is completely dry, it shall be thoroughly rolled longitudinally with a straight rolling pneumatic roller weighing from 2 to 5 tons. The finished surface shall be smooth, free from ridges, valleys and tool marks. No parts of construction involving Laykold materials or asphaltic base courses shall be conducted during rainfall or when rainfall is imminent, or unless the air temperature is at least 50°F and rising.

181.5.4 USE LIMITATION:

Shoes with spikes in excess of one-quarter (1/4) inch should not be used on tracks surfaced according to these specifications. "Misuse of the track" shall cancel the manufacturer's warranty for material performance.

181.5.5 TRACK & FIELD EVENT MARKINGS:

No sooner than forty-eight (48) hours after completion of the surfacing all lines shall be accurately located, marked and painted with "Chevron Laykold Line Paint" or an approved equal in accordance with the City Standard Specifications. Use of traffic, oil, alkyd or solvent vehicle type paints is prohibited. The painting shall be done by skilled mechanics in a workmanlike manner in accordance with the manufacturer's printed instructions. No parts of the construction involving painting of lines shall be conducted during rainfall, or when rainfall is imminent or unless the air temperature is at least 50°F and rising. Favorable weather conditions should be anticipated for at least eight (8) hours after application of paint. Allow paint to cure for at least twenty-four (24) hours under good drying conditions before opening the area to regular traffic.

**SECTION 182
RUNNING TRACK CONSTRUCTION
SYNTHETIC BOUND CUSHION**

182.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the installation of a synthetic bound cushioned running track & field event areas as indicated on the construction drawings and in the following specifications, Section 180 of the Specifications and as detailed on City Standard drawing No. 1778, Sheets 1 through 6.

182.2 **SUB-GRADE CONSTRUCTION:**

The sub-grade shall be stabilized to a depth of six (6) inches in accordance with Section 180 and the City Standard Specifications. This stabilization shall extend six (6) inches outside the limit of the track & field event areas.

182.3 **BASE CONSTRUCTION:**

The base course shall consist of four (4) inches of limerock placed and compacted in accordance with Section 180 and the City Standard Specifications, and shall extend six (6) inches outside the limit of the track & field event areas.

182.4 **LEVELING COURSE:**

A leveling course shall consist of Type II asphaltic concrete laid in two (2) layers. The maximum aggregate size shall be three-fourths (3/4) inch for the deeper layer with a compacted thickness of one and one-half (1-1/2) inches and three-eighths (3/8) inch for the upper layer with a compacted thickness of one (1) inch - the surface of each layer shall not vary from the specified grade more than one-fourth (1/4) inch in ten (10) feet when measured in any direction. The City Standard Specification shall apply and the special requirements of the Synthetic Surfacing manufacturer in order to achieve a bondable construction.

182.5 **SURFACE COURSE:**

The surface course material shall be "3M Company Tartan Brand Surfacing" or an approved equal.

182.5.1 Composition of the athletic track material shall contain no extraneous plasticizers or softening agents which are not integrally and completely bonded in the internal chemical structure which shall eliminate leaching and hardness variations under various weather and use conditions, the color finish being integral with the surface course material.

182.5.2 The surface shall have a granular texture to provide proper fractional characteristics and consistent running conditions under all weather extremes. Top surface shall be formed by implanting sized and graded resilient particles of the same polymeric composition as the base material immediately after

leveling and prior to hardening of the liquid resin to achieve proper penetration and adhesion of granules to surface. The base composition shall include an aggregate fraction consisting of closed-cell, synthetic, polymeric foam which will provide the proper end use physical properties and shall also provide a thickness or viscosity control for proper installation product quality.

182.5.3 The surface course shall be self-anchoring and shall adhere to the clean leveling course without the use of extraneous adhesives.

182.5.4 Installation equipment shall be such that mixing, pouring, and leveling of liquid surfacing material is done in a continuous manner which will provide a minimum number of permanently bonded, integral seams.

182.5.4.1 Application shall be made by factory trained personnel under the strict supervision of a qualified representative of the manufacturer and in strict accordance with the manufacturer's instructions.

182.5.4.2 Surfacing material in liquid form shall be capable of solidifying at ambient temperatures to a non-flowing, slump resistant state in a period of about one (1) hour and shall be capable of traffic use in about two (2) to three (3) hours.

182.5.5 The finished surface thickness shall be a minimum of three-eighths (3/8) inch and shall not vary more than one-eighth (1/8) inch in ten (10) feet from the specified grade in any direction.

182.6 **USE LIMITATION:**

Shoes with spikes in excess of one-quarter (1/4) inch should not be used on tracks surfaced according to these specifications. "Misuse of the track" shall cancel the manufacturer's warranty for material performance.

182.7 **TRACK & FIELD MARKING:**

No sooner than forty-eight (48) hours after the completion of the surfacing all lines shall be accurately located, marked and painted with "3M Athletic Track Marking Material" or an approved equal in accordance with the City Standard Specifications. Use of traffic, oil, alkyd or solvent vehicle type paints is prohibited. The painting shall be done by skilled mechanics in a workmanlike manner in accordance with the manufacturer's printed instructions. No parts of the construction involving the painting of lines shall be conducted during rainfall or when rain is imminent or unless the air temperature is at least 50°F and rising. Favorable weather conditions should be anticipated for at least eight (8) hours after the application of paint. Allow paint to cure at least twenty-four (24) hours under good drying conditions before opening the area to regular traffic.

**SECTION 183
RUNNING TRACK CONSTRUCTION
NATURAL CLAY**

183.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the installation of a natural clay running track & field event areas as indicated on the construction drawings and in the following specifications, Section 180 of the Specifications and as detailed on City Standard drawing No. 1778, Sheets 1 through 6.

183.2 **SUB-GRADE CONSTRUCTION:**

The sub-grade shall be stabilized to a depth of six (6) inches in accordance with Section 180 and the City Standard Specifications. This stabilization shall extend six (6) inches outside the limit of the track & field event areas.

183.3 **BASE CONSTRUCTION:**

The base course shall consist of four (4) inches of limerock placed and compacted in accordance with Section 180 and the City Standard Specifications, and shall extend six (6) inches outside the limit of the track & field event areas.

183.4 **LEVELING COURSE:**

A leveling course of gravel or limestone shall be installed over the base course with aggregate sized from a minimum of one-fourth (1/4) inch to a maximum of one (1) inch. Compacted thickness shall be a minimum of two (2) inches with the finished surface not more than one-fourth (1/4) inch above or below the grade set on the drawings.

183.5 **SURFACE COURSE:**

A surface course of clay as found in nature or as mixed crushed, screened, and blended shall be installed over a leveling course to a compacted thickness of four (4) inches meeting the following requirements:

183.5.1 Clay content shall be not less than fifteen (15) percent and not more than forty (40) percent with the remaining percentage divided equally between sand & silt.

183.5.2 Clay material on the surface shall have a plasticity index of not less than twelve (12) percent and not more than twenty (20) percent.

183.5.3 The surface shall be compacted by rolling with a tandem roller weighing not less than one (1) ton and not more than three (3) tons.

183.5.4 The finished surface shall not vary from the specified finished grade by more than one-eighth (1/8) inch in ten (10) feet measured in any direction.

183.6 **BRICK EDGING:**

A standard brick edging as detailed on construction drawings shall be laid in mortar around the entire perimeter (inside and outside) of the running track & field event runways.

183.7 **TRACK MARKING:**

Apply specifications in Section 180.6. Material to be used shall be marble dust and marking shall be necessary every time track is being used.

SECTION 184
RUNNING TRACK CONSTRUCTION
CINDER

184.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials & equipment necessary for the installation of a cinder running track & field event areas as indicated on the construction drawings and in the following specifications, Section 180 of the Specifications and as detailed on City Standard drawing No. 1778, Sheets 1 through 6.

184.2 **SUB-GRADE CONSTRUCTION:**

The sub-grade shall be stabilized to a depth of six (6) inches in accordance with Section 180 and the City Standard Specifications. This stabilization shall extend six (6) inches outside the limit of the track & field event areas.

184.3 **BASE CONSTRUCTION:**

The base course shall consist of four (4) inches of limerock placed and compacted in accordance with Section 180 and the City Standard Specifications, and shall extend six (6) inches outside the limit of the track & field event areas.

184.4 **LEVELING COURSE:**

A leveling course of gravel or limestone shall be installed over the base course with aggregate sized from a minimum of one-fourth (1/4) inch to a maximum of one (1) inch. Compacted thickness shall be a minimum of two (2) inches with the finished surface not more than one-fourth (1/4) inch above or below the grade set on the drawings.

184.5 **SURFACE COURSE:**

A surface course of cinders passing a one-fourth (1/4) inch screen mixed with clay binder in a ratio of 4 parts to 1 part clay as shown on the drawings and compacted to a thickness of not less than three (3) inches by rolling with a tandem roller weighing approximately six hundred (600) pounds per roll. Finished surface of the surface course shall not vary from the specified grade more than one-eighth (1/8) inch in ten (10) feet measured in any direction.

184.6 **BRICK EDGING:**

A standard brick edging as detailed in construction drawings shall be laid in mortar around the entire perimeter (inside and outside) of the running track & field event runways.

184.7 **TRACK MARKING:**

Apply specifications in Section 180.6. Material to be used shall be marble dust and marking shall be necessary every time track is being used.

**SECTION 185
MISCELLANEOUS EQUIPMENT
TRACK AND FIELD EVENTS**

185.1 **GENERAL:**

This section includes the technical information for the necessary equipment and miscellaneous items which provide for the use of the various activities previously specified.

185.2 **PORTABLE PITS:**

185.2.1 Necessary for pole vault and high jump. They shall be "PORTaPIT" as fabricated by Ampro Corporation, Anaheim, California, or an approved equal. The Super Olympian line shall be specified for meets calling for world record performance, and the Regular Olympian line for all other meets.

185.2.2 **SUPER OLYMPIAN POLE VAULT PIT:**

16'6" x 18' x 32" composed of three base units, 5'6" x 13' x 30" each, one FF (wide front) unit (two sections) 5' x 16' x 30", and one CL (cushion landing) unit, 16'6" x 18' x 2". Total weight, 1,100 pounds.

185.2.3 **SUPER OLYMPIAN HIGH JUMP PIT:**

22' x 8' x 28", composed of four base units, 5'6" x 8' x 26", each and one CL (cushion landing) unit, 22' x 8' x 2". Total weight, 600 pounds.

185.2.4 **REGULAR OLYMPIAN POLE VAULT PIT:**

16' x 16'6" x 32" composed of three base units, 5'6" x 11' x 30" each, one FF unit, 5' x 16' x 30" and one CL (cushion landing) unit, 16' x 16'6" x 2". Total weight, 900 pounds.

185.2.5 **REGULAR OLYMPIAN HIGH JUMP PIT:**

16'6" x 8' x 28" composed of three base units, 5'6" x 8' x 26" each and one CL (cushion landing) unit, 16'6" x 8' x 2". Total weight, 450 pounds.

185.2.6 The portable pits shall be fabricated with materials as itemized in the following lines or equal:

185.2.6.1 **Fabric:** Vinyl-coated nylon on two sides containing fungal and bacterial inhibitors, 15.4 to 16.5 ozs. per square yard, with #840 Denier Nylon for the base and GR-002 vinyl-coated nylon mesh for the top.

185.2.6.2 **Filler:** Prime quality foam, 2018 and 2041 density lattice construction with air pockets to minimize athlete's energy loss.

185.2.6.3 Miscellaneous: 450016 T.C. webbing, 12/4 Dacron HR thread, ff9 heavy duty brass zippers, nickel or zinc-plated hardware, five stitches per inch sewing, with all seams sewn at least twice, and three times where needed.

185.3 **PORTABLE PIT SHEDS:**

Necessary to protect portable pits when not in use (standard nylon weather covers favor mildew growth). Portable Pit Sheds shall be tents made of aluminum tubing two (2) inch diameter with heavy duty cast aluminum connectors and covered with waterproof, mildew treated, -flame proof, 12 oz. bulltwill heavy duty circus tent material with a plastic or aluminum ventilator on top. Dimensions as shown on the drawings shall be 24' x 24' x 6' at top x 3' at supports (6' O.C.) for pole vault area and 14' x 22' (Regular Olympian Pit) or 14' x 28' (Super Olympian Pit) x 6' at top x 3' at supports (5' O.C.) for high jump area. Bracings of two (2) inch diameter aluminum tubing shall run from each support to a central connector plate. The tents shall be demountable with ease for storage or a set of four (4) twelve (12) inch rubber wheels can be installed for quick handling.

185.4 **POLE VAULT & HIGH JUMP STANDARDS & RELATED ITEMS:**

Shall be as fabricated by Aluminum Athletic Equipment Company, Wynnewood, Pennsylvania, or approved equals.

185.4.1 OS-76 OLYMPIC STANDARD FOR POLE VAULT:

Portable model, two (2) inches aluminum telescoping tubes adjustable through the use of a large knob to any height between nine (9) feet and nineteen (19) feet. A set of eighteen (18) inch offset arms permit the standards to be placed over seventeen (17) feet apart and still allow the use of the official crossbar of fourteen (14) feet, ten (10) inches. A steel base eighteen (18) inches square moves on friction free nylon wheels along a five (5) foot runway of aluminum channels. The upright of the standard is anodized gold with large red numbers and is inserted into the movable base. The assembly shall be built in such a manner that tilting or turning over should be impossible.

185.4.2 OJ-80 OLYMPIC STANDARD FOR HIGH JUMP:

Portable model, two (2) inches aluminum telescoping tubes adjustable through the use of a large knob to any height between four (4) feet, six (6) inches to eight (8) feet. A steel base eighteen (18) inches square moves on a pair of three (3) inch nylon wheels. The upright of the standard is anodized gold with large red numbers and is inserted into the rollaway base.

185.4.3 XG5 POLE VAULT CROSS BAR:

14'10" long, 1-3/16" diameter fiberglass bar finished in gold, with six (6) inch semi-circular rubber ends, shall not break or sag.

185.4.4 XG4 HIGH JUMP CROSS BAR:

13'1-1/2" long, 1-3/16" diameter fiberglass bar finished in gold, with six (6) inch semi-circular rubber ends, shall not break or sag.

185.4.5 AMB ALUMINUM MEASURING BAR:

To measure all heights from three (3) feet to eighteen (18) feet, height being read to eye level, making unnecessary the use of tapes, ladders and forklifts.

185.4.6 ALT ALUMINUM CROSS BAR LIFTER:

A cross bar lifter of aluminum telescoping tubes with a maximum lift of eighteen (18) feet.

185.4.7 AVB (ALUMINUM VAULT BOX) AM) AVC (ALUMINUM VAULT COVER):

Cast aluminum box and cover shall not rust, warp or splinter. The angle between the bottom of the box and the stopboard shall be 105 degrees, the front buttress a trapezoid with six (6) inch and fourteen (14) inch parallel bases and the sides sloped outside to prevent pole contact. The covered box shall be flush with the runway surface and the top of the cover shall be finished with a material similar in color and texture to that of the runway surface.

185.5 LONG JUMP & TRIPLE JUMP TAKE-OFF BOARDS:

The take-off boards shall be sixty (60) inches long, twelve (12) inches wide, and four (4) inches deep, built in two pieces: three and one-half (3-1/2) inch deep bottom piece, of treated wood, solid or laminated fir or cypress and one-half (1/2) inch thick, removable top piece of treated marine plywood finished one face in white outdoor enamel and the other face with a material similar in color and texture to that of the runway. Fastened to the board and toward the sand pit, provide a galvanized or aluminum channel, three-fourths (3/4) inches deep, four (4) inches wide, sixty (60) inches long, flush with the runway to be filled with plasticine and to function as foul marker.

185.6 SHOT PUT & HAMMER STOP BOARD:

A stopboard shall be an arc of treated wood, solid or laminated fir or cypress painted white with non-slip finish. It shall measure 4'-0" in length along its inside edge, four and one-half (4-1/2) inches wide and four (4) inches in height firmly anchored in concrete with galvanized 2" x 6" x 1/8" anchors at twelve (12) inches O.C. The circle of which the stopboard is an arc shall measure 7'-0".

185.7 JAVELIN FOUL BOARD:

The foul board shall be made in the shape of an arc with a radius of 26'-3". The distance between its extremities shall be 13' - 1-1/2" measured straight across from end to end. It shall be of treated wood 2-3/4" wide x 1-1/2" deep secured in concrete with galvanized 2" x 6" x 1/8" anchors, or of aluminum or galvanized metal with anchoring

straps, set flush with the runway, painted white, with non-slip finish. On a synthetic surface it can be a painted line.

185.8 **HURDLES:**

Hurdles shall be Model XLAH Aluminum Athletic Equipment Company, or an approved equal, with 42" or 48", 3/4" thick x 2-3/4" wide top crossbar of treated wood with leveled edges, painted white with 2 vertical or diagonal stripes on the surface facing the starting line and anodized aluminum tubes with locking device for height adjustment, from 30" to 42", weights concealed, fixed and uniformly distributed, and dials that slide in graduated scales in the bases to set desired resistance from 6 to 8 pounds. Weight hurdles shall be 22 lbs. 2-1/2 ozs.

185.9 **STEEPLECHASE HURDLES:**

Steeplechase and water jump hurdles shall be 3'-0" high, 12'-0" wide truss frame and 15'-0" wide top bar. The section of the top bar shall be 5" square. Build with treated 6x6 fir or cypress throughout. The 2 bases shall be 3'-0" minimum to 4'-0" maximum, braced to uprights. For water jump provide four (4) 3/4" x 12" galvanized anchor bolts per base embedded in the concrete walls of the basin and for the other hurdles four (4) 3/4" x 12" galvanized anchor bolts per base to fit in 1" diameter x 7" galvanized sleeves set flush with the track surface and secured in concrete on a base of crushed stone. Paint white. Top bar shall have nonslip finish and four (4) vertical stripes on the surface facing the starting line.

185.10 **STARTING BLOCKS:**

Starting blocks shall be Model #414, "The Harry Gill Company", Urbana, Illinois, or an approved equal. All surface type not requiring holes in the track for anchoring, with rubber faced pedals, plunger locks and sixteen (16) needle spikes per block.

185.11 **FINISH POSTS:**

Finish posts shall be FPS Aluminum Athletic Equipment Company, or an approved equal, set at the official height of forty-eight (48) inches with steel rollaway bases and one automatic yarn dispenser per pair.

185.12 **REMOVABLE HAMMER & DISCOS CAGE:**

Shall be fabricated by "Jayfro Corporation", Waterford, Connecticut, or an approved equal. Ten uprights and twelve sleeves are required. The uprights are constructed of 15'6" long and 2-3/8" O.D. galvanized pipe, two feet of which is for insertion into accompanying ground sleeves. Each of the uprights have a two foot long piece of 1-1/2" schedule 40 pipe welded to it at the top. The arms have a D ring welded to them at the end to hold the net support cable. Both the uprights and arms are capped. The ground sleeves are provided with locking caps. The net is 14' high x 78' long and is constructed from #42 knotless type nylon, bound around and grommeted across the top for ease of installation. The net hangs from the upright's arms with the use of snap hooks, a cable and cable clamps.

185.13 **TIMERS & JUDGE STANDS:**

In good quality tracks, these stands shall be permanent, with locked storage space underneath, mounted on a concrete slab and made waterproof. In low budget tracks it will suffice a portable unit similar to Model #996, "The Harry Gill Company", Urbana, Illinois, made up of five (5) rows of forty-eight (48) inch seats on a steel angle frame and mounted on two (2) ten (10) inch wheels, or an approved equal. (Drawing needed for permanent stands).

SECTION 186
FOOTBALL AND SOCCER FIELDS

186.1 **SCOPE OF WORK:**

The work under this section includes the furnishing of all labor, materials and equipment necessary for the installation of a football field as indicated in the following specifications and as detailed on City Standard Drawing No. 1778, sheets 5 and 6.

186.2 **FOOTBALL FIELD:**

186.2.1 The field shall be a rectangular area with dimensions, lines, zones, goals and markers as shown on City Standard Drawing No. 1778, Sheet 5. The ground shall be graded to offer a smooth surface with a recommended down slope of two (2%) percent (1% minimum) from the center of the field to each sideline.

186.2.2 Lines shall be marked with a material which is not injurious to eyes or skin. No lime nor caustic material of any kind may be used. End lines and sidelines shall be at least four (4) inches wide. All other lines shall be at least two (2) inches but not more than four (4) inches wide. It is recommended that the goal lines and team box boundaries be marked in a color which contrasts with other field markings and the area between the sidelines and the team box boundaries be marked in solid white.

186.2.3 Measurements shall be from the inside edges of the boundary marks, such marks being out-of-bounds.

186.2.4 Each goal line mark shall be entirely in its end zone so the edge toward the field of play and its vertical plane is the actual goal line.

186.2.5 Goals shall be fabricated by Aluminum Athletic Equipment Company , Wynnewood, Pennsylvania, removable model AYG, or an approved equal, constructed of four (4) inch diameter aluminum alloy, with a single post to be inserted into a six (6) inch diameter aluminum ground sleeve, five (5) feet deep, with post bolt anchors that allow quick removal of goal.

186.2.6 Permanent goals shall be fabricated by Jayfro Corp., Waterwood, Connecticut, Model FBGD-275, or an approved equal, constructed of three and one-half (3-1/2) inch diameter galvanized steel uprights and two and three-eighths (2-3/8) inch diameter galvanized steel crossbar with welded bridge truss to eliminate bending. Post fit into three (3) foot deep ground sleeves.

186.2.7 Either model shall be twenty-three (23) feet and four (4) inches clear between uprights and twenty-four (24) feet maximum outside to outside, ten (10) feet from grade to top of crossbar and ten (10) feet minimum from crossbar to top of posts.

186.3 **SOCCER FIELD:**

- 186.3.1 The field shall be a rectangular area with dimensions, lines, center circle and goals as shown on City Standard Drawing No. 1778, Sheet 6. The ground shall be graded to offer a smooth surface with a recommended down slope of two (2%) percent (1% minimum) from the center of the field to each sideline.
- 186.3.2 Lines shall be marked with a material which is not injurious to eyes or skin. No lime nor caustic material of any kind may be used. All lines shall be at least four (4) inches wide.
- 186.3.3 Measurements shall be taken from the inside edges of the boundary marks.
- 186.3.4 Goals shall be as fabricated by Aluminum Athletic Equipment Company, or approved equal, model SSW, portable, with twelve (12) inch pneumatic wheels or SGS, permanent, with posts inserted in ground sleeves. Construction shall be of four (4) inch square aluminum with official NCAA round corners with two (2) inch diameter by thirteen (13) feet aluminum back stays inserted in ground sleeves to keep nets in place.
- 186.3.5 Nets, Nyloplast #A601 provided by AAE Company, or approved equal shall be attached to the uprights and crossbar and firmly pegged down to the ground behind each goal.
- 186.3.6 Either model shall be twenty-four (24) feet clear between uprights and eight (8) feet from ground to lower edge of crossbar. The width and depth of the goals posts and of the crossbar shall not be less than four (4) inches nor more than five (5) inches and shall be painted white.

186.4 **SURFACING:**

In grass fields, the cover shall be a dense growth of the grass variety best adapted to the area, cropped closely, watered, fertilized and replaced as often as necessary in order to secure a safe ground without grooves, depressions, or any sort of departure from the slope given to the field. Synthetic, multi-purpose fields shall be constructed in steps similar to a synthetic bound cushioned track as specified in Section 182 of the Specifications.

SECTION 187
SHUFFLEBOARD COURT CONSTRUCTION

187.1 **SCOPE OF WORK:**

The work specified in this section includes the furnishing of all labor, materials, and equipment necessary for the construction of concrete shuffleboard courts as shown in the City Standard Drawings and as specified herein. All work shall be performed by skilled mechanics experienced in this type of construction, in a workmanlike manner so as to provide a high quality shuffleboard court complete and in place ready for public use upon final acceptance of the Project.

187.2 **SITE PREPARATION:**

In addition to provisions of the City Standard Specifications for site preparation, all vegetation, including root systems to a depth of not less than twelve (12) inches shall be removed from the site and the soil treated with a sterilant, "Triox," manufactured by Chevron Chemical Company, or an approved equal product that will effectively inhibit future plant growth. Excavated areas shall be compacted to the same density required for fill material as specified in the City Standard Specification for excavation and fill.

187.3 **SUB-GRADE CONSTRUCTION:**

The sub-grade shall be compacted to 95% of maximum density with an L.B.R. of 30 within the limits of the shuffleboard court, and twelve (12) inches outside the court on all sides.

187.4 **CONCRETE MATERIALS:**

Unless otherwise approved by the Engineer, all concrete shall be supplied by local ready-mix concrete supplier capable of manufacturing concrete to the rigid standards specified herein. The design mix and the gradation of the aggregate required for each type of concrete used will be submitted and approved before construction begins.

187.4.1 **REGULAR CONCRETE:**

All concrete with the exception of the one-half (1/2) inch court topping shall have a minimum twenty-eight (28) day compressive strength of 3,000 PS I and shall conform to all requirements of the City Standard Specifications for Portland Cement Concrete.

187.4.2 **COURT TOPPING:**

The court topping shall be constructed of a one-half (1/2) inch thick pastel green colored "Class A" topping concrete consisting of a mixture of Portland Cement and fine aggregate with a minimum of 940 pounds of cement per cubic yard of concrete. The court topping shall have a minimum twenty-eight (28) day compressive strength of 4,000 PSI. Chromium oxide green, equal in quality to Davis Color #3221 pigment coloration manufactured by Frank D. Davis Company,

shall be premixed with the court topping concrete at the rate of five (5) pounds of coloration per cubic foot of cement. The coloring agent shall be added at the batch plant or at the warehouse after batching in accordance with ASTM C-94-55-G, Section 9, Paragraphs A through H. Materials, certification, and testing of the court topping concrete shall conform to the requirements of the City Standard Specifications for Portland Cement Concrete. Materials, method of batching, and mixing of materials shall be absolutely uniform in all respects to produce uniformity of the color in the finished surface.

187.5 **CONCRETE REINFORCEMENT:**

The concrete base and concrete gutter shall be reinforced with deforming reinforcing steel bars as shown in the City Standard Drawings.

187.5.1 **MATERIALS:**

All steel bars shall conform to the requirements of ASTM A615, grade 40 and shall be new, clean, and free from excess rust. The wire shall be 18 gauge galvanized wire.

187.5.2 **PLACEMENT OF REINFORCING BARS:**

Longitudinal reinforcing bars shall be cut and placed in lengths to provide no more than one lap joint per bar. All laps shall have a minimum of sixteen (16) inches and shall be arranged in a staggered manner to provide a minimum of six (6) feet between any two lap joints. Crossbars shall be cut to the desired length and tied at all intersections with tie wire double looped.

187.5.3 **TOLERANCES:**

Reinforcement steel shall be placed within one-half (1/2) inch vertically from the plan bottom clearance and within one (1) inch of the plan side clearance.

187.6 **DOWEL BARS FOR EXPANSION JOINTS:**

Dowel bars shall be plain steel bars as specified in Section 187.5.1 cut to the desired length as shown in the Plans. Dowel bars shall be spaced and positioned by a rigid template or other approved method to provide the desired positioning shown in the drawings.

187.7 **PLACING AND FINISHING CONCRETE:**

Prior to placing any concrete, all form work and reinforcement placement shall be approved by the Engineer.

187.7.1 **CONCRETE BASE CONSTRUCTION:**

The four and one-half (4-1/2) inch concrete base shall be placed in one continuous pour with no interruptions. All concrete used for the continuous placement shall be supplied in a single batch. The depth of the concrete base shall be

gauged at the intervals necessary to assure compliance with the tolerances specified herein. The concrete base surface shall be broom finished to assure bond with the playing surface.

187.7.2 CONCRETE PLAYING SURFACE CONSTRUCTION:

The concrete playing surface shall be applied to the concrete base a maximum of twenty-four (24) hours after the base pour. The concrete base shall be lightly sprayed with water and sealed with a slurry coat immediately before application of the playing surface. The slurry coat shall consist of Portland Cement and water at the rate of six (6) gallons of water per sack of cement. The rate of application shall be such that all depressions within the base surface are filled but no excess material is left on the surface. The maximum allowable time between application of slurry and pouring of the playing surface is thirty (30) minutes. The one-half (1/2) inch concrete playing surface shall be poured in one continuous pour with no interruptions. The pour shall be made during the morning hours to provide adequate time for finishing. The thickness of the playing surface shall be gauged at the intervals necessary to provide a uniform surface within the tolerances specified herein. The surface shall be worked to a smooth, level finish free of depressions or ridges. The floating and troweling operations shall be kept to a minimum to avoid segregation of aggregate and cement. All excess water shall be removed from the surface prior to final finishing. Dusting of cement or sprinkling of water will not be permitted during the finishing operation. While the concrete is still in a plastic state, the trueness shall be tested with an accurate straight edge. If irregularities exist they shall be immediately corrected and the surface finished by steel troweling. The texture shall be that of a sand finish. A well-defined continuous one-eighth (1/8) inch radius shall be produced on all edges of the playing surface. All tool marks or excess concrete shall be removed so as to provide a straight, uniform edge. When the concrete has made its initial set and is still green, the surface shall be rubbed smooth with a soft brick or wood block using water liberally to provide a smooth, uniform playing surface free from ridges or tool marks.

187.7.3 OTHER CONCRETE:

The concrete for curb, gutter, sidewalk construction shall be placed in the forms and tamped and spaded until mortar entirely covers its surface. The surface of the structure shall be floated smooth and the edges rounded to a one-eighth (1/8) inch radius as shown in the Plans. All exposed surfaces shall be given a broom finish. The forms shall be removed with twenty-four (24) hours after the concrete has been placed, and minor defects then filled with mortar composed of one part Portland Cement and two parts fine aggregate. Plastering will not be permitted. Any rejected curb, gutter, or sidewalk shall be removed and replaced without additional compensation. Any surface areas, which

are too rough or where other surface defects make additional finishing necessary, the Engineer may require that the concrete be rubbed to a smooth surface with a soft brick or wood block, with water used liberally.

187.8 **CURING OF CONCRETE:**

All concrete shall be cured by the wet burlap method as specified in the City Standard Specifications for Portland Cement Concrete.

187.9 **PAINTED MARKINGS:**

Paint shall not be applied to the courts until the concrete has cured for at least seven (7) days. The marking paint shall be an approved exterior white latex concrete paint capable of forming a uniform, durable painted stripe with a one-coat application. The areas to be painted shall be accurately measured and laid out with tape to provide clean straight edges. When approved by the Engineer, proper templates may be used to form the numbers.

187.10 **WAXING:**

After the painted markings have dried for twelve (12) hours, liquid shuffleboard wax shall be applied to the playing surface in accordance with the manufacturer's specifications. In addition, a one (1) year supply of wax shall be supplied and delivered to a designated location for each court built.

187.11 **TOLERANCES:**

The courts shall be constructed to the dimensions and elevations shown in the Plans within the tolerances specified herein. All horizontal distances shall be within one-half (1/2) inch of the dimensions shown on the Plans. All vertical distances and the thickness of the concrete shall be within one-eighth (1/8) inch of the dimensions shown on the Plans. The court topping shall be constructed flat with a tolerance of one-thirty-second (1/32) inch over a width of six (6) feet. All painted stripes and markings shall be within one-sixteenth (1/16) inch of the thickness and one-eighth (1/8) inch of the location shown on the Plans.

187.12 **WARRANTIES:**

Upon completion and acceptance of the Project, a written warranty shall be supplied to the Owner which shall be in effect for one (1) year from the date of final acceptance. The warranty shall cover the following:

1. The courts and other concrete shall have no horizontal or vertical movement due to improper fill, compaction, or construction methods.
2. Cracks due to expansion, contraction, or shifting of the concrete courts shall not appear within the playing surface.
3. The court topping shall not fade in color, crack, chip, or break due to improper materials or construction methods.

4. The painted markings shall not fade in color, crack, or peel off of the playing surface.

187.13 **PAYMENT:**

The payment for the shuffleboard courts shall be at the lump sum price per court submitted in the Proposal unless otherwise indicated in the Proposal or Special Conditions. The lump sum price shall include payment for all labor, equipment, parts, and materials for site preparation, excavation and fill, concrete work, court striping, court drainage, and sodding complete and in place.

SECTION 188
BRICK STREET REPAIR

- 188.1 Where existing exposed brick streets are being excavated, the existing brick street paving shall be restored with brick to a condition as good as or better than prior to such excavation. Normally brick removed can be stored on site and replaced when the excavation is completed. If additional bricks are required due to breakage or other shortage, a limited supply is available as noted below.
- 188.2 Where brick street paving is encountered during an excavation of a street that has been surfaced with asphalt, bricks removed shall be delivered to the storage yard as described below for future use. Restoration of the excavation shall be with either full depth asphalt or standard 6 inches of limerock and 1.25 inches of Type III asphaltic concrete surface.
- 188.3 A limited supply of paving bricks are available at the North Streets and Drainage Yard located at 4767 Moncrief Road, phone number (904)768-4888. These bricks are in a mound of construction debris, dirt and other material. They have not been separated, cleaned, culled for breakage, etc.; all of which must be done by user. Excess brick from any excavation shall also be delivered to this area to be available for future needs. The contractor is to call the above number at least forth-eight (48) hours in advance so that he will be advised where to dump.

Added 05/29/92

SECTION 189
UNDERGROUND UTILITY CROSSINGS
(by Methods Other Than Open Cutting)

189.1 **JACKING AND BORING:**

All jacking and boring within City rights-of-way or easements will be accomplished in accordance with the latest edition of Florida Department of Transportation "Jacking and Boring Supplement to the Utility Accommodation Guide". Copies of the accommodation guide may be obtained by contacting:

F.D.O.T. Maps and Publications
605 Suwannee Street
Tallahassee, FL 32399

189.2 **ALTERNATE METHODS:**

As an amendment to the Jacking and Boring Supplement to the Utility Accommodation Guide, two (2) alternate methods may be used. These two (2) alternate methods are to be used for plastic pipe only. Plastic pipe 3" I.D. or less is to be a minimum of 36" deep. Plastic pipe greater than 3" I.D. but not greater than 5" I.D. must be a minimum of 48" deep. This maximum length of a bore of these two (2) alternate methods shall be 60 feet.

189.2.1 **Alternate One:**

P40 and P80 long range, directional rod pusher as supplied by Ditch Witch Co., or an approved equivalent.

189.2.2 **Alternate Two:**

Pneumatic piercing tools as supplied by Ditch Witch Co., or an approved equivalent.

Information concerning these two methods may be obtained from:

Ditch Witch of Northern Florida
1495 Wells Road
Orange Park, FL 32073
(904)269-6786

OR

The Charles Machine Works, Inc.
P. O. Box 66
Perry, Oklahoma 73077-0066
(405)336-4402

NOTE: Copies of all of the above are available for review at City Hall, 220 East Bay Street, Room 101.

Added 05/20/92

DRAINAGE INDEX
SECTIONS 200-299

| <u>TITLE</u> | <u>SECTION</u> |
|--|----------------|
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| Storm Drains and Culverts | 201 |
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Revised 8/26/83

**SECTION 200
EXCAVATION AND BACKFILL**

200.1 **SCOPE:**

All specification designations refer to the latest edition.

200.1.1 The Contractor shall make all excavations to the designated elevation of footings or foundations for all appurtenant structures, trenching for underground piping,, shall backfill such excavations and dispose of excess or unsuitable materials from excavation, and shall provide and place necessary borrow material to properly backfill excavations, all as indicated on the drawings, specified herein or as directed by the Engineer.

200.2 **GENERAL REQUIREMENTS:**

200.2.1 **BORINGS:**

Any boring and sub-surface data including ground water elevations or conditions of existing piping and structural locations that may be appended in these Specifications or indicated on the Plans are presented only as information that is available which indicates certain conditions found. It is in no way guaranteed to represent materials at points other than those which the borings were made.

200.2.2 **SITE EXAMINATION:**

Bidders shall examine the job site and make their own determination of the character of materials and conditions to be encountered and their proposal shall be based upon their own investigations. Neither the Owner nor the Engineer shall be held responsible for variations found to exist between the attached data above referred to and actual field conditions that develop through the period of construction.

200.2.3 **SURVEY DATA:**

Bench marks and other reference points shall be carefully maintained and, if disturbed or destroyed, shall be replaced by the Contractor to the satisfaction of the Engineer at no additional cost.

200.2.4 **UNDERMINING:**

Excavation, dewatering, sheeting and bracing required shall be carried out so as to prevent the undermining or disturbance of foundations of any existing structure or work, and so that all work may be accomplished and inspected in the dry.

200.2.5 **TEMPORARY ACCESS:**

The Contractor shall provide suitable and safe temporary bridges, crossings, or accessways during construction to maintain traffic and/or provide access to private property,

and shall remove said structures after construction is complete.

200.2.6 DUST CONTROL:

If the Engineer determines that it is necessary to control dust from time to time during the progress of the work, the Contractor shall do so via a method approved by the Engineer at no additional cost to the Owner.

200.2.7 OPEN EXCAVATION:

The extent of excavation open at any one time will be held to a minimum consistent with the normal and orderly prosecution of the work.

200.3 CUTTING PAVEMENT:

200.3.1 ASPHALT:

Bituminous pavement shall be removed to a clean straight lines via cutting of edges. Where bituminous pavement adjoins a trench, the edge adjacent to the trench shall be trimmed in a neat straight line.

200.3.2 CONCRETE:

Concrete pavement shall be removed to neatly sawed edges. Saw cuts shall be made to a minimum depth of 1 to 1-1/2 inches. If a saw cut in concrete pavement falls within 3 feet of a construction joint, contraction joint, expansion joint or edge, the concrete shall be removed to the joint or edge. The edges of the existing concrete pavement adjacent to trenches where damaged subsequent to saw cutting of the pavement shall again be saw cut in neat straight lines for the purpose of removing the damaged pavement areas. Such saw cuts shall be parallel to the original saw cuts or shall be cut on an angle which departs from the original saw cut not more than 1-inch in each 6-inches.

200.3.3 OTHER:

Concrete curb, gutter, sidewalk and driveway shall be removed to neatly sawed edges with saw cuts to a minimum depth of 1-1/2 inches. Concrete sidewalks or driveways to be removed shall be neatly sawed in straight lines parallel to the curb or at right angles to the alignment of the sidewalk. No section to be replaced shall be smaller than 30 inches in either length or width. If the saw cut in sidewalk or driveway would fall within 30 inches of a construction joint, expansion joint, or edge, the concrete shall be removed to the joint or edge except that were the saw cut would fall with 12 inches of a score mark. Curb and gutter shall be sawed to a depth of 1-1/2 inches on a neat line at right angles to the curb face.

200.4 TRENCH EXCAVATION:

200.4.1 OPEN CUT:

All excavation for piping shall be open cut. Tunneling will not be permitted unless specifically called for on the Plans. Trench sides shall be approximately vertical between an elevation of 1 foot above the top of the pipe and the bottom of the pipe; otherwise, trench sides shall be as vertical as possible or as required. Trenches may be excavated by machinery to a depth that will not disturb the finish grade.

200.4.2 AROUND OBSTRUCTIONS:

The Contractor shall excavate the pipe trench by hand where excavation by machinery would endanger trees, structures, or utilities which otherwise might be saved by the use of hand excavation.

200.4.3 WIDTH:

Trench width shall be as narrow as practicable and shall not be widened by scraping or loosening material from the sides. In any case, trench width below 1 foot above the top of the pipe shall not exceed the external pipe diameter by more than 1/2 the diameter (12 inches/minimum) on each side of the pipe without obtaining the Engineer's specific approval in writing.

200.4.4 BEDDING:

Except where granular or concrete bedding is to be used, mechanical excavation shall be stopped above the final invert grade elevation and the remaining material carefully hand excavated so that the pipe may be laid on a firm, undisturbed, native earth bed.

200.4.5 FOR BELLS:

Bell holes shall be dug to permit the entire straight barrel of the pipe to rest on the trench bottom.

200.4.6 ROCK:

If rock is encountered, excavation shall be made to at least 6 inches below the finish grade of the pipe and the resultant over-excavation shall be filled and compacted with suitable bedding material. No section of pipe shall rest directly on rock. Boulders or loose rocks which might bear against the pipe will not be permitted in the trench bottom or backfill.

200.5 EXCAVATION FOR STRUCTURES:

200.5.1 LINE & GRADE:

The Contractor will be held responsible for prosecuting the work in accordance with the lines and grades shown on the Contract Drawings.

200.5.2 LIMITS:

The Contractor shall do all the excavating of every description of whatever substance encountered, to the dimensions and levels indicated on the drawings. All cuts shall be excavated to the depth indicated on the drawings.

200.5.3 DEWATERED:

Excavation shall be accomplished in a dewatered area to assure a measure of control over construction. Well points, if used, shall be in place and pumps operating at sufficient capacity to insure that the depressed water table is maintained below the excavation level, if needed.

200.5.4 WIDTH:

Excavations shall be made wide enough to allow for inspection and to permit the proper installation of the work. Care shall be taken that excavation does not extend below the exact lines of bottom of structures except as specifically shown. Should the excavation, through error or otherwise, be carried below such line, the Contractor shall fill in the resulting excess excavation with suitable backfill at no cost to the Owner and compact it to obtain a suitable foundation support. Where structures are not supported on piles, all loam, organic, or other unsuitable material shall be removed and replaced with suitable material as defined by the specifications.

200.5.5 BEDDING:

Except where a granular or concrete bedding is to be used, mechanical excavation shall be stopped above the final invert grade elevation and the remaining material carefully hand excavated so that the structure may be set on a firm, undisturbed, native earth bed.

200.5.6 ROCK:

If rock is encountered, excavation shall be made to at least 6 inches below the finish grade of the structure and the resultant over-excavation shall be filled and compacted with suitable bedding material. No portion of the box structure shall rest directly on rock. Boulders or loose rocks which might bear against the structure will not be permitted in the trench bottom or backfill.

200.6 EXCAVATION BELOW GRADE:

200.6.1 TOO DEEP:

In the event the Contractor through error or carelessness excavates below the elevation required, the Contractor shall at his own expense backfill with bedding material as herein specified and compact same to obtain a suitable pipe bedding or structure support as defined in the Specifications.

200.6.2 BAD MATERIAL:

In the event unstable or unsuitable bedding material is encountered at or below the limits of excavation noted on the drawings, such material shall be removed and replaced with suitable material compacted as specified when specifically authorized in writing by the Engineer. The Contractor will be paid in accordance with the measurement and payment provisions of this section. In the absence of written orders directing removal and replacement of unsuitable material, no payment for extra work will be allowed.

200.7 SHEETING, SHORING & BRACING:

200.7.1 PROVIDING:

The Contractor shall provide and install such sheeting and shoring as may be required to support the sides of any excavation to prevent earth movement that could endanger the work or workman, or any existing structures, or to confine the construction within a specified area such as an easement or street right-of-way. It shall be the Contractor's responsibility to place this sheeting and shoring for such protective purposes without the Engineer's instructions. Pipeline sheeting shall extend a minimum of 3 feet below pipe invert. In the process of extraction of sheeting, the use of vibratory type pile drivers (as opposed to impact type) shall be limited to that sheeting driven no greater than five (5) feet below the pipe invert.

200.7.2 EXCAVATION LESS THAN 10 FEET:

For excavations less than 10 feet in depth, the Contractor shall provide and install such sheeting and shoring as he may deem necessary. Such sheeting and shoring will be considered as being for the Contractor's convenience and benefit and all costs of furnishing, driving and removing same shall be borne by him. Sheeting for excavations less than 10 feet in depth may be timber or steel at the Contractor's option, unless specified on the Contract Drawings and Document, or specified by the Engineer.

200.7.3 TIMBER SHEETING CUT OFF:

Unless otherwise directed by the Engineer, all timber sheeting shall be cut off a minimum of 30 inches below grade and left in place, with proper bracing to provide lateral support. Timber sheeting, bracing and shoring above the cutoff elevation shall be removed by careful extraction so as not to endanger other structures or property. All voids left shall be immediately backfilled with approved material and compacted.

200.7.4 STEEL SHEETING:

Steel sheeting shall be required for all excavations ten feet or more in depth and at such other locations as may be indicated on the drawings. Steel sheeting may be completely removed when sufficient backfill has been placed to prevent damage to the work and/or existing structures. Care shall be exercised to prevent the opening of voids during the extraction process.

200.7.5 STEEL SHEETING LEFT IN PLACE:

Steel sheeting shall be left in place when so ordered by the Engineer. The top of steel sheeting left in place shall be no less than thirty inches below grade unless otherwise shown on the drawings, or directed by the Engineer.

200.7.6 DRAG SHIELD:

Steel Drag shields or trench boxes may be used, subject to the written approval of the City Engineer. They shall be equal to: Efficiency Trench Box, manufactured by Efficiency Production, Inc., 2360 East Jolly Road, Okemos, Michigan 48864. Voids left by the advancement of the shield shall be carefully backfilled and compacted in accordance with trench backfill requirements.

200.8 HANDLING WATER:

200.8.1 MEANS OF:

The Contractor shall at all times during construction provide ample means and devices with which to remove and dispose of promptly all water entering trench and structure excavations and shall keep said excavations acceptably dry, until the structures to be built therein are completed. All water pumped or drained from the work shall be disposed of in a suitable manner without causing damage to sewer, pavement, pipes, electrical conduits, or any other work or structures.

200.8.2 DRY EXCAVATION:

Drainage for the excavation shall be adequate. No pipe shall be laid in water and no water shall be allowed to rise above the bottom of any pipe while it is being jointed, except as otherwise permitted in writing. No masonry shall be placed in water and no water shall be allowed to rise over masonry until the concrete or mortar has attained its initial set. Nor shall water be allowed to run over completed masonry for four days, and in no event shall water be allowed to rise so as to set up unequal pressures in the structures for four days.

200.9 EXCAVATED MATERIAL:

200.9.1 SUITABLE BACKFILL MATERIAL:

Excavated material to be used for backfill shall be neatly deposited. Where stockpiling of excavated material is

required, the Contractor shall be responsible for obtaining the sites to be used and shall so maintain his operations as to provide for natural drainage and not present an unsightly appearance. Rock, shell, or other base materials for roads and alleys shall be carefully selected and kept separate. Grade and line stakes shall be protected. No excavated material shall be placed on private property without the written consent of the property owner.

200.9.2 UNSUITABLE BACKFILL MATERIAL:

Where material unsuitable for backfill is excavated within the limits shown on the drawings, and as directed by the Engineer, the unsuitable material shall be removed from the job site and disposed of by the Contractor. If the stockpiled excavated material is insufficient, Class A-3 soil shall be provided to replace the unsuitable materials, with measurement and payment made on the basis of unit price set forth in the Contract for Class A-3 soil. In no event shall the amount of material removed exceed the quantity authorized to be excavated by the Engineer. Unsuitable material shall include pile foundations, concrete, railroad and street car tracks, railroad ties, debris, muck, clay, etc., as determined by the Engineer.

200.9.3 TOPSOIL:

Material from the excavations suitable for topsoil shall be deposited in piles separate from other excavated material. Piles of topsoil shall be located so that the material can be used readily for the finished surface grading or as directed by the Engineer, and shall be protected and maintained until needed. At the option of the Contractor, topsoil material for use in finish grading may be obtained from other locations.

200.9.4 ADDITIONAL MATERIAL:

Should the quantity of material excavated in connection with the various structures be unsuitable for making the backfills required by the Contract Drawings, sufficient additional granular material as specified herein for backfill shall be provided by the Contractor when specifically authorized by the Engineer.

200.10 SILTATION & EROSION:

The Contractor shall take steps and make suitable provisions to minimize siltation and erosion which may result from, or be as a result of, his operations during the course of construction of the project.

200.11 BACKFILL - TRENCHES:

200.11.1 TESTING:

Attention is called to the various testing requirements of the particular pipe to be installed as specified under the

pipe sections of these specifications. The Contractor shall be responsible for obtaining the necessary inspections, before, during and after backfilling. He shall re-excavate, refill and perform all such related work if necessary to obtain satisfactory backfill results.

200.11.2 MATERIAL:

Excavated native granular material free from perishable and objectionable objects and containing no stones or clods larger than three (3) inches in diameter shall be used for backfilling and such grading on the site as required. Any excess material shall be place where directed.

200.11.3 TO TOP OF PIPE:

For backfill up to a level of one (1) foot over the top of the pipe, only selected native granular material shall be used as defined above but containing no stones or clods larger than two (2) inches in diameter. Backfilling shall be placed in uniform layers not to exceed six (6) inches compacted thickness in depth up each side- Each layer shall be placed, then carefully and uniformly tamped, so as to eliminate the possibility of lateral displacement. Care shall be taken to completely backfill under the pipe haunches. The remainder of the backfill material may then be placed in layers not to exceed twelve (12) inches loose thickness and tamped to a compaction as specified hereinafter. Above the level of one (1) foot over the top of the pipe, water-jetting or puddling may be used, subject to the approval of the Engineer, wherever the material is of non-plastic type and is void of all fines passing through a 200 sieve and smaller. Compaction by water-jetting or puddling will not be permitted within the right-of-way or other traffic areas.

200.11.4 IMPROPER:

Whenever trenches have not been properly filled, or if settlement occurs, they shall be refilled, smoothed off, and finally made to conform to the surface of the ground. Backfilling shall be carefully performed and the surface restored to the elevations shown on the plans. In unpaved areas, the surface of trenches shall conform and be equal in quality, character, and materials to the surface immediately prior to making the excavation, or as specified in the Contract Documents.

200.11.5 RAMPING:

All backfill shall be placed in uniform horizontal layers. "RAMPING", that is, pushing backfill material down a ramp into excavated areas, will not be permitted unless authorized in writing by the Engineer.

200.11.6 MAINTENANCE:

The Contractor shall refill any settlement in backfilled areas. The surfaces of backfilled trenches shall be maintained in a safe and satisfactory condition at all times after being opened to traffic until the final acceptance of the Contract work by the Owner.

200.12 **BACKFILL - STRUCTURE:**

200.12.1 **APPLICATION:**

Where backfill is to be placed around underground structures in the piping system or other structures on the work, the procedures set forth hereinafter shall be followed.

200.12.2 **WHEN:**

Backfilling shall be accomplished as soon as practicable after underground work on the structure is completed and inspected. No trash shall be allowed to accumulate in the space to be backfilled. Particular care should be taken to avoid leaving wood where it will be buried (other than sheeting to be left in place).

200.12.3 **MATERIAL:**

Excavated native granular material from perishable and objectionable objects and containing no stones or clods larger than three (3) inches in diameter shall be used for backfilling and such grading on the site as required. Any excess material shall be placed where directed.

200.13 **COMPACTION & TESTS:**

200.13.1 **LAYERS:**

Backfill material up to a level of one (1) foot over the top of pipe shall be placed in layers not to exceed six (6) inches loose thickness and compacted to ninety-eight percent (98%) of its maximum density at +/-2% of optimum moisture content as determined by the Laboratory Modified Proctor Test (AASHTO Designation T180). A tolerance of minus two percent (-2%) shall be allowed in the compactive effort.

200.13.2 **WITHIN RIGHTS-OF-WAY:**

In paved or unpaved roadways and traffic areas, including shoulders, railroad crossings, and driveways, backfill material above one (1) foot over the top of pipe and above the bottom of structures, shall be placed in layers not to exceed twelve (12) inches loose thickness and compacted to ninety-eight percent (98%) of its maximum density +/-2% of optimum moisture content as determined by the Laboratory Modified Proctor Test (AASHTO Designation T180).

200.13.3 **OUTSIDE RIGHTS-OF-WAY:**

In areas outside the roadways and outside traffic areas, backfill material above one (1) foot over the top of the

pipe and above the bottom of the structures shall be placed in layers not to exceed twelve (12) inches compacted thickness. Water-jetting and puddling may be used around structures in accordance with paragraph 200.11.3, but only above the level of one (1) foot over the top of the joining pipe(s).

200.13.4 ON FILL:

Where pipe or structures are to be constructed on fill materials in lieu of undisturbed earth, the fill material shall be brought up to the bottom elevation of the pipe structure in six inch maximum layers compacted thickness. Each layer shall be compacted to ninety-eight percent (98%) of the maximum density as determined by the Laboratory Modified Proctor Test (AASHTO Designation T180). A tolerance of minus two percent (-2%) shall be allowed in the compactive effort.

200.13.5 METHOD OF:

The method of compacting backfill material shall be at the Contractor's option provided the compaction requirements hereinbefore specified are obtained, except that consolidation by flooding will not be permitted under or adjacent to paved or unpaved traffic areas. If tests for in-place density consistently fail to meet the requirements, the Engineer may require the Contractor to change his method of compaction without claiming additional compensation.

200.14 COMPACTION WITHIN STATE RIGHT-OF-WAY:

200.14.1 APPLICATION:

As exception to the above paragraph, the following shall govern work within State Road Rights-of-way.

200.14.2 TO TOP OF PIPE:

Backfill material up to a level of one (1) foot over the top of pipe, and up to the bottom of structures, shall be placed in layers not to exceed six (6) inches (compacted thickness) and compacted to one-hundred percent (100%) of its maximum density at +/-2% of optimum moisture content as determined by the Laboratory Standard Proctor Test (AASHTO Designation T99). No minus tolerance shall be allowed in the compactive effort.

200.14.3 UNDER ROADS:

When pavement is to be constructed over the pipe, backfill material above one (1) foot over the top of the pipe and above the bottom of structures shall be placed in the manner and compacted to the degree required in Paragraph 200.14.2 above. No minus tolerance shall be allowed in the compactive effort.

200.14.4 NOT UNDER ROADS:

Where no pavement is to be constructed and vehicular traffic is not to pass over the pipe, backfill material above one (1) foot over the top of the pipe and above the bottom of structures shall be compacted to a firmness approximately equal to that of the soil adjacent to the pipe trench or structure excavation.

200.14.5 COMPACTION:

The above specifications for work within State Road rights-of-way are in conformance with compaction requirements set forth in Paragraph 125.8.3.2 of the 1977 Edition of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction. Should there be variance with any future edition, the criteria in that future edition shall govern.

200.15 TESTING:

200.15.1 LAB:

The Contractor shall retain an approved independent testing laboratory to make in-place density tests of trench backfill at intervals of not more than one-hundred fifty (150) feet for each compacted lift along all drain lines. Reports of these tests shall be submitted in triplicate within twenty-four (24) hours to the Engineer for approval. Additional compaction control shall be performed at the discretion of the Engineer by an independent testing laboratory employed by the Owner.

200.16 BEDDING MATERIAL:

200.16.1 FURNISHED:

The Contractor shall furnish, place and compact granular backfill as specified in authorized excavation above or below normal grade, as pipe bedding material, in other locations as indicated on drawings, or as specified, and where ordered by the Engineer.

200.16.2 CONSISTENCY:

Bedding material shall consist of well-graded, crushed stone or crushed gravel, meeting the requirements of ASTM Designation C33, Graduation 67 (3/4 inch to No. 4). Air cooled blast furnace slag, alone or in combination with crushed stone and/or crushed gravel conforming to ASTM Designation C33 requirements, may also be used.

200.16.3 SUBSTITUTIONS:

In lieu of the above specified material for bedding, the Contractor, when so authorized by the Engineer, may use a good grade of AASHTO Class A-3 soil, free of organic or other unsuitable material in quantities which if present would render the sand unsuitable for bedding use.

200.16.4 LAYERS:

Bedding material to be compacted shall be placed in layers not over six (6) inches thick, and each layer shall be thoroughly compacted with mechanical vibrators.

200.17 MEASUREMENT & PAYMENT:

200.17.1 ABOVE INVERT:

Except as noted below, no payment will be made for the work above the proposed structure or pipe bottom. The cost thereof is included in the unit or lump sum price set forth in the Contract for the items to which the excavation and backfill is incidental or appurtenant.

200.17.2 BEDDING:

When authorized for use, bedding material shall be paid for at the unit price set forth in the Contract. Bedding material used shall be measured in cubic yards, compacted in place, and as specified. This shall constitute full compensation for excavating the material to be placed; removal from the job site and disposal of all unsuitable material; furnishing, placing and compacting bedding as specified, and any de-watering required.

200.17.3 NOT CALLED FOR:

Granular material used to backfill, unauthorized excavations for any purpose shall not be measured nor paid for.

200.17.4 A-3 SOIL:

When authorized for use as backfill, AASHTO Class A-3 soil shall be paid for at the price per cubic yard as set forth in the Contract. This shall constitute full compensation for removal from the job site and disposal of all unsuitable material, and furnishing, placing, and compacting backfill as specified. The cost of excavation of unsuitable backfill and de-watering shall be included with the unit cost of pipe installation.

200.17.5 REMOVAL:

The quantity of granular material used for bedding and backfill below and/or above the normal grade measured for payment shall be the same as the number of cubic yards of unsuitable material ordered removed.

200.17.6 SHEETING:

No measurement or payment shall be made for timber sheeting driven and left in place or steel sheeting driven and pulled. The cost shall be merged with the cost of the items to which the sheeting is incidental or appurtenant.

200.17.7 STEEL SHEETING CUT OFF:

Steel sheeting driven, cut off, and left in place, when authorized by the Engineer, or called for in the Contract Drawings and Documents, shall be measured for payment from pipe invert or the line of demarcation, whichever is deeper, to designated cut-off elevation. Except in the areas where pile supports are used, steel sheeting driven and left in place, when authorized by the Engineer, shall be measured for payment from pipe invert to designated cut-off elevation.

200.18 GRASSING & MULCHING:

The work involved herein consists of furnishing grass seed, mulch, fertilizer and water and placing same to effect a grassing and mulching of specified graded earthen areas for the purpose of establishing a permanent grass turf throughout these areas. Grass seed shall be a mixture of equal parts of Bermuda seed and Pensacola Bahia except during winter months when Rye grass seed or other approved winter crop seed may be substituted for the Bermuda seed as directed by the City Engineer. The two types of seed used shall be thoroughly dry-mixed immediately before sowing. Seed which has become wet or moldy will not be acceptable for use. Bermuda seed shall be hulled and Pensacola shall be scarified, have a minimum activity germination of forty percent (40%) and total germination of eighty-five percent (85%). All seed shall meet the requirements of all applicable state and local laws and be approved by the Engineer before sowing. Dry mulch shall be used for mulch materials and shall be straw or hay consisting of Oat, Rye, or Wheat Straw, or Pangola, Peanut, Coastal Bermuda, or Bahia Grass Hay. Fertilizer may be of either liquid or dry and must comply with all state and local laws. The chemical designation shall be 8-8-8 with the first digit referring to total nitrogen; the second, available phosphoric acid; and the third, water-soluble potash contained in the fertilizer. Water shall be any water from a lake or stream. Salt water or water containing anything that might be harmful to plant life, produce an obnoxious odor, or cause excessive discoloration will not be allowed. The Contractor shall apply 800 to 1000 pounds of dry fertilizer to an acre, depending on soil condition from sandy to loamy. Liquid fertilizer, if used, shall be applied at an equivalent rate, 74 to 92 gallons per acre. The fertilizer shall be applied uniformly. Dry fertilizer shall be applied to moist earth, not later than seven (7) days after seed has been sown. Mulch shall be spread to approximately a two (2) inch loose thickness and then cut in, to produce a three to four (3 to 4) inch loose layer of soil and mulch. Soon after the mulch has been cut in, seed shall be scattered uniformly over the grassing area. The rate shall be sixty (60) pounds per acre using thirty (30) pounds each of Bahia, and Bermuda, (or Rye during the winter season). Immediately after seeding, the entire grassed and mulched area shall be given the best treatment as needed to assure a uniform stand of grass which shall be maintained by watering and possible rolling as needed. Any washouts or otherwise damaged grass areas shall be repaired before final acceptance of the grassing and mulching. Measurement in square yards shall be made by an actual field measurement in plain view of the area within the pay lines shown on the Drawings acceptably grassed and mulched. Payment for

this item shall be made at the Contract unit price per square yard for grassing and mulching as stated in the Proposal.

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SECTION 201
STORM DRAINS AND CULVERTS

201.1 **SCOPE:**

The work specified in this section includes the furnishing of all labor, equipment and materials required to construct the storm drainage piping shown on the drawings and specified hereinafter.

201.2 **MATERIALS:**

201.2.1 **STANDARD PRODUCTS:**

Storm drainage piping shall be the standard product of a manufacturer of established good reputation in the industry and in a permanent plant adapted to meet the design requirements of the pipe. All storm drainage piping shall meet the requirements of Section 204, Section 205 and/or Section 206, of these specifications as applicable, unless otherwise shown on the drawings.

201.2.2 **BOX CULVERTS:**

Box culverts and associated concrete drainage structures shall be constructed of reinforced concrete, proportioned, mixed, placed, finished and cured in accordance with the requirements of Standard Specifications of the American Concrete Institution, ACI 301-66.

201.2.3 **JOINTING:**

Jointing materials gaskets and pipe ends shall conform to the requirements given in Section 204, Section 205, and/or Section 206, of these specifications, as applicable.

201.3 **INSTALLATION:**

201.3.1 **GENERAL:**

Bell and spigot pipe shall be laid with the bell end pointing up grade.

201.3.2 **OPEN ENDS:**

Open ends of pipe at the end of each day's work shall be closed temporarily with blocks or bulkheads.

201.3.3 **FLOTATION:**

The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench.

201.3.4 **JOINTING TOLERANCE:**

Jointing tolerance shall be in accordance with the Section 204, Section 205, and/or Section 206, of these specifications, as applicable.

201.4 **TESTING & INSPECTION:**

201.4.1 **GENERAL:**

All work shall be in first class conditions and constructed properly in accordance with the Drawings & Specifications. No piping shall be buried, covered, or concealed until it has been inspected and approved.

201.4.2 **FACTORY TESTS:**

Certified copies of test reports shall be submitted to the Engineer as proof that piping conforms to the requirements of the applicable Section 204, Section 205, and/or Section 206, of these Specifications. Test reports shall be furnished, if requested, prior to pipe installations.

201.4.3 **METHOD:**

Drainage Piping shall be Inspected as Follows: A light held in a manhole shall show a full circle of light through the pipe when viewed from the adjoining end of the line.

201.4.4 **MEASUREMENT & PAYMENT:**

Measurement of a storm drain pipe for payment shall be the horizontal distance between structures with a deduction for those spaces occupied by these structures. Payment for storm drain pipe will be at the unit price per linear foot basis as stated in the Proposal. Payment will be at the Contract unit price per foot for the size and type of pipe material actually installed. Payment shall constitute full compensation for excavating, bed preparation, backfilling, de-watering, sheeting and shoring trenches, soil compaction, site restoration and clean-up, unless otherwise call for in the Specifications or Bid form.

201.5 **UNDERDRAIN:**

201.5.1 **PIPE:**

Pipe used for underdrain shall meet AASHTO M177 specifications for bituminous fiber pipe, AASHTO M189 for asbestos cement pipe, AASHTO M197 for corrugated aluminum pipe, AASHTO M175 for concrete pipe, of ASTM D3033 for polyvinyl chloride pipe and ASTM C508 for perforation requirements.

201.5.2 **FILTER MATERIAL:**

The filter material must meet one of the following three specifications. In any selection, the material furnished must be free of all organic or other deleterious materials:

201.5.2.1 **Coarse Aggregate:** The filter material may consist of gravel or stone, as specified in Section 130, City Standard Specifications, Paragraphs 130.3.2 and 130.3.1.

201.5.2.2 Coquina: Coquina shell used for filter material shall be mollusk shell (i.e. oyster, mussel, clam, etc.). Steamed shell shall not be permitted, nor shall any coquina be permitted, which shows significant tendency to slake or to undergo chemical or physical change on exposure to water. Each source of coquina proposed for use shall be announced to the Engineer and the Engineer shall be given an opportunity to inspect the material at the source prior to any of it being brought to the job site. Acceptance or rejection of the material shall be made on an individual source basis. At least 50% (by weight) of the total material shall be retained on a No. 4 sieve. Not more than 7.5% (by weight) of the total material shall pass the No. 200 mesh sieve when determined by washing. The Contractor will provide independent certification of these criteria for the material.

201.5.2.3 Solite: An expanded shale product known commercially as "Solite" may be used but only the filter material grade; i.e., particle sizes between three-fourths (3/4) inch and two (2) inch.

201.5.3 TOP SEAL:

Top seal over the filter material shall consist of two layers of thirty (30) lb. building felt, 0.006" polyethylene, or a synthetic filter fabric, and shall be lapped over the filter material.

201.5.4 PLUGS:

Upstream ends of underdrain pipes are to have a removable plug for future clean out. Payment for these plugs is to be included as part of the underdrain pipe.

201.5.5 TRENCH:

The trench shall be excavated carefully, to such a depth as is required to permit the pipe to be laid on the filter material to the grade desired, and to the dimensions shown in the Plans.

201.5.6 BEDDING:

The pipe shall be bedded firmly on the filter material in the bottom of the trench, with perforations down and joints securely made.

201.5.7 BACKFILLING WITH FILTER MATERIAL:

After the pipe has been laid and approved by the Engineer, the trench shall be backfilled with filter material to the

lines shown on the drawings. The filter material shall be placed and compacted around the pipe for the full width of the trench, in layers not exceeding six inches in thickness. Special care shall be taken to avoid displacement or damage to the pipe.

201.5.8 BACKFILL ABOVE FILTER MATERIAL:

For all types of pipe, the portion of the trench above the filter material shall be filled with a suitable pervious material which shall be placed and compacted in layers not to exceed twelve (12) inches in thickness.

201.6 MEASUREMENT AND PAYMENT:

The quantity of underdrain to be paid for shall be the length in feet of underdrain measured in place, along the center line and gradient of the underdrain, completed and accepted. The quantity shall be paid for at the Contract unit price per linear foot for underdrain. This price and payment shall be full compensation for all work specified, including all materials, excavation, etc. Such price shall also include all disposal of surplus material, backfilling and tamping.

**SECTION 202
DRAINAGE STRUCTURES**

202.1 **SCOPE:**

The work under this section includes the furnishing of all labor, materials, and equipment necessary for the construction and installation of all manholes, catch basins, endwalls, and other such structures, as called for on the drawings. These are to be shown in the details.

202.2 **MANHOLE MATERIALS:**

202.2.1 **PRECAST:**

Manhole bases, sections, and cones shall conform to the requirements of ASTM C478, Specifications for Precast Reinforced Concrete Manhole Sections. Concrete shall meet the minimum requirements for the type and/or class designated as specified in Section 130, Portland Cement Concrete. Minimum wall thickness shall conform to City Drainage Standards. Rings shall be custom made with openings to meet indicated pipe alignment conditions and invert elevations. The Contractor shall submit shop drawings for each individual structure on the drawings for approval by the Engineer before placing order for structures.

202.2.2 **BASES:**

Bases for manholes shall be cast integrally with the bottom manhole section.

202.2.3 **JOINTS:**

Joint contact surfaces shall be formed with machined castings; they shall be exactly parallel with a 2 degree slope and nominal one-sixteenth (1/16) inch clearance with the tongue-equipped with a proper recess for the installation of an O-Ring rubber gasket, conforming to ASTM C443, Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gasket, or Ramnek Pre-molded Plastic Joint Sealer with Joints Pre-primed.

202.2.4 **ADJUSTMENT:**

- a. **Bricks:** Brick shall be sound, hard, and uniformly burned, regular and uniform in shape and size, of compact texture and satisfactory to the Engineer. Brick shall comply with the ASTM Standard Specifications for Sewer Brick (Made from Clay or Shale), Designation C32, latest, Grade MM.
- b. **Mortar for Brickwork:** The mortar shall be composed of Portland Cement and sand. Mortar shall be one part cement and two parts sand. lime shall not be added.
- c. **Cement:** Portland, ASTM C150, Specifications for Portland Cement, Type I.

- d. Sand: Washed silica sand ASTM C144, Specifications for Aggregate for Masonry Mortar.

202.2.5 LAYING BRICKS:

Only clean brick shall be used in brickwork. The bricks shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar, nor so wet as to be slippery when laid. Each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed.

202.2.6 PLASTER:

Both faces of brick masonry shall be plastered with mortar from one-fourth (1/4) inch to three-eighths (3/8) inch thick. If required, the masonry shall be properly moistened prior to application of the mortar. The plaster shall be carefully spread and troweled so that all cracks are thoroughly worked out. After hardening, the plaster shall be carefully checked, by being tapped, for bond and soundness. Unbonded or unsound plaster shall be removed and replaced. Brick masonry and plaster shall be protected from too rapid drying by use of burlaps kept moist, or by other approved means, and shall be protected from weather and frost, as required.

202.2.7 CAST IRON FIXTURES:

Fixtures shall be of the standard Jacksonville type as detailed on drawings. Castings shall be made of good quality, strong, tough, even grained cast iron and shall be smooth, free from scale, lumps, blisters, sand holes and defects of any nature which would render them unfit for the service for which they are intended. Castings shall meet the requirements of ASTM A48, Specifications for Gray Iron Castings, Class No. 30, or Grade 65-45-12, Ductile Iron meeting the requirements of ASTM A536, Standard Specification for Ductile Iron Castings. In either case, manhole frame and cover shall be designed to withstand HS 20-44 loading defined in the AASHTO Specifications. Before being shipped from the foundry, casting shall be given one coat of coal tar pitch varnish applied in a satisfactory manner so as to make a smooth coating, tough, tenacious and not brittle or with any tendency to scale off. Frames & covers shall be machined or ground at touching surfaces so as to seat firmly and prevent rocking. Any set not matching perfectly shall be removed and replaced at no additional cost.

202.3 MANHOLE INSTALLATION:

202.3.1 INSTALLING SECTIONS:

Precast concrete sections shall be set so the manhole will be vertical and with sections in true alignment. Joint

surfaces of the base or previously installed section shall have an O-ring installed in the recess or shall be sealed with pre-molded plastic joint sealer equal to "Ramnek". If "Ramnek" is used, joints shall be primed with an asphaltic cement material.

202.3.2 NON-SHRINK JOINT:

All holes in precast section used for handling, and the annular space between the wall and entering pipes shall be thoroughly plugged with non-shrinking mortar, applied so that there will be zero leakage through openings and around pipes. The mortar shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces.

202.3.3 GRADE ADJUSTMENT:

A minimum of twelve (12) inches of brick masonry shall be used on top of manhole and precast concrete manhole cones in accordance with the drawings for grade adjustment in setting the manhole.

202.3.4 SETTING MANHOLE FRAMES:

Manhole frames and covers shall be set to conform accurately to the finished ground or pavement surface as established by the Contract Drawings, unless otherwise directed by the Engineer. Frames on manhole cones shall be set concentric with the masonry and in a full bed of mortar so that the space between the top of the manhole and masonry and the bottom flanges of the frame shall be completely filled and made watertight. A ring of mortar at least one (1) inch thick and pitched to shed water away from the frame shall be placed around the outside of the bottom flange. Mortar shall extend to the outer edge of the masonry and shall be finished smooth and flush with the top of the flange.

202.4 CATCH BASINS:

202.4.1 MATERIAL:

Catch basins shall be of precast construction as detailed and shall be dimensioned as called for on the Drawings. Solid brick structures may be used in certain special places as called for on the Drawings.

202.5 REMOVE EXISTING STRUCTURES:

202.5.1 GENERAL:

Removing existing structures shall include the complete removal of the existing manhole. The existing structure shall be removed from the job site. Cast iron castings removed from existing structures shall be thoroughly cleaned and subjected to a careful hammer inspection in the presence of the Engineer. If the castings pass inspection, they shall be painted with one coat of coal tar pitch; and, if not used on this job, shall be delivered to the property yard of the

City of Jacksonville, Department of Public Works. The Contractor will be held strictly accountable for all castings removed. Any or all existing pipes in and out of the structure to be removed, which are not themselves removed, shall be sealed, or as shown on the Plans, connected to the new structure. If a pipe is to be abandoned, the sealing shall be accomplished by mortaring (bricking) the end of the pipe for a distance of 18" minimum, or half the diameter of the pipe, whichever is larger, into the pipe with rubble and acceptable cement grout to form a solid waterproof plug completely bonded to the pipe, unless otherwise specified.

202.6 **ABANDONING EXISTING STRUCTURES:**

202.6.1 Abandoning existing structures shall include the abandonment of structures as shown on the Drawings or called for elsewhere in the Contract Documents. Abandonment shall be accomplished by sealing any and all pipes leading in and out of the structure to be abandoned. The sealing shall be completed by placing rubble and approved cement grout for a distance of 18" minimum, or half the diameter of the pipe, whichever is larger, in the end of each pipe completely bonding this mortar plug to the pipe and forming a tight waterproof seal. The structure shall be removed to a depth of not less than thirty (30) inches below the proposed finished grade. The remaining portion of the structure shall be filled with sand or other granular fill material. The fill material used to fill the abandoned structure shall be clean, granular, well-graded, free of organic matter or any deleterious material, and be compacted to the abandoned structure to 98% of the maximum density as determined by the Modified Proctor AASHTO T180. The abandonment shall be completed by backfilling the void left by removing the top of the structure with approved fill material, and replacing the pavement or other surface conditioning in kind. Pavement repair shall be as outlined in the details.

202.7 **ABANDON EXISTING AND CONSTRUCT NEW STRUCTURE:**

202.7.1 Where a new structure is designated to replace an existing structure, complete removal of the existing structure shall be achieved so as to permit the construction of a new structure at approximately the same location. Depth of the new structure may vary considerably from the existing structure.

202.8 **CONNECTIONS TO EXISTING STRUCTURE:**

202.8.1 **OPENING:**

The Contractor shall cut suitable openings into existing structures or remove the existing pipe to accommodate the pipelines as indicated in the Contract Drawings and as herein specified. The portion of each existing structure removed for new installation shall be confined to the smallest opening possible, consistent with the work to be done.

202.8.2 REPAIR:

After the pipe is installed, the Contractor shall carefully close up the openings around the pipe, and repair the existing manhole invert, if necessary, in a manner satisfactory to the Engineer.

202.9 MEASUREMENT & PAYMENT:

202.9.1 MEASUREMENT:

- a. Manhole: The depth of the manhole will be measured vertically from the top of the manhole frame to the bottom of the center of manhole bases.
- b. Remove Existing Structures: Measurement for removal of existing structures shall be the actual physical count of structures removed as called for on the Contract Drawings or as approved by the Engineer. Removal shall be complete as specified in Paragraph 202.5.1.
- c. Remove and Construct Structure: Measurement for payment of, removal and construction structure, will be the depth of the new structure measured vertically from the top of the structure frame to the bottom of the center of the structure base.
- d. Abandon Existing Structures: Measurement for payment of abandoned structures shall be the actual physical count of structures abandoned, as called for on the Contract Drawings or approved by the Engineer. Abandonment shall be complete as specified in Paragraph 202.6.

202.9.2 PAYMENT:

- a. Manholes: Payment for manholes will be in accordance with the unit and/or lump sum prices in the Contract. Prices for manholes will be the installed price, complete and in place for the type and depth of manhole. Prices will be full compensation for furnishing all labor, materials, tools, and equipment for manhole construction, including manhole frames, covers, and all work appurtenant thereto, but exclusive of stub-outs.
- b. Remove Existing Structures: Payment for structures removed shall be at the unit price set forth in the Proposal for each structure actually removed. Payment will be compensation in full for complete removal of the structure and disposal of debris; removal, cleaning, inspecting and delivering frames and covers for storage; sealing any and all pipes leading in and out of the structure; placing and compacting the backfill of the void left by removing the structure and replacing the pavement or other surface condition

in kind, if the removed structure is outside the construction trench for the new construction.

- c. Remove and Construct Structure: Payment for existing structures removed for installation of new structures will be at the unit price set forth in the Proposal for "Remove and Construct". Payment will be compensation in full for the removal of the existing structure and disposal of the debris; removal, cleaning, inspecting and delivering frames and covers for storage. Payment shall include furnishing all labor, materials, tools, and equipment for the construction of the new structure complete, for the type and depth, including frames, covers, grates, and all work appurtenant thereto, but exclusive of stub-outs.
- d. Structures Abandoned: Structures filled and abandoned as specified herein shall be paid for at unit price set forth in the Contract Agreement for each structure actually filled and abandoned. Payment will be compensation in full for removal of the upper portion of the structures and disposal of the debris; removal, cleaning, inspecting and delivering frames and covers for storage; sealing any and all pipes, leading in and out of the structure; placing and compacting fill material used to fill the abandoned structure; and backfilling the void left by removing the top of the structure with approved compacted fill material and replacing the pavement or other surface condition in kind.
- e. Connections to Existing Structures: Payment for connecting to existing structures will be at the unit price set forth in the Contract for the size of connection shown regardless of depth of cut. The unit price will constitute full compensation for making the connection, including breaking out, grouting, and repair to the structures.
- f. Stub-outs: Payment for stub-outs from manholes will be at the unit price set forth in the Contract for the size of the stub-out and type of pipe material used. Unit price will constitute compensation in full for installing the stub-out to the limits shown, including sealing the end of the stub-out.

**SECTION 203
CONCRETE WORK - GENERAL**

203.1 **GENERAL REQUIREMENTS:**

All concrete work shall be in accordance with the American Concrete Institute Standard Specifications for Structural Concrete Buildings (ACI 301-66) except as herein modified in Section 130, Portland Cement Concrete, of the specifications.

203.2 **WORK INCLUDED:**

The use of concrete in this project will be limited to poured-in-place concrete. Precast sections for structures are covered under Section 202, Paragraph 202.2. The Contractor will provide all materials, equipment and labor necessary for performing all operations for constructing concrete work as called for on the drawings or as necessary for the proper completion of the work in accordance with the specifications to the line, grade, notes and dimensions indicated on the drawings. The concrete strength shall be noted in the drawings.

203.3 **SAND - CEMENT RIPRAP:**

203.3.1 **CEMENT:**

The Portland cement used in sand-cement riprap shall be from an approved source and the product of an established and reputable manufacturer. This sand shall be subjected to the colorimetric tests for impurities. If the color produced is darker than the standard solution it will be rejected. Sand shall be graded so as to fall within the following limits:

| <u>Passing</u> | <u>Percent</u> |
|--------------------|----------------|
| No. 4 sieve..... | Minimum 97 |
| No. 100 sieve..... | Maximum 20 |
| No. 200 sieve..... | Maximum 5 |

203.3.2 **SACKS:**

The sacks shall be jute sacks, or any suitable sacks of material which will hold the sand-cement mixture without leakage when handled, and which is permeable or absorbent enough to permit the passage of water when wetted. The sacks shall be of uniform size and dimensions, in order to provide uniformity of lines in the completed work. They shall be free from holes and strong enough to stand handling without ripping or splitting. Only one type and size of sack shall be used at any one structure.

203.3.3 **MIXING:**

The sand and cement shall be mixed dry, in the proportions of five (5) cubic feet of sand to one (1) cubic foot of cement, until the mixture is of uniform color.

203.3.4 **SACK FILLING & PLACING:**

The mixed material shall be accurately measured into each sack, with care being taken to place the same amount of material in each sack. At least the top six (6) inches of the sacks shall remain unfilled to allow for proper tying and folding and to insure against breaking of the sack during placing. The filled sacks shall be placed with their tied and folded ends all in the same direction unless otherwise shown in the Plans. The sacks shall be laid with broken joints, in a regular pattern. The sacks shall be rammed or packed against each other so as to form a close and molded contact after the sand and cement mixture has set up. Sacks ripped or torn in placing shall be removed and replaced with sound, unbroken sacks. All sacks shall then be thoroughly saturated with water.

203.3.5 GROUTING:

Before watering, all openings between sacks shall be filled with dry grout composed of one part Portland cement to five parts sand. This material shall be the same as that used in the sacks.

203.3.6 MEASUREMENT AND PAYMENT:

The quantities to be paid for under this section shall be the volume in cubic yards of sand cement riprap actually used in the dry mixture (including the grout), which is satisfactorily placed and accepted. The sand shall be measured loose before mixing, in a batch box or by some other means satisfactory to the Engineer. The quantities shall be paid for at the contract unit price per cubic yard for sand cement riprap, which price and payment shall be full compensation for all work specified in this section and shall include all materials, grouting, hauling, excavation and backfill. The cost of dressing and shaping the existing fills (or subgrade) for placing riprap shall be included in the contract unit price for sand cement riprap.

**SECTION 204
CORRUGATED STEEL PIPE AND PIPE ARCH**

204.1 **SCOPE:**

The work specified in this section includes furnishing all labor, equipment and materials required to construct corrugated steel storm drainage piping shown on the drawings and specified hereinafter.

204.2 **MATERIALS:**

204.2.1 **GENERAL REQUIREMENTS:**

Corrugated steel pipe, including round culvert pipe, pipe arch, and coupling bands for each type, shall conform to the requirements of AASHTO M36, including the provisions for helical corrugations for the round culvert pipe and the pipe arch, and with the additional provisions contained herein. Only corrugated steel pipe fabricated with helical corrugations with continuous locked or welded seams running from end to end of each length of pipe shall be used. They shall have reformed ends to provide at least (2) two annular corrugations at each end.

204.2.2 **ROUND CULVERT PIPE:**

For round culvert pipe, unless shown otherwise in the Plans, the minimum thickness of the metal (including the galvanizing), and the dimensions of corrugations, shall be as specified below:

**TABLE ONE
THICKNESS OF METAL FOR PIPE**

| Nominal Diameter (Inches) | Galvanized Sheet Gage No. | Mean Thickness Galvanized Metal (Inches) |
|---------------------------------|---------------------------------|--|
| 15 | 16 | 0.0635 |
| 18 | 16 | 0.0635 |
| 21 | 16 | 0.0635 |
| 24 | 16 | 0.0635 |
| 30 | 14 | 0.0785 |
| 36 | 14 | 0.0785 |
| 42 | 12 | 0.1084 |
| 48 | 12 | 0.1084 |
| 54 | 12 | 0.1084 |
| 60 | 10 | 0.1382 |
| 66 | 10 | 0.1382 |
| 72 | 10 | 0.1382 |
| 78 | 8 | 0.1681 |
| 84 | 8 | 0.1681 |
| 90 | 8 | 0.1681 |
| 96 | 8 | 0.1681 |

TABLE TWO
PERMISSIBLE VARIATION IN THICKNESS OF
GALVANIZED METAL FOR PIPE & CONNECTING BANDS

| Galvanized Sheet Gage No. | Mean Thickness of Galvanized Metal (Inches) | Permissible Variation (Inches) |
|------------------------------|---|--------------------------------------|
| 16 | 0.0635 | 0.007 |
| 14 | 0.0785 | 0.008 |
| 12 | 0.1084 | 0.009 |
| 10 | 0.1382 | 0.009 |
| 8 | 0.1681 | 0.009 |

The corrugation pitch (measured on outside, at right angles to the crests) shall be a maximum of two and three-fourths (2-3/4) inches except that for pipe of thirty-six (36) inches and larger in diameter, a maximum pitch of three (3) inches will be allowed in conjunction with the corrugation depth of at least one (1) inch. A tolerance of one-sixteenth (1/16) inch will be allowed in corrugation depth.

204.2.3 PIPE ARCH:

For corrugated metal pipe arch, in addition to the requirements shown in AASHTO M36, thickness of the metal shall be shown for the equivalent size round pipe in Tables One and Two, above, and the fabrication of the pipe arch sections shall be such as to insure a substantially flat invert.

204.2.4 BITUMINOUS PAVED INVERT:

When bituminous coated paved invert is specified, the pipe or pipe arch shall be coated and paved in accordance with AASHTO M190, for Type C (Fully Bituminous Coated and Paved).

204.2.5 PAVED INTERIOR:

204.2.5.1 Asphalt: When bituminous coated paved interior is called for, the coating and paving shall meet the requirements specified above for bituminous and paved invert (Type C), with the following additions and exceptions: The smooth pavement formed by the asphalt cement shall extend over the entire interior of the pipe. No markings will be required on the outside of the pipe to designate the centerline of the top of the pipe. Lifting lugs shall be attached to the pipe, and shall be suitably placed to facilitate moving the pipe without damage to the exterior or interior bituminous material.

204.2.5.2 Concrete: When concrete-lined corrugated steel pipe is called for, the steel pipe shall be equal to the above-referenced corrugated steel pipe so far as wall thickness, construction, diameter, connection methods and all other

applicable aspects. The steel corrugated pipe will be either plain galvanized or aluminized steel as required by the soil and water pH levels. These pH level readings shall be taken at the specific horizontal and vertical location of the proposed drainage pipe. The inside portion of this corrugated metal pipe shall have a concrete lining equivalent to that manufactured by Armco Steel Corp. When concrete-lined corrugated metal pipe is used, the Manning coefficient of friction shall be equal to that coefficient used for an equally sized reinforced concrete pipe.

204.2.6 BASIS OF ACCEPTANCE OF BITUMINOUS COATING AND PAVING:

The acceptance of the bituminous coating paved invert, and the paved interior will be based on the manufacturer's certified mill tests.

204.3 SPECIFIC REQUIREMENTS FOR CORRUGATED STEEL PIPE

204.3.1 FIELD JOINTS:

Corrugated steel pipe shall be field-jointed with locking bands as specified in Articles 21.1, 21.2, 21.3 and 21.5 of AASHTO M36-78. The bands shall be such as to conform to the annular corrugations (at or rolled into) the ends of the pipe and of like material as the pipe. Two "O ring" gaskets or a single neoprene rubber gasket of 7" minimum width of proper size shall be installed at each pipe joint.

204.3.2 LAYING & SHAPE REQUIREMENTS FOR CORRUGATED STEEL PIPE:

Upon completion of the project, and just prior to acceptance, corrugated steel pipe shall be cleaned and inspected for breaks or other damage and any repairs necessary shall be made. When pipe is laid the interior shall be reasonably uniform and as near circular (or arch shaped) as is practical.

The vertical diameter shall not be less than 100 percent, nor more than 105 percent, of the nominal diameter, and the horizontal diameter shall not be less than 95 percent, nor more than 100 percent, of the nominal diameter.

All measurements for the above dimensions shall be made at the surface of the coating, at the point of smallest diameter on the corrugations.

Revised 8/26/83, 9/14/84

SECTION 205
HELICAL CORRUGATED ALUMINUM ALLOY PIPE

205.1 **SCOPE AND GENERAL REQUIREMENTS:**

The work specified in this section includes furnishing all labor, equipment, and materials required to construct the storm drainage piping using corrugated aluminum alloy culvert pipe. Only helical pipe will be used, and will conform to the specifications set forth in AASHTO M211 quoted below for convenience. Unless specifically required by the contract documents, pipe sizes less than fifteen (15) inch will not be used. When specified, those smaller pipe sizes will conform to the AASHTO M211. The design and contract documents will specify the wall thickness of the aluminum alloy pipe to be used depending on the amount of cover and the anticipated loading. Where approved field changes become necessary and alter the depth of cover, the Contractor will refer to the Engineer for a decision on the appropriate wall thickness.

205.2 **MEASUREMENT AND PAYMENT:**

Measurement and payment will be accomplished according to the contract bid proposal.

STANDARD SPECIFICATION FOR
HELICALLY CORRUGATED ALUMINUM ALLOY CULVERT PIPE
AASHTO Designation M 211-65

SCOPE:

- 1.1 This specification covers helically corrugated aluminum alloy pipe for culverts.

TYPE OF PIPE:

- 2.1 Culverts finished under the specification shall be of the full circle type with continuous helical lock-seam construction. The lock seam shall be parallel to the corrugations, extend from end to end of pipe, and shall be fabricated in such a manner that it will not affect the shape or nominal diameter of the pipe or create an element of weakness in the pipe.
- 2.2 Except as modified in 2 to 5 inclusive, helically corrugated aluminum alloy pipe shall conform in all respects to the requirements of the Standard Specification for Corrugated Aluminum Alloy Culvert Pipe, AASHTO M 196.

CORRUGATIONS:

- 3.1 Helically corrugated pipe having a diameter of 10 inches or less shall have corrugations not less than 1-3/8 inches nor more than 1-7/8 inches center to center, measured at right angles to the direction of the corrugations and shall have a depth of not less than 1/4 inch.
- 3.2 Helically corrugated pipe having a diameter of 12 inches or greater shall have corrugations not less than 1-7/8 inches nor more than 2-3/4 inches center to center, measured at right angles to the direction of the corrugations. Pipe having diameters of not less than 12 inches nor more than 21 inches shall have corrugation depth of not less than 7/16 inch. Pipe having diameters greater than 21 inches shall have corrugation depth of not less than 1/2 inch.
- 3.3 The angle between the direction of the corrugations and the longitudinal axis of the pipe shall not be less than 45 degrees.

PIPE THICKNESS AND WEIGHT:

- 4.1 Helically corrugated aluminum alloy culvert pipe shall have nominal thickness and nominal weights per linear foot as shown in Table 1. The average weight per linear foot of finished pipe shall not underrun the weight given in Table 1 by more than 5 percent.

COUPLING BANDS:

- 5.1 Field joints in helically corrugated aluminum alloy culvert pipe shall be made with aluminum alloy band couplers of the same base alloy as that used in the pipe. Band couplers shall have corrugations that mesh with the corrugations of the pipe. Bands shall be not less than 7 inches wide for culvert diameters of 6 inches to 30 inches inclusive; not less than 12 inches wide for culverts with diameters of 36 inches to 60 inches

inclusive; and not less than 24 inches wide for culverts with diameters greater than 60 inches. The thickness of such bands shall conform to Table 1.

- 5.2 One or two-piece band couplers may be used. Pipe diameters of 10 inches or less with one-piece couplers shall be fastened with two 3/8 inch diameter galvanized bolts; those with two-piece couplers shall be fastened with four 3/8 inch diameter galvanized bolts. Pipe diameters of not less than 12 inches with the 7 inch band shall be fastened with not less than two galvanized steel bolts of not less than 1/2 inch diameter. The 12 inch band shall be fastened with not less than three galvanized steel bolts of not less than 1/2 inch diameter. The 24 inch band shall be fastened with not less than five galvanized steel bolts of not less than 1/2 inch diameter. Other equally effective methods for connecting the sections may be used if approved by the Engineer.

M211

TABLE 1

DIMENSIONS AND WEIGHTS OF HELICALLY CORRUGATED ALUMINUM ALLOY CULVERTS

| Nominal Dia. | Nominal Thickness of Sheets (a) | Computed Weight per Foot of Finished Culvert for Various Non Thickness Exclusive of End Finish. | | | | | Connect Band Nom. Thick. |
|--------------|---------------------------------|---|-------|-------|-------|------|--------------------------|
| | | .060 | .075 | .105 | .135 | .164 | |
| Inch | Inches | Pounds | | | | | Inches |
| 6 | .060 | 1.60 | | | | | .060 |
| 8 | .060 | 2.14 | | | | | .060 |
| 10 | .060 | 2.66 | | | | | .060 |
| 12 | .060 .075 | 3.17 | 3.98 | | | | .060 |
| 15 | .060 .075 .105 | 3.93 | 4.93 | 6.90 | | | .060 |
| 18 | .060 .075 .105 | 4.69 | 5.89 | 8.24 | | | .060 |
| 21 | .060 .075 .105 | 5.45 | 6.84 | 9.56 | | | .060 |
| 24 | .060 .075 .105 .135 | 6.25 | 7.80 | 10.90 | | | .060 |
| 30 | .075 .105 .135 .164 | | 10.24 | 14.35 | 18.48 | | .060 |
| 36 | .075 .105 .135 .164 | | 12.25 | 17.17 | 22.00 | | .075 |
| 42 | .105 .135 .164 | | | 19.99 | 25.61 | | .075 |
| 48 | .105 .135 .164 | | | 22.81 | 29.22 | | .075 |
| 54 | .105 .135 .164 | | | 25.65 | 32.85 | | .075 |
| 60 | .135 .164 | | | | 36.42 | | .105 |

- (a) Different nominal thicknesses are shown for use in design for various heights of fill over the top of the pipe. The thickness should be based on the design requirements for each installation and should be shown on the plans or in the proposal.

TABLE 1a

| <u>Nominal Thickness in Inches</u> | <u>Equivalent U.S. Gauge Number</u> |
|------------------------------------|-------------------------------------|
| .060 | 16 |
| .075 | 14 |
| .105 | 12 |
| .135 | 10 |
| .164 | 8 |

SECTION 206
REINFORCED CONCRETE PIPE

206.1 **GENERAL SPECIFICATIONS FOR ROUND CONCRETE PIPE:**

Standard concrete pipe shall meet the design requirements of Class III Wall B of ASTM C76. Special concrete pipe shall meet the design requirements of Class IV, except where the Plans specifically designate Class V pipe. For all classes, any of the alternate wall specified in ASTM C76 shall apply. The process of manufacture and the details of the pipe design including the strength of the concrete, will be inspected or checked at the Engineer's option.

206.1.1 **SPECIFIC CAUSES FOR REJECTION OF PIPE:**

Specific causes for rejection of concrete pipe in addition to any failure to meet the requirements specified in ASTM C76 are:

- a. Pipe shall be subject to rejection on account of failure to conform to any of the specification requirements. Individual sections of pipe may be rejected because of any of the following:
- b. Fractures of cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
- c. Defects that indicate imperfect proportioning, mixing, and molding.
- d. Surface defects indicating honeycombed or open texture.
- e. Damaged or cracked ends where such damage would prevent making a satisfactory joint.
- f. Any continuous crack having a surface width of 0.01 in (0.25 mm) or more and extending for a length of 12 in. (310 mm) or more, regardless of position in the wall of the pipe.

206.1.2 **JOINTS FOR ROUND CONCRETE PIPE:**

Round Concrete pipe joints shall be sealed by the use of round rubber gaskets. The gasket and the surface of the pipe joint, including the gasket recess, shall be clean and free from grit, dirt and other foreign matter, at the time the joint is made. In order to facilitate closure of the joint, application of an approved vegetable soap lubricant immediately prior to closing of the joint will be permitted. When round rubber gaskets are installed in the pipe joint the gasket shall be the sole element relied on to maintain a tight joint.

These specifications shall be used in conjunction with the FOOT Standard Index Drawing outlining other requirements for this type of construction. The joint shall be of the bell-

and-spigot type meeting the requirements called for in the Plans. The joint shall be so proportioned that the spigot shall readily enter the bell of sleeve of the pipe. The joint ring forms for forming the joint surface shall be of heavy steel, cast iron, or aluminum, and shall be accurately machined to the dimensions of the joint. They shall have a true circular form within a tolerance of 1/32 of an inch. Dimensional checks of joint ring forms shall indicate for each size pipe a length of spigot, or tongue, not more than 1/8 shorter than the bell, or groove, depth.

The pipe shall be so manufactured that joint surfaces are concentric with the inside of the pipe within a tolerance of 3/32 inch. The shape and dimensions of the joint shall be such as to provide compliance with the following requirements:

- a. The joint shall be so dimensioned that when the gasket used is placed on the spigot it will not be stretched more than 20 percent of its original length.
- b. The space provided for the gasket shall be a groove in the spigot end of the pipe and such space, when the joint is made, shall not be more than 110 percent of the volume of the gasket.
- c. The joint shall be so designed that when the outer surface of the spigot and the inner surface of the bell come into contact at some point on the periphery, the diametric deformation in the gasket at the point of contact shall not be greater than 50 percent of the normal gasket diameter, and the diametric deformation in the gasket at a point opposite the contact point shall not be less than 20 percent of the normal gasket diameter.
- d. When the pipes are joined there shall be parallel surfaces on both the bell and the spigot, extending from the edge of the gasket toward the bell face for a distance of not less than 3/4 inch. These parallel surfaces shall in no case be farther apart than 1/8 inch when the spigot is centered on the bell. The tapers on these surfaces shall not exceed three (3) degrees.
- e. The inside surface of the bell at the end of the bell shall be flared to facilitate joining the pipe sections without damaging or displacing the gasket.

206.1.3 ROUND RUBBER GASKETS FOR PIPE JOINTS:

Except where O-ring type gaskets are specified for special cases and for special type pipe, round rubber gaskets for use in concrete pipe joints shall meet the requirements of Article 5.9 of ASTM C361, with the additional requirements that the gasket used shall be of such cross sectional area and perimeter as to properly fit the space provided in the

pipe joint in which it is to be used. Prior to use, the gasket shall be stored, in as cool a place as practicable.

206.1.4 LAYING REQUIREMENTS FOR ROUND CONCRETE PIPE:

For concrete pipe laid with rubber gasket joints, any deviation from true alignment or grade, which would result in a displacement from the normal position of the gasket of as much as one-quarter (1/4) inch, or which would produce a gap exceeding one-half (1/2) inch between sections of pipe for more than 1/3 of the circumference of the inside of the pipe, will not be acceptable. Where such occurs the pipe shall be re-laid without additional compensation. Where minor imperfections in the manufacture of the pipe cause a gap greater than one-half (1/2) inch between pipe sections, the joint will be acceptable provided the gap does not extend more than 1/3 the circumference of the inside of the pipe. No mortar, joint compound, or other filler which would tend to restrict the flexibility of the gasket joint shall be applied to the gap.

206.2 GENERAL SPECIFICATIONS FOR ELLIPTICAL CONCRETE PIPE:

Elliptical concrete pipe shall conform with the requirements of ASTM C507, except that ASTM C76, for round concrete pipe, shall apply also to elliptical pipe, where applicable. Standard elliptical pipe shall meet the requirements of Class HE-III. Special elliptical pipe shall meet the requirements of Class HE-IV.

206.2.1 COLD ADHESIVE PREFORMED PLASTIC GASKETS (FOR SEALING ELLIPTICAL CONCRETE PIPE JOINTS):

Cold adhesive preformed plastic gaskets shall be a material, shape and size so as to effect a permanent water tight seal in joints of elliptical concrete pipe. A minimum of two parallel rows of gasket material shall be used in each joint. The gasket material shall be protected by a two-piece removable wrapper. To facilitate application, the two-piece wrapper shall be so designed so that one half may be removed longitudinally without disturbing the other half. The size of the gasket shall be in accordance with the manufacturer's recommendation for the particular joint in which it is to be used. However, the minimum size for each of the gaskets used in a joint shall be in accordance with the following:

| <u>Pipe Size (Inches)</u> | <u>Nominal Gasket Size (Inches)</u> | <u>Minimum Cross Section (Sq. Inches)</u> |
|-------------------------------|---|---|
| Up to 19 x 30 | 1-1/2 | 1.75 |
| 19 x 30 to 53 x 83 | 1-3/4 | 2.50 |
| Over 53 x 83 | 2 | 3.25 |

206.2.2 COMPOSITION:

The gasket sealing the joints shall be produced from blends of refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler. The material shall

contain no solvents and shall not produce irritating fumes or obnoxious odors. The gasket shall not depend on oxidizing evaporation or chemical action for its adhesive or cohesive strength. The chemical composition of the gasket material shall meet the following requirements:

| | Min. | Max. |
|---|------|------|
| Bitumen - Petroleum Plastic Content (% by weight) | 50 | 70 |
| Ash-Inert Mineral Matter (% by weight) | 30 | 50 |
| Volatile Matter at 325 degrees F. (% by weight) | 2.0 | Max. |

The gasket joint sealing compound when immersed for 30 days at ambient room temperature separately in 5% solution of caustic potash, a mixture of 5% hydrochloric acid, a 5% solution of sulfuric acid, or a saturated hydrogen sulfide solution shall show no visible deterioration. The physical properties of the gasket joint sealing compound as shipped shall meet the following requirements:

| | Min. | Max. |
|--|---------------------|------|
| Specific Gravity at 77 degrees F. | 1.20 | 1.35 |
| Ductility at 77 degrees F. | 5.0 cm | |
| Softening Point | 320 degrees F. Min. | |
| Penetration at 77 degrees (150 grams) (5 seconds) | 50 | 120 |

206.2.3 CERTIFICATION:

The manufacturer of the gasket material shall furnish the Engineer certified test results covering each shipment of material to the project.

206.2.4 JOINTS FOR ELLIPTICAL CONCRETE PIPE:

Pipe to be laid with joints made from preformed plastic gasket material shall be subject to the following requirements:

- a. General: Installation shall be in accordance with the manufacturer's instructions and these specifications. The Contractor shall be responsible for obtaining a permanent water tight joint.
- b. Joint Design: The pipe manufacturer shall furnish the Engineer with details in a regard to configuration of the joint and the amount of gasket material required to effect a satisfactory seal. Joint surfaces which are to be in contact with the gasket material shall not be brushed or wiped with a cement slurry. Minor voids may be filled with cement slurry provided that all excess cement slurry is removed from the joint surface at the point of manufacture.
- c. Primer: Prior to the application of the gasket material, a primer of the type recommended by the manufacturer of the gasket material shall be applied to all joint surfaces which are to be on contact with

the gasket material. The surface to be primed shall be thoroughly cleaned and dry when primer is applied.

- d. Application of Gasket: Prior to placing a section of pipe in the trench, gasket material shall be applied to form a continuous gasket around the entire circumference of the leading edge of the tongue and the groove joint. The paper wrapper on the exterior surface of the gasket material shall be left in place until immediately prior to joining of sections. The gasket material shall be checked to assure that it is bonded to the joint surface, immediately prior to placing a joint in the trench. Plastic gasket material shall be applied only to surfaces immediately before application of the plastic gasket material. When the atmospheric temperature is 60 degrees F., or below, the plastic joint seal gaskets shall either be stored in a area warmed to above 70 degrees F., or artificially warmed to this temperature in a manner satisfactory to the Engineer.

206.2.5 INSTALLATION OF PIPE:

Handling of a section of pipe after the gasket material has been affixed shall be carefully controlled to avoid displacement of gaskets or contamination of gasket material with dirt or foreign material. Any gasket displaced or contaminated in handling of the pipe shall be removed and repositioned, or replaced, as directed. The pipe shall be installed in a dry trench. The bottom of the trench shall be carefully shaped so as to minimize the need for realignment of sections of pipe prior to the gaskets coming into contact. Realignment of a joint after the gaskets come into contact tends to reduce the effectiveness of the seal and shall be held to a minimum. When pipes are joined the entire joint shall be filled with gasket material for the entire internal and external circumference of the joint. Excess material on the interior of the pipe shall be trimmed to provide a smooth interior surface. After the pipe is in its final position, the joint shall be carefully examined to determine that the gasket material has satisfactory adhesion to all surfaces of the joint and that the entire joint is filled with gasket material. If a joint is defective the leading section of pipe shall be removed and the joint resealed.

206.3 TOLERANCES AND IMPERFECTIONS, AND PERMISSIBLE REPAIRS FOR CONCRETE PIPE:

The entire surfaces of near-contact of the jointed pipes shall be free from air holes, chipped spalled concrete, laitance, and other such defects. Pipes showing minor manufacturing imperfections or handling injuries to the bell or spigot may be acceptable if such defects can be, and are, acceptably repaired as prescribed below:

- 206.3.1 Individual air holes, (trapped air), or spalled areas with a length of up to one half the pipe radius, or twelve (12) inches, whichever is the lesser, may be repaired by careful

use of a hand-placed, stiff, pre-shrunk, one-to-one mortar of cement and fine sand, and with no additional preparation other than a thorough washing with water of the defect. Curing shall be done either by moisture curing under wet burlap or by application of an approved membrane curing compound. Such repaired pipe which is sound, properly finished and cured, and otherwise conforms to the specification requirements will be considered acceptable.

SECTION 207
PRECAST CONCRETE BOX CULVERTS

207.1 **SCOPE OF WORK:**

The work specified in this Section consists of the construction of precast concrete box culvert. The work shall be done in accordance with these Specifications and in conformity with the lines, grades, dimensions, and notes shown in the Plans.

207.2 **MATERIALS:**

Precast concrete box culvert shall conform to the material and manufacture requirements as outlined by AASHTO M-259 (latest edition) subject to the exceptions contained herein.

207.3 **TRENCH, FOUNDATION, LAYING AND BACKFILL:**

The methods for construction of trench and foundation, and for laying and backfilling shall conform to the requirements specified in Section 200, with the following additional requirements: The bedding shall consist of a minimum 6" depth of coarse concrete sand or other suitable granular material placed below the culvert to a minimum width of one (1) foot outside the exterior walls of the culvert between graded forms set one (1) foot outside each exterior wall of the box culvert. This material shall be removed after placement of the precast box culvert section. When required by the Plans, other special bedding shall be provided. Holes provided for lifting or joint restraint shall be sealed by plugging using a non-shrinking mortar in accordance with Section 202.3.2 and properly cured as to insure a sound and watertight plug.

207.4 **JOINTS:**

Field joints for precast concrete box culvert shall be made with a butyl rubber based preformed plastic gasket material or as detailed in the Plans. Culverts to be laid with joints made from preformed plastic gasket material shall be subject to the requirements as outlined in Section 206.2, with the following additional requirements:

The culvert producer shall furnish the Engineer a written recommendation of the size (cross-sectional area) of gasket material which will create a watertight seal. This recommendation shall be the minimum quantity of gasket material permitted. In addition, the outside of each joint shall be completely wrapped with either a woven or non-woven filter fabric. The fabric shall be a minimum of two feet in width and secured tightly against the box culvert section by metal strapping. When specified in the Plans, the joint shall be secured by a suitable device capable of holding the sections to line and grade as well as fully home. These devices shall be removed after sufficient backfill has been placed and compacted to secure the sections.

207.5 **METHOD OF MEASUREMENT:**

The quantities to be paid for under this Section shall be the length in feet of Precast Concrete Box Culvert, installed in place, completed and accepted, measured along the center line of the structure, from end to end.

207.6 **BASIS OF PAYMENT:**

The quantities, determined as provided above, shall be at the contract unit prices per linear foot for Precast Concrete Box Culvert of sizes shown in the Proposal. Such prices and payments shall be full compensation for all work specified in this Section and shall include the cost of special bedding material and its placement, graded forms, sealing holes, preformed plastic gasket material, filter fabric material, attachment of the filter fabric, and restraining devices when required. The price shall include all excavation except the volume included in the items for the grading work specified for separate payment.

New 8/26/83

SECTION 300
WATER

DELETED

All water mains, reclaimed water mains, sanitary sewer mains, and sewer pump stations shall be constructed in accordance with the latest JEA Water and Sewer Standards Manual. The JEA standards are available on the JEA Web site at the following address:

<http://www.jea.com/business/services/contractor/standards.asp>.

SECTION 400
SEWER

DELETED

All water mains, reclaimed water mains, sanitary sewer mains, and sewer pump stations shall be constructed in accordance with the latest JEA Water and Sewer Standards Manual. The JEA standards are available on the JEA Web site at the following address:

<http://www.jea.com/business/services/contractor/standards.asp>.

TRAFFIC INDEX
SECTIONS 500-599

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SECTION 500
TRAFFIC STANDARD SPECIFICATIONS

500.1 **AREA OF DETECTION:**

The loop shall be so designed as to preclude the possibility of causing a detection to be indicated as a result of vehicles operating more than two (2) feet outside the perimeter of the loop, while insuring that a detection is indicated whenever any portion of a vehicle is within the perimeter of the loop. The lead-in shall not be sensitive to the presence of a vehicle, and no detection shall be caused by the presence of a vehicle over a lead-in.

500.2 **MAINTENANCE OF MECHANICAL PROPERTIES:**

Mechanical Properties, including flexibility, resiliency, moisture resistance, strength, bonding and corrosion resistance shall be maintained at approximately their initial values for a time not less than five (5) years following installation.

500.3 **LOOP SIZE AND SHAPE:**

The loop size and shape shall be as specified on the standard index included in the plans. Where more than one (1) size shape combination is indicated on the standard index, the configuration to be bid shall be indicated by an appropriate symbol on the intersection plan sheet or, if none, by verbal description in the contract documents.

500.4 **POLARITY OF LOOP AND LEAD-IN**

The polarity of the loop and lead-in shall be indicated by color code. From the harness connector to the loop, the black insulated wire of the twisted pair shall be visualized as conducting current "to" the loop.

Simple rectangular loops shall be wired to the lead-in such that current visualized to flow "into" the loop from the black insulated wire will flow clockwise as viewed from above. When loops are preformed for later installation in a prepared saw cut, the "top" side of the loop shall be indicated.

500.5 **SURGE PROTECTION DEVICES:**

Each lead-in shall be equipped with a surge protection device approved by the Department for loop lead-in surge protection. Where multiple loops with complete lead-ins are connected to form assemblies, each loop with complete lead-in shall be supplied with an appropriate surge protection device.

500.6 **WIRE SIZE AND TYPE:**

(a) Loop Wire:

- AWG 12 or AWG 14
- Stranded copper wire (seven (7) strands per conductor, minimum)

- UL insulation Type XHHW, or other polyethylene or high density cross linked polyethylene approved by the Department for use as loop wire insulation.
- Insulation thickness sufficient to withstand electric fields of at least 600 volts applied across the thickness of the insulation without loss of insulating properties.

(b) Lead-in Cable:

- Twisted pair, shielded and jackets construction.
- Polyethylene or high density cross-linked polyethylene insulation shall be used.
- The conductors of the twisted pair shall be color coded, with one (1) color being black, the other color being any other color.
- The conductors of the twisted pair shall each have at least nineteen (19) strands of tinned copper wire.
- The insulation thickness on each conductor of the twisted pair shall be sufficient to withstand electric fields of at least 750 volts (1,000 volts if AWG 12) applied across the thickness of the insulation without loss of insulating properties.
- An aluminum backed Mylar shield shall be wrapped around the twisted pair conductors so as to provide 100% coverage of the twisted pair.
- A bare copper drain wire shall be provided the length of the lead-in cable, and shall be in contact with the conducting surface of the aluminum shield surface.
- Stranded, tinned copper wire shall be used as the drain wire. It shall be at least AWG 16 (AWG 14 if the twisted pair is AWG 12) and shall include at least nineteen (19) strands.
- A continuous polyvinyl chloride (PVC) outer jacket, at least .035" thickness (.040" if the twisted pair is AWG 12) shall cover the twisted pair shield drain wire assembly.

500.7 **SPLICING:**

Splices shall be permitted only in loop lead-in wires. If the loop itself is damaged, a new loop shall be installed. Refer to Details Figure 1 for splicing instructions.

500.8 **SEALANT MATERIAL:**

All sealant material shall be specifically approved by the Department for sealing saw-cuts. The material used shall be flexible bonding epoxy type mixed on the job site. It shall remain flexible through all anticipated temperature and weather conditions and shall neither become hard nor melt. It shall resist the upward movement of the loop and lead-in in the saw-cut and shall exhibit stable electrical characteristics, including a low permittivity and high dielectric strength. It shall bond to the roadway paving material forming the edge of the saw-cut, and shall prevent the entry of water and moisture into the vicinity of the conductors.

500.9 (Page 152 of the July 1979 Supplement) is modified to provide that for use on asphalt pavements sealants shall be "steep" asphalt Type III as specified by ASTM D-312 or coal tar base plastic cement Type II as specified by Federal Specification SS-C-153C. The sealant shall be heated and applied to the saw-cut in a molten state.

500.10 **LOOP IDENTIFICATION TAGS:**

Tags supplied for identifying each lead-in with its associated loop location or vehicle detector amplifier notation shall be approved by the Department for the intended use.

- The legend shall be clear and readable and shall not deteriorate with exposure to dirt, water, sun or other conditions found in controller cabinets.
- The legend shall be firmly and securely fixed to the lead-in cable near the cable information.
- An identification tag shall be supplied for each loop lead-in installed and for each vehicle amplifier installed. The tag shall be affixed to the appropriate harness cable.
- When vehicle detector amplifiers are "furnish only," two (2) blank tags shall be supplied with each unit.

500.11 **ENVIRONMENTAL REQUIREMENTS:**

Operating Voltage and Frequency: The Loop and Complete Lead-in shall retain its operational characteristics, as defined in Section A660-3.1, with applied operating voltages of 0 to 24V EMS over the frequency range of 20,000 to 2,000,000 Hertz.

500.12 **TEMPERATURE AND HUMIDITY:**

Operational characteristics of the loop and complete lead-in, as defined in Section A660-3.1, shall be retained over the temperature range of 0°F and over the humidity range of 10% RH to 100% RH with condensation. In this case 100% RH with condensation shall be construed to include flooding with water (such as storm water run-off) to a depth of six (6) inches for a period of one (1) hour.

500.13 **VIBRATION AND POSITION:**

Operational characteristics for the loop and complete lead-in shall be retained, as required in Section A660-3.1, in the presence of vibration, including sites such as fill areas, bridge decking, structures, concrete slabs and flexible pavements. Such vibration requirements specifically apply to loops in pavement and lead-ins in conduit, in cabinets and at terminal strips. Operating characteristics of lead-ins shall not be in position sensitive. Operating characteristics of loops shall be retained when positioned approximately parallel to and over the range of 1/2" to 6" below the roadway surface.

500.14 **TRANSIENTS:**

The loop with complete lead-in shall retain its operational characteristics following exposure to voltage transients of the power magnitude and duration described in Section A660-2.3.4.

500.15 **PAVEMENT TYPES:**

The loop with complete lead-in shall retain its operational and physical characteristics when embedded in any pavement type, including bridge decking, structures, steel reinforced concrete slabs, and flexible pavements, provided.

- No loop shall be installed across the boundary between differing pavement types.
- No loop shall be installed across an expansion joint.
- No lead-in shall be installed within an expansion joint.
- Adequate strain relief and protection from stress, strain, and chaffing is provided when lead-ins must cross any expansion joint.

500.16 All replacement of damaged loops shall be accomplished as soon as possible so that the traffic signal can be returned to normal operation.

500.17 After the replacement loop has been installed the Traffic Engineering Division shall be notified so that Traffic Engineering personnel can inspect the installation.