INFRASTRUCTURE DESIGN STANDARDS

STANDARD HIGHWAY SPECIFICATIONS VOLUME I of II

August 1, 2015

THE CITY OF NEW YORK
DEPARTMENT OF TRANSPORTATION

INTRODUCTION

This publication has been prepared by the New York City Department of Design and Construction (NYCDDC) to provide a compilation of standard requirements, called specifications, used by the New York City Department of Transportation for street construction contracts. These specifications define the Contractor's responsibility in meeting each specification, enumerate the Department's expectations and how they are going to measure and pay, and explain what the Contractor is expected to provide. When this publication, entitled Standard Highway Specifications and dated August 1, 2015, is incorporated by reference into the Department's construction contracts, it is made a part of that document.

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DIVISION I – CONTRACT REQUIREMENTS

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DIVISION I

CONTRACT REQUIREMENTS

SECTIONS 1.01 THRU 1.05 (NO TEXT)

SECTION 1.06 - General Conditions

1.06.1. Work Described.

The Contractor, at his own cost and expense, shall furnish all the labor, materials and equipment, etc., necessary or proper for the purpose, and in a good, substantial and workmanlike manner, in strict accordance with the plans, the specifications and the directions of the Engineer, and contract herein contained or hereto annexed; shall regulate, grade, pave or repave with the specified pavement on the designated foundation, and set or reset or construct such curbs, and lay or relay or construct such sidewalks, and set or reset header stones, manholes, etc., as may be required; all as herein provided; and maintain said work as stipulated in this contract. Any work or materials that may have been accidentally omitted in the description of the work, but which is clearly implied, shall be furnished by the Contractor the same as if it had been specifically stated, without any additional charge to The City.

1.06.2. Understanding of the Plans and Specifications.

The Contractor hereby distinctly and expressly declares and acknowledges that, before the signing of this contract, he has carefully read the same, and the whole thereof, together with and in connection with the plans and specifications, and that he has made such examination of this contract and of said plans and specifications, and material required to be furnished and the location where said work is to be done, and such investigation of the work required to be done as to enable him to thoroughly understand the intention of the same, and the requirements, covenants, agreements, stipulations and restrictions contained in this contract and in said plans and specifications; and distinctly agrees that he will not hereafter make any claim or demand upon the City based upon or arising out of any alleged misunderstanding or misconception on his part of the said requirements, covenants, stipulations and restrictions; and that any information given to the Contractor by the Engineer or others as to the quantities in the work, prior to or during the progress of the work, shall have no bearing or effect whatsoever upon the total amount of work to be paid for in the final settlement.

1.06.3. Conflicting Plans and Specifications.

Anything shown on the plans and not mentioned in the specifications, or mentioned in the specifications and not shown on the plans, shall have the same effect as if shown or mentioned, respectively, in both.

Should any conflict occur in or between the plans and specifications, see Article 1.2 of the Standard Construction Contract.

Any doubt as to the meaning of this contract and the specifications thereof, or any obscurity as to the wording of them, or any discrepancy between them, or any discrepancy between figures and drawings will be explained by the Engineer and his explanation will be accepted by the Contractor, who hereby agrees to execute the work in accordance with such explanation, and to make no charge or claim for any extra or additional work or damage on account thereof.

1.06.4. Deviations from Plans and Specifications.

No deviation from the plans and specifications will be allowed, unless the same has been previously authorized by and written permission therefor obtained from the Commissioner.

1.06.5. Measurement of Work and Materials.

All quantities of work and materials to be paid for will be measured and determined according to the plans or working drawings to be issued from time to time and specifications, when the work conforms thereto. No allowance will be made on any part of the work for any excess above the quantities required by such plans, lines and specifications. Should the dimensions of any part of the work, or of the materials, be less than those required by the plans, the actual quantities only will be allowed in measurement.

1.06.6. Workmanship, Contract and Standard Drawings.

All workmanship shall be first class in every particular, and all materials and construction shall be as hereinafter more particularly described and in accordance with the Contract Plans and the Standard Drawings on file in the office of the Commissioner, all of which shall also form part of these specifications.

Wherever any feature of the work is not fully set forth in these specifications, it shall be understood that the same be governed by the rules of the best modern practice, as determined by the Engineer.

1.06.7. All Work and Materials Necessary to be Furnished.

It is especially understood and agreed by the Contractor that anything, whether materials or labor, which may not be shown, indicated or described on either the plans or in the specifications, but which is necessary for the proper operation and perfect completion of the entire work under this contract according to the true intent and meaning of the plans and specifications, shall be furnished by him as part of his contract without any extra cost to the City as though it were herein particularly set forth or shown on the plans.

1.06.8. Definitions of Terms.

Whenever in the specifications and contract the following terms, words, expressions or pronouns in place of them are used, the meaning and intent shall be interpreted as follows:

Whenever it is provided that anything is "to be" or "to be done," "if" or "as" or "when" or "where approved," "required," "directed," "prescribed," "permitted," "ordered," "designated," "deemed necessary," or "satisfactory," or words of like import, it shall be taken to mean and intend, approved, required, directed, prescribed, permitted, ordered, deemed necessary or satisfactory, as the case may be, by the Engineer.

Whenever "specified" is used herein it shall mean "specified in the contract."

Whenever the words "desirable," "suitable," "sufficient," "satisfactory," or others of a similar purport are used, it is hereby agreed that the desirability, suitability, sufficiency, satisfactoriness, or other denominated condition shall be as determined by the Engineer.

Whenever the term "railroad area" is used, it refers to and means that portion of the street included between the tracks, the rails of the tracks and two feet in width outside, and any other portion of the street which the railway company is required by its franchise to maintain. Whenever the word "approach" is used, it refers to and means the abutting pavement that has to be adjusted to fit the new work.

Whenever reference is made herein to any other specifications, plan or section of these specifications, it shall mean the latest revision thereof in effect at the time of invitation to bid, unless otherwise specifically provided.

When a tentative revision of a specification is in effect which is later than the latest standard specification, the tentative revision shall govern.

1.06.9. Plans and Specifications Furnished to the Contractor.

After the award of the contract, the Contractor will be furnished with four (4) sets of prints of the plans and with four (4) sets of the specifications. Additional copies of the plans and specifications, if available, will be furnished to the Contractor, when requested.

1.06.10. Supplementary Contract Drawings and Specifications.

When, in the opinion of the Commissioner, it becomes necessary to more fully explain the work to be done or to illustrate the work further or to show any changes which may be required, supplementary drawings and specifications will be prepared by the Commissioner or will be forwarded by the Commissioner if they are prepared by a collaborating agency. Four (4) prints of each of these drawings and four (4) sets of these specifications will be furnished to the Contractor. These supplementary drawings and specifications shall be binding upon the Contractor with the same force as the Contract Plans and Specifications.

No work affected by the supplementary drawings and specifications shall be done if the revisions occasioned thereby require an adjustment in the prices bid, until a written agreement has been reached and the Contractor has received written authorization from the Commissioner to proceed with the work.

1.06.11. Contractor to Verify Dimensions.

Existing underground and overhead utilities shown on the contract drawings have been determined by standard surveying methods and available records. Neither the exact location nor the information of these existing utilities is guaranteed to be complete or correct.

The Contractor is advised that block interior angles, block lengths and legal grades were obtained from the final maps of the Borough.

The Contractor shall verify all dimensions and details on the drawings and other data received from the Commissioner and shall notify him of all errors, omissions, conflicts and discrepancies found therein. Notice of such errors shall be given before the Contractor proceeds with the work. Figures shall be used in preference to small scale drawings.

1.06.12. Copies to Subcontractors.

The Contractor shall furnish each of his subcontractors and materialmen copies of such portions of the plans, supplementary drawings, and specifications as may be required for his work.

1.06.13. Shop and Working Drawings.

(A) GENERAL

The Contractor shall promptly prepare and submit accurate and complete shop and working drawings for all parts of the work (including drawings showing the locations and details of steel reinforcement) as may be required for the proper performance of the work, and such other detail drawings, diagrams, photographs or bulletins as may be demanded by the Commissioner, in accordance with the plans and specifications. He shall submit these shop and working drawings as directed herein, and have them approved by the appropriate agency as specified, before any work covered by these drawings shall be undertaken. In addition, any electrical drawing which requires the approval of the Division of Traffic Operations shall have its stamp of approval affixed thereon before work covered by said drawings may be undertaken.

All shop drawings submitted for review and approval are to be sealed and signed by a licensed New York State Professional Engineer.

(B) SCOPE

Shop and working drawings shall accurately and distinctly represent the following:

1. All working and erection dimensions.
2. Arrangements and sectional views.
3. Necessary details, including complete information for making necessary connections with other work.
4. Kinds of materials and finishes.
5. All other information requested by the Commissioner, and as required under other headings of the Specifications.

(C) STRUCTURAL STEEL SHOP DRAWINGS

Structural steel shop drawings shall show all dimensions and details. They shall include erection, camber and match marking diagrams; lists of field rivets, bolts, nuts and other parts for structural steel, castings and metal parts. Shop drawings for castings shall be so complete that the parts may be duplicated without reference to patterns, other drawings, or individual shop practice. Shipping statements for castings shall contain the actual weight of each member or piece.

(D) STEEL REINFORCEMENT SHOP DRAWINGS

Steel reinforcement shop drawings shall be made to a sufficiently large scale to show clearly the arrangement, splicing and spacing of the reinforcement rods. The drawings shall show the location of construction joints and shall give all pertinent dimensions of the concrete construction, to the end that the details and lengths of rods may be readily checked. They shall show the rods in their true position, tying in the reinforcement steel with the concrete and structural steel construction.

(E) ELECTRICAL SHOP AND WORKING DRAWINGS

Electrical shop and working drawings shall show complete wiring and installation details, and shall include the following:

1. Equipment details and ratings.
2. Conduit, cable and wiring runs and layouts.
3. Conduit, cable, cabinet and box support details.
4. Cabinet and box connection diagrams.
5. Complete wiring diagrams.
6. Any other items and details which the Engineer may require.

(F) SIZES OF SHOP AND WORKING DRAWINGS

All shop and working drawings shall be submitted on ANSI, F size, sheets 28" x 40", which includes a border of 2" on the left and a border of 1/2" on the other three sides. Sketches may be 8-1/2" x 11", including 1/4" border. Each drawing shall be dated, numbered and shall have an identifying title.

(G) SUBMISSION OF SHOP AND WORKING DRAWINGS

The Contractor shall submit the following number of prints:

1. Three (3) for each structural shop or working drawing, and for each mechanical drawing not having electrical work.
2. Five (5) for each electrical drawing and for each mechanical drawing having electrical work.

A satisfactory drawing will be stamped "Approved", be dated, and one copy thereof will be returned to the Contractor. Should the drawing be not approved, one copy of the drawing with the corrections and changes indicated thereon will be returned to the Contractor, and the Contractor shall independently check and make such corrections and changes, and again submit prints of the drawing for approval in the number specified above. Each submission of drawings shall be accompanied by a letter of transmittal in triplicate. If the drawings show variations from the contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in his letter of submittal and shall clearly indicate them on the shop drawings.

(H) UNCHECKED SUBMISSIONS TO BE RETURNED UNEXAMINED

Any submission not containing the signature of the checker as an indication that the drawing has been completely checked, will be deemed to be substantially incomplete, and will be returned marked "UNEXAMINED" by the Engineer.

(I) PRINTS OF APPROVED SHOP AND WORKING DRAWINGS

Upon approval of the drawings by the Engineer, the Contractor shall insert the date of final approval on the original tracing and shall promptly furnish prints of the approved drawings in accordance with the following schedule:

1. Five (5) for each structural shop or working drawing, and for each mechanical drawing not having electrical work.
2. Seven (7) for each electrical drawing and for each mechanical drawing having electrical work.

(J) CONTRACTOR'S RESPONSIBILITY

The approval of shop and working drawings will be as to general design only and such approval shall not relieve the Contractor of responsibility for the accuracy of such drawings nor the proper fitting of the work, and any incorrect work resulting therefrom shall be corrected by the Contractor without additional cost to the City.

(K) TRACINGS OF APPROVED SHOP AND WORKING DRAWINGS

Upon completion of the work, the Contractor shall check all approved tracings and make them conform to the work as executed, and shall furnish, for the records of the Department, a complete set of legible, corrected and approved original ink on cloth tracings of all shop and working drawings for the records of the Department.

The following types of legible black line photographic reproductions, made from intermediate negatives, will be accepted in lieu of the original ink on cloth tracings, subject to the conditions stated hereinafter:

1. Wash-off on 4 mil mylar base, with intermediate negative, or
2. Photo-Tracing, 4 mil mylar base, with intermediate negative, or
3. Approved equivalent process, on 4 mil mylar base, with intermediate negative,

provided that:

1. A sample reproduction is first made, and submitted to the Engineer together with the intermediate negative. After approval by the Engineer, all tracings submitted by the Contractor or his subcontractors shall be of this approved type.
2. All defects in the reproductions have been touched up or otherwise rectified by the Contractor or his subcontractors.
3. Each reproduction shall be submitted together with its intermediate negative. The intermediate negative will be returned to the Contractor if so requested.

The diazo/ammonia process is not acceptable for the reproduction of tracings, and is prohibited.

1.06.14. As-Built Drawings.

As-built drawings will be made by the Engineer, with the exception of as-built drawing for Trunk Water Mains twenty-four (24") inches and above which shall be done by the Contractor as per the *Specification for Trunk Main Work*. The Contractor shall fully cooperate with the Engineer in the making of the as-built drawings to insure their accuracy. They shall contain data, measurements and information necessary to accurately show the work "as installed", special attention being given to data on concealed construction and on construction that differs from the plans in their present form.

The sizes and type of material for as-built drawing sheets shall be as specified for tracings of approved shop and working drawings.

The Engineer will provide one (1) additional set of all as-built tracings pertaining to sewers, water mains and their appurtenances installed in the work.

1.06.15. Bulletins.

Where the Contractor has submitted prints in the form of technical bulletins or other printed matter as a shop drawing, having diagrams or drawings thereon of material or equipment installed in the work, he shall furnish six (6) sets thereof so that the Bureau may have all the necessary information for the proper operation, maintenance and repair of the material and equipment and for ordering of future replacements.

1.06.16. Reference Drawings.

Original shop, working and other reference drawings pertaining to existing construction, if they exist, are on file in the office of the Department of Design and Construction (DDC), Infrastructure Division, 30-30 Thomson Avenue, Long Island City, New York 11101, and are available for the Contractor's inspection.

The Contractor may obtain reproductions of these drawings provided that he pay all expense incurred thereby. At no time, however, will the original drawings be permitted to go out of the possession or control of the Bureau. The City will make all arrangements to procure the reproductions for the Contractor in accordance with his request.

It is distinctly understood that these drawings, if they exist, are made available to the Contractor only as information in the possession of the City, without any warranty, expressed or implied, as to their present accuracy or sufficiency. The information therein contained may not be complete nor disclose the true conditions that may be met during the course of the work under this contract. The Contractor must make his own measurements at the site and make his field check of all information obtained from these drawings before putting them to use.

1.06.17. Records of Borings.

When borings have been taken for a project, the records of the borings and the cores and samples therefrom, and records of other borings in the vicinity may be examined in the offices of the Department. It should be distinctly understood, however, that the information therein contained may not disclose the true conditions that may be met during the course of the construction work under the contract. Said information is not part of the contract and the Contractor is warned not to rely upon it in forming conclusions as to the nature of the conditions to be encountered. The Contractor hereby specifically agrees that he will not hold the City liable because of any condition that may be encountered and which may be different from that assumed by him.

1.06.18. Records of Subsurface Structures, Etc.

The Contractor expressly stipulates that it is his understanding and he agrees that the duty of anticipating the sub-soil materials, subsurface conditions and existing subsurface structures is upon him, and that he made such investigation and research of his own for this purpose as he deems necessary.

The Contractor admits that he has carefully examined the locations of the work, has made special inquiry at the office of the companies, or individuals or various City Departments having cognizance and control of pipes, tunnels, conduits, sewers, foundations, bulkhead walls and other subsurface structures, and he has determined to his satisfaction the character, size, location and lengths of such aforementioned structures, and he has made further personal inspection and investigation as he deemed proper to determine the correctness of the information so obtained; and he clearly understands that the City does not insure the accuracy of such reports or information, and he agrees that he will not make any claim against the City for damage or extra work caused or occasioned by his relying upon such records, reports or information furnished by any City Departments or any companies either as a whole or in part.

The Contractor is hereby advised that under-sidewalk vaults may be present in both sidewalk and roadway areas within the project limits. Where Contractor claims any locations can not be completed because of vaults, he should indicate by which method he has determined vault interference and provide that information to the Engineer.

Prior to any sidewalk excavation, the Contractor shall be responsible to verify the existence of under-sidewalk vaults. The Contractor shall perform visual sidewalk reconnaissance; search for and examine record drawings; gain access to cellars and obtain measurements within vaults; and perform sub-surface radar examination or use other non-destructive methods to locate possible vault structures. Where these above methods of verification are not available to the Contractor, it shall then be required to locate the vault envelopes and their roof depth below finished sidewalk grade by drilling holes (at no direct payment), or by Test Pits, under Item No. 9.00 C, as directed by the Engineer.

The Contractor shall be liable for any damage to the under-sidewalk building vaults and/or its contents and/or occupants due to his failure to verify the pre-existing vault condition.

Vault records may be available from the following (or other) sources:

A- NEW YORK CITY DEPARTMENT OF BUILDINGS
B- FOIL / RECORD ACCESS
OFFICE OF LITIGATION SERVICES AND RECORDS MANAGEMENT
NEW YORK CITY DEPARTMENT OF TRANPORTATION
C- NEW YORK CITY DEPARTMENT OF FINANCE

Where vault roofs are determined to interfere with construction of standard pedestrian ramps, the Engineer may approve for construction of, or installation of, non-standard pedestrian ramps, which may include relocation of ramps and/or partial roadway ramps.

An overall field sketch of each corner suspected of having a vault, along with at least one photograph (3" x 3" minimum) of each location, and the results of his/her investigation shall be furnished by the Contractor to the Engineer for review at least ten (10) working days prior to start of work at that respective corner. Said photographs shall be in addition to those required under Item No. 6.43. Each field sketch shall show measurements of affected areas of vaults, the building line as a reference guide which can be employed to indicate the vault envelope in the sidewalk, the boundaries of the underground structures, curb reveals, and location of proposed pedestrian ramps. No additional payment is to be made for this overall sketch.

Any vault structures punctured by the Contractor's operations shall be repaired by the Contractor to match the existing structure. Said hole in vault structures shall be temporarily repaired with an approved epoxy mortar, or securely steel plated if permanent repairs are not completed prior to the end of that same working day. No holes in vault roofs shall be left unattended at any time.

The Contractor shall also be responsible to replace damaged water proofing directly over vault roofs at his own expense.

1.06.19. Duties of the Contractor.

The Contractor shall personally see that the requirements of the contract, of the plans, and of the specifications are fully and faithfully complied with by all his subcontractors, materialmen and workmen at all times, that all of this work is prosecuted with the utmost diligence, and that all materials are provided promptly in sufficient quantities in order not to delay the work. He shall exercise the closest inspection of all materials delivered, promptly returning defective materials without waiting for their rejection by the Engineer. He shall also become thoroughly familiar with the plans and specifications and shall promptly report to the Engineer all errors, discrepancies or omissions, which he may discover in them. He shall abide by the decisions and explanations of the Engineer made in regard to such matters.

If during construction the Contractor encounters a condition that it believes may require a change order to be issued, the Contractor shall immediately notify the Associate Commissioner for Construction in writing, identifying the condition and any potential extra work. The Contractor shall at the same time list any information or documents that it requests from DDC in order to prepare its detailed cost proposal, in accordance with **Articles 25 and 26** of the Standard Construction Contract.

If no further information or documents are requested from DDC, the Contractor's detailed cost proposal shall be submitted within 10 days of its initial letter to the Associate Commissioner. If such documents or information are requested, the Contractor shall submit its detailed cost proposal within 10 days of DDC's response.

In addition, the Contractor will be expected to sign a copy of 'THE NEW YORK CITY DEPARTMENT OF DESIGN AND CONSTRUCTION CONTRACTOR CODE OF CONDUCT' policy, as contained on the following two (2) pages, at the pre-construction meeting. The Contractor is strongly advised that failure to comply with this policy could negatively impact upon their performance evaluations.

THE NEW YORK CITY DEPARTMENT OF DESIGN AND CONSTRUCTION

CONTRACTOR CODE OF CONDUCT

Although the New York City Department of Design and Construction (DDC) carefully stages construction activities to minimize disruption to people and businesses, the nature of sewer, highway, sidewalk, and water main work is such that some disruptions, noise and dirt will occur. To minimize the impact that capital construction has on residents and businesses, DDC has developed a Contractor Code of Conduct. The Code of Conduct describes what the Contractor will do to minimize inconveniences and how the Contractor's workers will conduct themselves. In signing this Code of Conduct, DDC's Contractor acknowledges the obligation to be a "good neighbor" during the construction period. However, in the event of a conflict between the policy and the contract, the contract will control.

Noise will be minimized

- Construction will not begin before 7 am or as specified in the DOT traffic stipulations.
- Workers arriving at the project site will respect the community's need for quiet before construction begins; shouting will be avoided and materials will not be handled carelessly or dropped.
- Equipment will not be left idling unnecessarily.
- Road plates will be secured.

The site will be clean and well maintained

- Garbage and debris on the site and adjacent to the project will be removed immediately; workers will discard lunch debris in trash containers and not on the ground around the worksite or on private property.
- Small tools and equipment will be kept off private property.
- Dust will be controlled; the project site and roadways will be swept and washed at the end of the day.
- Workers will use porta-sans.
- Materials will be neatly and securely stored and fenced.
- Materials will not spill or blow from trucks traveling to and from the worksite; if material is spilled, it will be promptly cleaned up.
- Once work is completed at a location all equipment and materials will be removed as soon as possible.
- Existing catch basins will be maintained.
- Whenever possible, water shut-off notices will be distributed at least 24 hours before the water is scheduled to be shut-off.
- The site will be protected against unauthorized dumping.
- Sanitation pickups will be maintained.

Relationships with the community will be polite and helpful

- Inappropriate or foul language will not be tolerated.
- Personal and commercial deliveries will be accommodated.
- Access will always be maintained for mail delivery and the community.
- Construction personnel will be courteous to the public and will refer all questions to the Resident Engineer or Community Construction Liaison.

The community will be kept informed about the project

- An overall project schedule along with detailed information about immediate project activities will be maintained and kept up-to-date, for use by City representatives to keep the community informed of Contractor's operations.
- All 24 Hour Notifications signs prepared by the project staff in order to inform the public of impending work (i.e. water shutdowns, parking interruptions, traffic pattern changes, access restrictions, etc.) shall be posted by the Contractor in the affected geographical area as directed by the Engineer, at least 24 hours before the start of such work.

Construction will proceed in a safe manner

- Temporary walkways will be clearly marked, smooth, drained, and clear of obstacles.
- Access to active fire hydrants will be maintained.
- Equipment and vehicles will be operated at acceptable speeds and in a safe manner.
- Fencing will be maintained in an acceptable condition.
- There will be sufficient traffic control devices and they will be maintained.
- Trucks will not stand idling.
- Steel road plates will be skid-resistant.
- Flaggers will ALWAYS be used when equipment is moved into and out of congested or high-volume traffic areas.
- Temporary asphalt ramps and roadway restorations will be well maintained.

_____

Signature of Principal of Construction Company Date

_____

Name of Construction Company (Print)

1.06.20. Contractor Assumes Risk of Loss or Damage.

The Contractor agrees to assume and to make no claim on account of any and all loss or damage arising out of the nature of the work to be done under this contract, or for any unforeseen obstructions or difficulties which may be encountered in the prosecution of the same, or from the action of the elements, or from encumbrances on or near the line of the work.

1.06.21. Contractor's Representative and Temporary Structures.

(A) CONTRACTOR'S REPRESENTATIVE

The Contractor or his authorized representative shall be present on the work site at all times while work is being progressed, to receive and promptly execute all orders or directions of the Engineer. The foregoing provision shall be complied with irrespective of whether work is being progressed by the Contractor or his subcontractor's forces. Furthermore, the Contractor, prior to commencement of work and for the duration of the contract, shall make available to the Engineer a telephone number through which the Contractor or his authorized representative can be contacted to respond to any and all emergency situations, 24 hours a day, 7 days a week. Failure by the Contractor to respond to any emergency condition shall be reason for a poor performance rating, and shall therefor authorize the City to correct such condition, as required, and deduct the cost of the corrective work from any monies due to the Contractor.

(B) CONTRACTOR'S FIELD OFFICE

The Contractor shall, during the period of construction, erect or provide for his own use a temporary field office in which readily accessible copies of all Contract Documents and approved shop and working drawings shall be kept. The field office shall be located at the site, where directed by the Engineer, and shall be provided with a telephone.

(C) MATERIAL SHEDS

Material sheds used by the Contractor for the storage of tools, materials and equipment, shall be kept at locations which will not interfere at any time with the progress of the work.

(D) SUBSTANTIAL CONSTRUCTION

All the Contractor's temporary structures shall be of substantial construction and neat appearance and shall be painted a uniform gray, unless another color is ordered by the Engineer.

(E) CONTRACTOR'S SIGN

The Contractor shall post and keep posted, at the site, on the outside of his field office, exterior fence or wall, a legible sign giving the full name and address of the Contractor, and the telephone numbers of responsible representatives of the Contractor who can be reached in the event of an emergency at any time when there is no representative at the site.

(F) CONTRACTS OF LIMITED SCOPE

When, in the opinion of the Engineer, the scope of the work to be done under the contract does not require a field office or material sheds, the Engineer may exempt the Contractor from providing any or all of the above services.

(G) TELEPHONE TIE LINE

Contractors whose offices are located outside the City shall make available to the Bureau a (212) or (718) tie line to their telephone service. Failure to provide such tie line shall be considered a substantial breach of the Contract.

1.06.22. Contractor's Plant.

The Contractor may occupy with his construction plant any unused location within the area controlled by the Department, subject to the approval of the Engineer. If the Contractor desires to use additional area outside of that controlled by the Department, he shall arrange for such area at his own expense. The location of the Contractor's stationary and mobile equipment shall be subject to the Engineer's approval.

Sufficient construction plant shall be provided and maintained at all points where work is in progress to meet adequately all the demands of the work, with ample margin for emergencies or overload. The plant shall be of such capacity as will permit a rate of progress to insure completion of the work within the time stipulated in the contract.

The Engineer shall have the right to reject or condemn any plant, apparatus, staging or other appliance which, in his opinion, is unsafe, improper or inadequate. Whether or not the Engineer exercises this right, the Contractor shall not be relieved from his sole responsibility for the safe, proper and lawful construction, maintenance and use of such plant, apparatus, staging or other appliance or for the adequacy of such plant.

All materials shall be properly stacked in convenient places adjacent to the site, or where directed, and protected in a satisfactory manner. All stacking of materials on streets shall be done in compliance with local laws and ordinances. If it should become necessary to remove and restack materials to avoid impeding the progress of any part of the work, or for any other reason deemed sufficient by the Engineer, the Contractor shall remove and restack such materials, as directed, at his own expense.

1.06.23. Rules, Laws, and Requirements.

(A) PERMITS

The Contractor shall, at his own cost unless otherwise stated, obtain all necessary permits, give all necessary notices, pay all legal fees, and comply with all Federal, State and City Building and Sanitary Laws, ordinances and regulations applicable to this contract and to the work to be done hereunder. Such permits may include, but are not limited to:

(a) Permits from the New York City Department of Transportation (NYCDOT) Office of Construction Mitigation and Coordination (OCMC) to make necessary excavations in the street (street opening permits), to store materials offsite in street and/or roadway areas, and for street closures (street closure permit);

(b) Any planned work requiring a NYCDOT Construction Permit that may potentially be within 100 feet of a bridge structure will be placed on a Bridge Hold. If any proposed work is within 100 feet of a bridge structure, permittees must submit a scaled drawing showing the work and exact location, along with the following:

- Plan layout of the project area.
- The scope of work.
- The contractor's means and methods.
- Indicate if work will be done of the bridge itself or its abutments, and the type of work.

If the work is more than 100 feet away from the bridge structure, permittees may send a certification by e-mail stating so. Either response must be sent to the

Division of Bridges at bridgeshold@dot.nyc.gov for review and release prior to commencing work. Emergency work will not be placed on hold and shall proceed in accordance with the New York City Highway Rules, section 2-11 (g);

(c) Permits from the Department of Sanitation for use of City landfills; and,

(d) All necessary permits from the Department of Environmental Protection which may include, but are not limited to, permits for use of City water.

No fee permits will be issured by the NYCDOT for their projects (such as installation of sidewalks, installation of pedestrian ramps, pavement milling, resurfacing, rehabilitation of retaining walls, and bridge and roadway reconstruction type projects).

No fee permits for use of City water will be issued by the Department of Environmental Protection (DEP)_for completion of their sewer and/or water main projects and for completion of any NYCDOT project being done in conjunction with the DEP sewer and/or water main project. However, for all other type projects (such as installation of sidewalks, installation of pedestrian ramps, pavement milling, resurfacing, rehabilitation of retaining walls, and bridge and/or roadway reconstruction type projects that are not being done in conjunction with a DEP sewer and/or water main project) the Contractor will be required to obtain the water use permit at its own cost.

Photostatic copies of all required permits shall be filed with the Commissioner.

A copy of each permit shall also be posted in a conspicuous place on or near the material or equipment being stored or kept on the site or in the designated field headquarters of the work with respect to which the permit was issued so as to be readily accessible for inspection.

(B) DISPOSAL OF CONSTRUCTION WASTE

The Contractor shall dispose of all waste materials in a legal and proper manner. Should the facilities of the New York City Department of Sanitation be used, waste material shall be disposed of in accordance with the rules and regulations of the Department of Sanitation. The Contractor shall submit an affidavit to the Commissioner indicating that he has complied with said rules and regulations, the site used, and proof of purchase of dump tickets. Should the Contractor use a site other than the Department of Sanitation, the Contractor shall submit an affidavit to the Commissioner indicating that he has complied with all laws for removal of waste material, the site used, and a paid receipt. In addition, should the facilities used be located in the State of New York, it shall be a Solid Waste Management Facility registered with the New York State Department of Environmental Conservation, Division of Solid & Hazardous Materials. Failure to comply with this provision shall be deemed a material breach of this contract.

(C) CONFORMANCE WITH FEDERAL, STATE AND CITY AGENCIES

The Contractor shall, in performance of this contract in its different works, conform to the rules and regulations of the various agencies which have any jurisdiction or authority affecting either the execution of the work, its sanitary or other conditions, the use or occupancy of the public grounds, roadways, streets, or which govern protection to the public.

The Contractor is notified that the Department of Design and Construction has adopted a zero tolerance policy with respect to the consumption of alcohol or use of drugs during the work shift, as specified below:

- Use, or working under the influence of alcohol or controlled substances (other than prescribed or over-the-counter medication that does not impair one's muscular or mental capabilities or cause drowsiness) is strictly prohibited at all times during the work shift.
- Use of alcohol or controlled substances at any time during the work shift shall result in immediate removal from the site and permanent loss of access.
- Site workers may be subject to substance use testing at any time "for cause" or following a safety or property damage incident.

The Contractor is alerted to the Rules and Regulations of 16 NYCRR Part 753 (also cited as Industrial Code 53 or Code Rule 53) and is directed to comply. The City shall not be liable for any costs incurred by the Contractor as a result of the compliance, non-compliance, or improper compliance by the franchised operators of underground facilities, with sub-part 753-3 of 16 NYCRR Part 753. For additional requirements concerning underground facilities see **Subsection 1.06.28.(H)**.

The Contractor is notified that all vehicles that are owned, leased or operated by the Contractor or its subcontractors and used in connection with the Project shall comply with the following requirement:

> Every truck, tractor, and tractor-trailer or semitrailer combination, having a gross vehicle weight rating of twenty-six thousand pounds or more, and a conventional cab configuration in which more than half of the engine length is forward of the foremost point of the windshield base, and the steering wheel hub is in the forward quarter of the vehicle length shall be equipped with a convex mirror on the front of such vehicle or combination of vehicles. Such convex mirror shall be adjusted so as to enable the operator of such vehicle or combination of vehicles to see all points on an imaginary horizontal line which is three feet above the road, is one foot directly forward from the midpoint of the front of such vehicle or combination of vehicles, and extends the full width of the front of such vehicle or combination of vehicles.
>
> Any vehicle that does not comply with this provision may be prohibited from entering the Project site and/or supplying equipment or materials to the Project. The Contractor shall not be entitled to any damages as a result of such prohibition.

The Contractor is notified that all persons constructing or operating a large article, machine, device, equipment, such as a rock crusher, or other contrivance or facility capable of causing or permitting emission of dust into the atmosphere at a construction site shall keep on site a document* detailing such equipment . Information provided on this document shall include the ownership, location, design, make and model, operation, i.e. how does it operate, as well as any other pertinent information requested by the Department. **In addition, the measures utilized to reduce dust emissions resulting from the use of these items as set forth in 15 RCNY 13-01 et seq. shall be clearly outlined. This document shall be attached as an addendum sheet to the Noise Mitigation Plan prepared pursuant to Section 24-220 of the Noise Code.**

(D) NOTICES

The Contractor shall give notice, in writing, to all Federal, State and City agencies, having jurisdiction, whose facilities or functions will be affected by the work, at least forty-eight (48) hours before commencing construction.

The Contractor shall notify the Engineer at least forty-eight (48) hours in advance of the start of paving work.

The Contractor shall notify the Fire Department's Bureau of Facilities Management, Plant Operations Engineering Unit, telephone (718) 281-3846 or (718) 281-3933, at least **one (1) month** in advance of starting construction and to make an appointment to pick up FDNY base maps at 316 Sgt. Beers Avenue, Fort Totten, Bayside, Queens 11359. However, said drawings are made available to the contractor, architect, engineer, agency, etc., only as information in the possession of the City, without any warranty, expressed or implied, as to their present accuracy or sufficiency. The Contractor must make his own field check of all information obtained from these drawings before putting it to use.

To request street markouts of Fire Communications underground facilities, the Contractor must contact Plant Operations Engineering at (718) 281-3846 or (718) 281-3933 at least **one (1) month** prior to commencement of work.

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* Use latest verision which can be found on the DEP Website at:
http://www.nyc.gov/html/dep/pdf/dust_mitigation_form.pdf

The Contractor must contact Empire City Subway or Verizon for any Point of Entries (P.O.E.'s) into their manholes and obtain wall markouts by them. The Contractor will be responsible for all P.O.E. and ECS/Verizon inspections.

The Engineer shall notify the Department of Transportation, Division of Traffic Operations, Signs and Markings to verify all thermoplastic pavement markings detail drawings seven (7) calendar days prior to the start of work on pavement markings.

The Contractor shall notify the Department of Transportation, Division of Traffic Operations, Signals, Street Lighting, Systems Engineering at least seventy-two (72) hours prior to the start of work.

The Contractor shall notify the Department of Transportation, Division of Traffic Operations, Parking Operations, forty-eight (48) hours prior to the start of work to have parking meters removed. The following information must be given: (1) Parking Meter Numbers, (2) Location of Meters, and (3) Date when meters can be re-installed.

The Contractor shall notify the Department of Parks and Recreation, not less than seventy two (72) hours in advance, when the job is started, to permit a survey and examination of the site by their Inspection Unit.

(E) CLOSING OF STREETS - FORMAL REQUEST FOR APPROVAL

No street shall be closed for contract construction until Form MP 125 (REQUEST TO CLOSE STREET) has been submitted to and approved by the Commissioner. This form must be filed notwithstanding that a provision in the contract may provide for the closing of streets.

(F) REQUIREMENTS FOR SIDEWALK CONSTRUCTION CONTRACTS

The Contractor shall not proceed with any sidewalk construction unless ordered to do so by the Commissioner or his authorized representative. Sidewalks shall be constructed only in those specific areas as designated in the Commissioner's order.

(G) RULES GOVERNING NAVIGATION

The Contractor shall observe all laws, rules and regulations prescribed by the Supervisor of the Harbor, the United States Coast Guard, and the United States Army Corps of Engineers.

Proper and sufficient temporary warning signs and lights for the prevention of accidents to boats shall be furnished and maintained by the Contractor, as required by Federal regulations.

During the entire period of construction, no interruption to waterway traffic will be permitted for any length of time. Any protective measures specified hereinbelow shall be such that the channel depth and headroom between the water level and underside of the bridge or traveling platform shall be maintained. Should it be suspected that the channel depth may have been impaired or that an obstruction may exist from the work, the Contractor shall, upon request by the Coast Guard or Corps of Engineers, provide the necessary equipment and personnel to undertake a survey to determine the presence of any obstruction, or objects, or silting that may have occurred during construction. The cost for this work shall be borne by the Contractor.

The Contractor shall provide a safety net directly below the underside of the bridge to cover the entire work area. The net shall be strong enough to catch any materials, debris or persons from falling into the water. The safety net shall be subject to the approval of the Engineer. The Contractor shall also provide a fire-retarding asbestos tarpaulin above the safety net and an asbestos tarpaulin directly beneath the area where flame cutting, welding or any burning operations are being done. The material for and method of providing the fire-retarding asbestos tarpaulin shall be subject to the approval of the Engineer.

(H) CONTRACTOR TO EXAMINE SITE

The Contractor is assumed to have visited the site of the work and to have familiarized himself with the present conditions, and to have judged for himself the extent and nature of the work to be done under this contract, and no extra compensation will be allowed him because of his failure to include in his bid all costs of labor and materials for which he is required to furnish.

(I) PROTECT EXISTING CONSTRUCTION

The Contractor shall protect from injury all parts of the work, and any damage caused by him or his agents to any part of existing construction shall be repaired by him at his expense to the full satisfaction of the Engineer.

(J) SCAFFOLDING AND LADDERS

The Contractor shall furnish and securely set scaffolding, platforms and ladders required for the erection and inspection of his work. All such facilities shall be of good, sound materials, adequately dimensioned, substantially braced and tied, and shall be approved by the Engineer.

(K) NO ADVERTISING SIGNS

The Contractor shall not display any advertising signs on or about the site of the work, other than his name and address, without the written permission of the Commissioner.

(L) SANITARY SERVICES

The Contractor shall provide toilet and other sanitary facilities for the use of his employees on the project, in accordance with the requirements of the New York State Labor Law and in accordance with the regulations of the City of New York. The Contractor shall furnish all labor, energy, water, heating and all other services necessary to maintain these facilities in a clean and sanitary condition. Toilets and other sanitary facilities shall be connected to sewers. After completion of the work and when directed, the temporary toilet facilities shall be completely removed.

(M) SANITARY NUISANCES

The Contractor shall not permit any sanitary nuisances to be committed by his employees in or about the work and shall enforce all sanitary regulations of the City and State Health Authorities.

(N) MEDICAL SERVICE

The Contractor shall provide such equipment and facilities as are necessary or required in case of accident for First Aid Service to anyone injured in the progress of the work and shall have standing arrangements for the removal and hospital treatment of any employee who is injured or becomes ill.

(O) WATER IN EXCAVATIONS

Whenever water is encountered or collects in the excavations or trenches, the Contractor shall remove the same in a satisfactory manner.

(P) HOURS OF WORK

Working hours shall be as stipulated by the Department of Transportation's Office of Construction Mitigation and Coordination (OCMC). Generally, no work shall be done on the job before 7:00 A.M. nor after 6:00 P.M., excepting that water mains shall not be shut down before 8:30 A.M. nor after 4:30 P.M., nor shall any work be done on Saturdays, Sundays, or the following holidays, as celebrated in New York City, unless the Contractor shall have given the Engineer at least 7 calendar days advance notice in writing, and the Engineer shall, in turn, have given written permission for such work:

1. New Year's Day
2. Memorial Day
3. Independence Day
4. Labor Day
5. Thanksgiving Day
6. Christmas Day

The above hours of work shall apply except when, because of failure to shut down any water main due to any difficulty encountered, or because of any act or omission by the City, the work of connecting to existing water mains is delayed, and such delay mandates that work be performed beyond 4:30 P.M. in order to restore water service.

If the day preceding any of these holidays falls on a normal work day, then no water shutoffs will be allowed on that day preceding the holiday and the Contractor shall cease construction operations and shall restore the streets to public use by midday of that day. The Contractor may be granted permission to continue working beyond midday on the day preceding a holiday if the Contractor requests written permission at least seven (7) calendar days in advance from the Engineer and receives written approval from the Engineer prior to the holiday.

Pursuant to the provisions of §24-222 of the Noise Control Code: the permissible hours of work shall be on weekdays from 7:00 A.M. to 6:00 P.M., unless a variance therefrom is provided in the contract.

(Q) CONTRACTOR AGREES TO PROTECT CITY STRUCTURES WITHIN THE LIMITS OF, ALONG, AND OUTSIDE THE LIMITS OF ORDERED EXCAVATION

The Contractor agrees to support and to properly protect from injury the City fire alarm system, all water mains and service water pipes, sewers and appurtenances and conduits or duct lines owned, controlled or operated by the City which may be affected in any manner by the Work done under this Contract, except as hereinbefore provided, and to protect all such water and service pipes from freezing. If the Contractor fails to do so, the Commissioner shall be and he is hereby authorized to relay and recaulk and repair the same immediately, in each block, as the Work progresses, and the cost thereof shall be charged to the Contractor, and the City hereby is authorized to retain and deduct said cost out of the monies which may be due or become due to the Contractor.

All existing Fire Department Communication facilities shall be protected and provisions made for their continuous operation during construction. All alarm boxes and posts must remain accessable. The cost of all labor, materials, plant, equipment, and incidentals required and necessary to support, protect, and maintain portions of the existing Fire Communication System, including, but not limited to, manholes, in order to complete the work of this Contract shall be deemed included in the contract prices bid for all items of work.

If, due to the Contractor's operation, Fire Alarm Service is inadvertently interrupted or Fire Communication System equipment or facilities are damaged, the Contractor will be held responsible and shall replace them at his/her own expense and in accordance with Fire Department requirements and **Section 6.23** herein these Standard Highway Specifications.

In general, existing traffic signal and street lighting conduits are not shown on the contract drawings. It is the Contractor's responsibility to determine the location of the traffic and street lighting underground distribution system. The Contractor shall make his own field observations and research the City's records to determine the location of such facilities.

Should it prove necessary to disturb existing traffic signals or street lighting equipment which is the property of the City of New York, the Contractor shall provide, at no separate payment, temporary traffic signal and street lighting as directed, in accordance with the following NYC Department of Transportation items:

<u>Traffic Signal Items</u>

2.16 FURNISH, INSTALL, MAINTAIN AND REMOVE TEMPORARY POST OR PYLON WITH SIGNALS
2.18 FURNISH, INSTALL, MAINTAIN AND REMOVE TEMPORARY POST OR PYLON WITH CONTROLLER AND SIGNALS

Street Lighting Items

21.02.02	FURNISH AND INSTALL A STANDARD WOOD POLE
21.09.03	REMOVE A WOOD POLE WITH ALL ATTACHMENTS, IF ANY
29.01.01	FURNISH, INSTALL, MAINTAIN AND REMOVE EQUIPMENT FOR TEMPORARY LIGHTING (PYLON), AS PER DWGS F-3390, F-5005 AND F-5005A
29.01.02	REMOVE TEMPORARY LIGHTING UNIT
29.01.03	FURNISH, INSTALL, MAINTAIN AND REMOVE EQUIPMENT FOR TEMPORARY LIGHTING, AS PER DWG J-5226
33.02.02	FURNISH AND INSTALL NO. 6 AWG XLP COPPER CABLE OR EQUAL FOR OVERHEAD INSTALLATION

and the costs for such work shall be deemed included in the prices bid for all scheduled Contract items.

Upon completion of the work, traffic signals, luminaires, lampposts, and accessory equipment shall be restored and temporary facilities shall be removed. Such work shall be accomplished in coordination with the Department of Transportation, Division of Traffic Operations and the appropriate utility companies. All costs for connections, disconnections, supply, erection, dismantlement, storage, and restoration of existing facilities shall be included in the prices bid for all Contract items.

Should the Contractor disturb, damage, remove or relocate any conduits, junction boxes, traffic post and/or lampposts, luminaires or traffic signals in the streets affected by this work, such damage, removal or relocation shall be immediately repaired with the knowledge of and to the satisfaction of the City. The cost of such work shall be at the sole expense of the Contractor.

(R) PLANT PEST CONTROL REQUIREMENTS

The Contractor and/or subcontractors shall be certified by the New York State Department of Agriculture & Markets to perform work within the Asian Longhorned Beetle Quarantine Zone. The Contractor must review and abide by the description of the quarantine and compliance agreements as presented in the publication entitled Part 139 of the New York State, Department of Agriculture & Markets (NYSDAM) law. Full information can be obtained from Federal and State Pest Control personnel.

Due to current Federal and New York State laws and regulations concerning Asian Longhorned Beetle management, the following host species may not be planted in the quarantine zone. Host species are as follows: Acer-Maple, Aesculus-Horsechestnut/Buckeye, Salix-Willow, Betula-Birch, Populus-Poplar, Ulmus-Elm, Albiza-Mimosa/Silk Tree, Celtis-Hackberry, Fraxinus-Ash, Platanus-London Planetree, Sycamore, Sorbus-Montain Ash.

The Contractor must comply with all Federal, State, and City laws pursuant to the handling and disposal of woody organic material that is host material for the Asian Longhorned Beetle. All wood that is host material for the Asian Longhorned Beetle must be chipped, ground, or shredded inside the quarantine zone to a size of less than one (1”) inch in at least two dimensions before it is permitted to leave the quarantine zone. Please refer to Part 139 of the New York State Department of Agriculture and Markets law and contact State personnel for further details.

In addition, Nurseries located within the quarantine zone shall comply with State and Federal Law and all Contractors and/or Subcontractors shall be certified by the New York State Department of Agriculture and Markets to perform work within the Quarantine Zone.

Any host material that is infected with the Asian Longhorned Beetle must be immediately reported to NYSDAM for inspection and subsequent removal by either State or City contracts, at no cost to the Contractor.

Prior to commencement of tree work, the Contractor shall submit to the Commissioner a copy of a valid Asian Longhorned Beetle compliance agreement entered into with NYSDAM and the Contractor or its sub contractor performing tree work. If any host material is transported from the quarantine area the Contractor shall immediately provide the Commissioner with a copy of the New York State "Statement of Origin and Disposition" and a copy of the receipt issued by the NYSDAM approved facility to which the host materials are transported.

Quarantine areas, for the purpose of this contract shall be defined as all five Boroughs of the New York City. In addition, prior to the start of any tree work, the Contractor shall contact the NYC Department of Parks & Recreation's Director of Landscape Management at (718) 699-6724, to determine the limits of any additional quarantine areas that may be in effect at the time when tree work is to be performed. The quarantine area may be expanded by Federal and State authorities at any time and the Contractor is required to abide by any revisions to the quarantine legislation while working on this contract. For further information please contact: NYSDAM (631) 288-1751.

No separate payment shall be made for Plant Pest Control. The cost for Plant Pest Control shall be deemed included in the unit prices bid for the various tree removal and tree pruning items in the contract.

1.06.24. Conflicts of Interest.

See Article 72. in the Standard Construction Contract for Conflicts of Interest provisions.

1.06.25. Schedule of Operations.

Before beginning field operations, the Contractor shall submit, for approval by the Engineer, a Schedule of Operations, which shall give and explain in detail the method of doing each phase of the work, the kind and quantity of equipment and labor proposed to be used therefor, and a step-by-step description of the operations. The Schedule of Operations shall be integrated with the requirements for the maintenance of traffic.

If required, the Contractor shall submit a detailed drawing showing and explaining his proposed methods of doing the work.

Approval of the detailed Schedule of Operations shall not relieve the Contractor from his responsibility for the safety of his methods or for carrying out the work in conformity with the Contract Documents.

The above Schedule of Operations is in addition to, and not in lieu of, the Progress Schedule required by Article 9 of the Standard Construction Contract.

All Schedules of Operations as required under this Article and Progress Schedules as required under Article 9 of the Standard Construction Contract shall be submitted in the form of a bar chart using "Microsoft Project 2010", or in an approved equivalent program which shall be directly and fully translatable into Microsoft Project 2010 format. Each bar chart shall show the order and interdependence of all activities necessary to complete the work and the sequence in which activity is to be accomplished as planned by the Contractor and in accordance with all subcontractors or suppliers whose work shall be shown on the bar chart. The Contractor shall submit the bar chart for the Engineer's review and revise it, if required, until approved by the Engineer.

The Schedule of Operations as required under this Article shall be submitted within seven (7) working days of the initial Pre-Construction Meeting and each bar in the Schedule of Operations chart shall show dates the Contractor plans to start and complete each construction activity after the initial Pre-Construction Meeting.

In addition, within fifteen (15) days after the Notice to Proceed, the Contractor shall submit for approval to the Engineer, along with the proposed progress schedule required under **Article 9** of the Contract, the following: a submittal schedule log in Excel format (tied to construction schedule) indicating a description of and the scheduled submission dates for all required submittals, shop drawings, approval requests, design mixes, reports, samples, etc., as required by the specifications and terms of this Contract.

The Contractor shall submit weekly progress status update reports showing its anticipated work schedule for the upcoming week or as otherwise directed by the Engineer. Timely submission of these weekly progress schedules are critical for preparation of the Weekly Construction Bulletin to be prepared by the Construction Community Liaison or project staff. If the Contractor fails to submit the required anticipated work schedule, the Resident Engineer will issue a Field Order. The Contractor shall submit updated bar chart every month. The revised bar chart shall be made in the same form and detail as the original submittal and shall be accompanied by an explanation of the reasons for the revisions all of which shall be subject to approval by the Engineer.

1.06.26. Job Meetings.

The Contractor agrees to attend in person or by a representative duly recognized and approved by the Engineer, and to procure the like attendance of all subcontractors required by the Engineer to be present, at any and all conferences called by the Engineer upon twenty-four (24) hours notice thereof, either at the Site of the Work or at the Office of the Department of Design and Construction, 30-30 Thomson Avenue, Long Island City, New York 11101, as directed in said notice.

1.06.27. Controls, Surveys and Layout.

Bench marks and control lines for the alignment and grades necessary for the procecution of the work, where required, shall be established by a licensed Professional Land Surveyor retained by the Contractor. When necessary, the Land Surveyor shall obtain the required data from the Topographical Bureau of the Borough President's Office, in the respective borough in which the work is to be performed.

The Contractor shall furnish all stakes, range poles, range sights, scaffolding, platforms and staging required, and shall maintain the said controls.

The Contractor shall take cognizance of datum planes used in the work.

Unless otherwise noted, the elevations indicated on the plans refer to the respective Borough Datum specified below in feet above mean sea level as established by the U.S.C.&G. Survey at Sandy Hook, New Jersey is:

The Bronx	2.608	Manhattan	2.750	Brooklyn	2.560
Queens	2.725	Staten Island	3.192		

The Contractor shall provide the required survey parties and all necessary surveying equipment. He shall make all necessary computations and determine the alignment, elevation and position for all construction work from the controls furnished by the Engineer. The Contractor shall be responsible for the accuracy of all lines and grades established by him. The Engineer may check any or all of the survey work done by the Contractor, but such check shall not relieve the Contractor of his responsibility for the accuracy of his work.

The Contractor's survey parties shall take all preliminary measurements, prepare all sketches and obtain other field data, as required, when so ordered by the Engineer. Copies of survey notes and sketches shall be delivered to the Engineer, when required, and such copies shall be signed by, and bear the seal of a Professional Engineer or Land Surveyor licensed in the State of New York.

The Contractor must furnish the necessary forms, templates, lines, levels, stakes and other tools, implements and materials and employ competent and skillful men to correctly set out from the grade marks or stakes all details of the work, in full accordance with the plans, specifications, and directions of the Engineer.

Prior to commencement of work, preliminary transverse cross-sections extending from building line to building line shall be taken by the Contractor at longitudinal intervals not exceeding fifty (50') feet, at all grade breaks and at ends of streets midway into the intersecting street. Transverse cross-sections shall be plotted on approved cross-section paper to a scale of 1" = 1'- 0", vertical, and 1" = 10'- 0", horizontal. The Contractor shall plot to the same scale, a longitudinal profile for each curb line, showing the proposed curb line grades and existing elevations at not more than twenty-five (25') feet intervals and at intermediate points where unusual sidewalk conditions occur. He shall also prepare two (2) copies of curb and gutter grade sheets, one (1) for his use and one (1) for the Engineer's use.

All plotted material, curb and gutter grade sheets and supporting data shall be submitted to the Engineer, for approval, at least one week before work, which is dependent upon approval of the submitted material, is started.

The Contractor shall submit to the Engineer a certification from a Professional Engineer or Land Surveyor, licensed in the State of New York, that the lines and grades used in the completed work comply with the contract requirements or such revisions thereof which the Engineer shall direct or order.

(A) PRESERVATION OF MONUMENTS, POINTS, STAKES, ETC.

The Contractor shall safeguard all points, stakes, grade marks, monuments and bench marks, made or established on or near the line of the work, and he agrees to accept the responsibility for and to remedy at his cost any mistakes that may be caused by the unauthorized disturbance or removal of such points, stakes, grade marks, monuments and bench marks.

The Contractor shall not disturb or excavate within five (5') feet of any City monument which may be within the limits of or be disturbed by the work herein contemplated, or in any manner disturb the same, but shall cease work at such places until the said monument has been referenced and reset or otherwise disposed of, except upon special permit from the Commissioner in accordance with the City ordinance therefor. After permission is given to remove any monument, the Contractor shall take up and preserve such monument, and, if required, remove same to the nearest Bureau yard.

Any expense incurred in replacing any points, stakes or bench marks, which the Contractor, or any person working under him, may have failed to preserve, shall be charged to the Contractor and deducted from the amount to be paid him for doing the work under this contract.

A New York State licensed Professional Land Surveyor shall perform all work regarding the re-establishment of monuments.

(B) LICENSED SURVEYOR

All bench marks and control lines for the alignment and elevations necessary for the prosecution of the work shall be established by a Professional Land Surveyor, licensed in the State of New York, retained by the Contraclor.

1.06.28. Protection of the Work, Persons and Property.

The Contractor shall protect the work, persons and property in accordance with the Provisions of Article 7 of the Standard Construction Contract, and furthermore as follows:

(A) MAINTENANCE OF EXISTING DRAINS, ETC.

Where the work herein contemplated intercepts or affects in any way any stream, ditch, drain or culvert, the Contractor shall, where required, arrange for keeping the same permanently open by building drains, culverts, or other structures or by rebuilding, repairing, or extending those existing with materials of the quality specified herein, of the size required, and as directed for each case.

(B) DRAINS TO BE KEPT CLEAN

During the progress of the work and until the completion and acceptance thereof, all catch basins and inlets, and connections, whether built under this contract or existing to remain, shall be kept thoroughly serviceable throughout, and shall be left serviceable. The Contractor shall be required to actively provide protection shielding to prevent construction debris from entering catch basins and inlets.

All existing basins and connections within the limits of this contract and contiguous thereto are to be cleaned and flushed to the satisfaction of the Engineer. Unless a scheduled item is provided for this work, the cost of cleaning these existing basins and connections shall be deemed included in the unit prices bid for all scheduled items.

(C) PROTECTION OF WATER PIPES, ETC.

The Contractor shall maintain, without injury, all City main and service water pipes, sewer connections, and the City fire alarm system which may be affected in any manner by the work under this contract, including any such protective measures as may be required in cold weather to prevent them from freezing; or, failing to do so, the Commissioner shall be and he is hereby authorized to relay and recaulk and repair the same immediately, in each block, as the work progresses, and the cost thereof shall be charged to the Contractor, and The City hereby is authorized to retain and deduct said cost out of the moneys which may be due or become due to the Contractor.

(D) MATERIALS ON PUBLIC PROPERTY

No excavated or other materials necessary to be disposed of, excepting as herein otherwise specified, shall be dumped or placed within the limits of any existing or projected public street or road, nor shall any materials be excavated and removed from such locations, without the written permission of the Commissioner.

(E) MATERIALS ON PRIVATE PROPERTY

The Contractor hereby agrees that no excavated material or materials of construction will be placed by him or for him upon private property unless a written affidavit granting such permission has been obtained from the owners or lessees of said private property and filed with the Commissioner. In the event that materials are placed on private property without permission, and such materials are not removed and such damages not remedied by the Contractor within forty-eight (48) hours after the receipt by him of a written notice from the Commissioner to do so, he agrees that the Commissioner shall be and is hereby authorized to dispose of such materials, and to remedy such damages, and to deduct the expense thereof from the money due or to become due under this contract. Copies of all written affidavits shall be given to the Engineer prior to the placement of any material on private property.

(F) REPAIR OF DAMAGED PROPERTY

In case any damage or injury shall or may result to pipes, lampposts and other works of any utility, railroad or other company, or to any private property or to any sidewalk along the line of the work, in consequence of any act or omission on the part of the Contractor or his employees, agents or subcontractors in carrying out any of the provisions or requirements of this contract, the Contractor shall make such repairs as are necessary in consequence thereof, at his own expense and to the satisfaction of the Commissioner, or in case of damages to property of utility companies, pay such amount as shall or may be sufficient to cover the cost of repairing such damages.

Grass or lawn areas that are injured or defaced as a result of the Contractor's construction operations shall be replaced with sod, unless otherwise directed by the Engineer, in accordance with the requirements of the **Section 4.19**. Payment for the replacing of injured or defaced grass or lawn areas due to the Contractor's construction operations shall be deemed included in the prices bid for all items of work.

All water service pipes damaged in performance of the work under this contract shall be repaired by a licensed plumber at the expense of the Contractor and under the rules and regulations of the Bureau of Water and Sewer Operations.

In case of failure on the part of the Contractor to promptly make such repairs, the Commissioner may have such repairs made and deduct the cost thereof out of the moneys due or to become due under this contract, or The City may retain from the moneys due or to become due under this contract a sum, estimated by the Commissioner as sufficient to pay the cost of making such repairs by third parties.

(G) WALKS REPLACED

New flagging or concrete sidewalk furnished to replace any breakage shall be of the same thickness and quality as that broken or displaced and will not be included in the final measurements.

(H) UNDERGROUND FACILITIES

Intent. Contractors must comply with the provisions of 16 NYCRR Part 753 (also cited as Industrial Code 53 or Code Rule 53), including, but not limited to, the provisions of Subparts 753-3.1(a) and (b), which states that excavators shall notify the New York City One Call Center at 1-800-272-4480 at least two but not more than ten working days, not including the date of the call, before the commencement of excavation. Care and caution shall be exercised by the Contractor while performing the work, to insure that continuing service to all underground facilities will be maintained. The cost of any and all work necessary to ensure continuing service to private underground facilities is to be borne by the private utility company and not by the City. In addition, care shall be taken so as not to damage anything that will remain a part of the finished product.

In particular, until hand-dug test holes have been made to verify the locations of underground facilities, powered or mechanical equipment may be used for the removal of pavement, but only to the depth of such pavement. Maximum bit diameter shall be 4-1/2", Maximum length 2'-0", Maximum penetration 12".

Use of powered or mechanical equipment will be permitted, as follows:

1. Resurfacing Projects - Use not permitted. All pavement breaking shall be accomplished by using hand-held pneumatic or hydraulic tools.

2. Sewer and/or Water Main Installations - Hoe-Rams will be permitted as long as the above Intent is followed. Longitudinal cuts shall be made with concrete saw or vermeer-type cutting wheel. Hoe-Ram will be permitted to crack the pavement between longitudinal cuts just prior (same day) to the excavation (where surrounding pavement is to remain).

3. Street and Highway Reconstruction - Hoe-Rams will be permitted as long as the above Intent is followed. Use must be the same day as excavation (no holes are to be left overnight). Use permitted for water main and sewer work in conjunction with roadway reconstruction as long as same day as excavation (no holes are to be left overnight).

4. Bridge and Structural Reconstruction - Hoe-Rams will be permitted as long as the above Intent is followed, except where there is a partial demolition of deck (e.g. the existing structural steel frame is to be reused).

THE CONTRACTOR IS ADVISED THAT THE PROVISIONS OF 16 NYCRR PART 753 DO NOT APPLY TO CITY OWNED UTILITIES. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE LOCATION OF THE CITY OWNED UNDERGROUND DISTRIBUTION SYSTEMS. THE CONTRACTOR SHALL MAKE HIS OWN FIELD OBSERVATIONS AND RESEARCH THE CITY'S RECORDS TO DETERMINE THE LOCATION OF SUCH FACILITIES BEFORE THE COMMENCEMENT OF EXCAVATION.

1.06.29. Street Surface Railroads.

If, within the limits of the contract, a street surface railroad company shall fail to make the repairs or lay pavements ordered by the Commissioner, then, upon written notice from the Commissioner, the Contractor shall perform the work within the railroad franchise area, or such portion thereof as may be directed by the Commissioner, in accordance with the terms of this contract, and at the prices fixed herein. And the Contractor hereby agrees to make a contract with the railroad company to perform the aforesaid work in accordance with the terms of this contract and at the prices fixed herein, unless other terms are mutually agreed upon. Provided, however, that if the railroad company performs the aforesaid work or any portion thereof, then the Contractor shall not perform the within specified work within the railroad franchise area, and in that event the Contractor shall not demand or receive any compensation therefor or any sum of money whatever as damages of any kind, nature or description or for prospective profits lost because of the failure of The City to allow the Contractor to perform said work within the railroad franchise area, other than that provided for in this contract for work actually performed.

1.06.30. Contractor Not to Discommode Private Companies.

During the progress of the work, the Contractor shall afford the necessary facilities to any and all companies owning railroad tracks, pipes, subways, ducts, or other surface or sub-surface structures on the line of the work, for their preservation from injury.

In case it be necessary to remove, repair, protect, support, or temporarily remove and replace these structures or any portions of them that may be on the line of the work, the Contractor shall give notice, in writing, to the company or companies owning such structures, so that said companies may remove, repair, protect, support, or temporarily remove and replace their structures at their expense, and the Contractor shall not cause any hindrance to or interference with said companies in performing such work on their structures. If said companies, within five (5) days after receipt of such notice, shall fail to commence performance of such work, the Contractor shall, upon the approval of the Commissioner, perform the same, it being expressly understood that the cost thereof shall <u>not</u> be a charge against the City, but shall be a matter for adjustment between the Contractor and the company or companies concerned.

Pursuant to the above, the Contractor agrees to confer with and to make or entertain an offer from such company or companies owning the said structures, and the Contractor further agrees to enter into an agreement with said company or companies by what terms and at what prices the removal, repair, protection, support, or temporary removal and replacement of the said structures will be undertaken and accomplished, and in the event of the failure to make such agreement with said company or companies, he will not complain nor make any demand for additional compensation for the removal, repair, protection, support, or temporary removal and replacement of the said structures, it being expressly understood that the cost thereof shall <u>not</u> be a charge against the City, but shall be a matter for adjustment between the Contractor and the company or companies concerned.

The provisions of this section shall be understood to include all work performed to remove, repair, protect, support or temporarily remove and replace privately owned utility property, including all work which may be authorized by the Engineer to avoid interference with privately owned utility property. The provisions of this section shall govern in all cases where private utility property interferes with or is about to be disturbed by the City work, notwithstanding any other provisions of the contract.

The Contractor shall give notice in writing, at least seventy-two (72) hours before breaking ground, for the purpose of constructing the work hereunder, to any bus company operating in the streets affected by the work and to any and all private utility companies whose structures may be affected by such work.

1.06.31. Approval of Materials.

(A) LOCAL LAWS

All materials, appliances and types or methods of construction shall be in accordance with the contract documents and shall, in no event, be less than that necessary to conform to the requirements of the Administrative Code and the Charter of the City of New York.

(B) APPROVAL OF MANUFACTURERS

The names of proposed manufacturers, materialmen and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Commissioner for approval, as early as possible to afford proper investigation and checking.

(C) REPUTE OF MANUFACTURER

No manufacturer will be approved for any materials to be furnished under the contract unless he shall be of good reputation, shall have a plant of ample capacity and shall have successfully produced similar products.

(D) DOCUMENTARY EVIDENCE OF TESTS

For any materials which may not be inspected by the City or its designated representatives, satisfactory documentary evidence that the materials have passed the required inspection and testing must be furnished to the Commissioner prior to their incorporation in the work.

(E) MATERIALS AND WORKMANSHIP

All materials furnished under the contract, unless otherwise specifically called for herein, shall be new and unused, of standard first grade quality and of the best workmanship and design. No inferior or low grade articles will be either approved or accepted, and all work of assembling and construction must be done in a neat, first-class and workmanlike manner.

(F) INFORMATION TO SUPPLIERS

In asking for prices on materials under any item of the contract, the Contractor shall supply the manufacturer or the dealer with such complete information from the specifications and the plans, as may in any case be necessary, and in every case he shall inform the manufacturer or dealer of all the general conditions and requirements herein contained.

(G) STANDARDS

Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization or body, it shall be construed to mean the latest standard, code or specification adopted and published at the date of advertisement for bids, even though reference has been made to an earlier standard.

When no reference is made to a code, standard or specification, the Standard Specification of the American Society for Testing and Materials (A.S.T.M.) shall govern.

(H) COMMISSIONER TO SELECT INSPECTORS

Except as specifically provided in the contract documents, the Commissioner will select and designate all persons, firms, or corporations to make or witness each and every inspection, test or analysis, with or without reports.

(I) ACCESS TO MANUFACTURING PLANTS

The Commissioner or his designated representative shall have free access at all times to the works, laboratories and refineries where the materials are prepared, and shall be permitted to take such samples therefrom as he may deem necessary.

(J) SAMPLES OF MATERIALS

The Contractor shall submit to the Commissioner for approval, as and when required, samples of materials proposed to be used, as follows:

1. Samples shall be in triplicate, of sufficient size or number to show the quality, type, range of color, finish and texture or material.

2. Each of the samples shall be labeled, bearing the name and quality of material, Contractor's name, date, and contract number.

3. A letter of transmittal, in triplicate, from the Contractor requesting approval, must accompany all such samples.

4. Transportation charges to the Commissioner's Office must be prepaid on all samples forwarded.

5. Samples for testing purposes shall be in accordance with the requirements of the contract documents.

(K) SAMPLES OF ASPHALT FOR PAVING

If the Contractor proposes to use an asphalt that has never been used in a pavement in The City of New York, he shall, if a pavement has been laid with the proposed asphalt in any city of the United States, file with the samples a statement of where such pavement has been laid, the date of laying, and the name of the official under whose supervision the pavement was laid.

(L) TIMELY SUBMISSION

Samples shall be submitted in due time so as to permit proper consideration without delaying any operation under the project. Materials should not be ordered until approval is received in writing from the Commissioner. All materials shall be furnished equal in every respect to the approved samples.

(M) APPROVAL OF SAMPLES

The approval of any samples will be given as promptly as possible, and shall be only for the characteristic color, texture, strength, or other feature of the material named in such approval, and no other.

When this approval is issued by the Commissioner, it is done with the distinct understanding that the materials to be furnished will fully and completely comply with the contract documents, the determination of which may be made at some later date by a laboratory test or by other procedure. Use of materials will be permitted only so long as the quality remains equivalent to the approved sample and complies in every respect with the contract documents. The Commissioner will be the final judge as to acceptability of laboratory test data and performance in service of materials submitted.

(N) VALUABLE SAMPLES

Valuable samples such as hardware, electrical fixtures, etc., not destroyed by inspection or test, will be returned to the Contractor and may be incorporated into the work after all questions of acceptability have been settled, providing suitable permanent records are made as to location of the samples and their properties.

(O) EQUIVALENT QUALITY OF MATERIALS - "APPROVED EQUIVALENT" OR “APPROVED EQUAL”

All materials and equipment which are designated in the contract documents by a number in a catalog of any manufacturer or by a manufacturer's grade or trade name are designated for the purpose of describing the article and fixing the standard of the quality and finish. Materials and equipment which are, in the opinion of the Commissioner, the equivalent to that specified, will be accepted.

The submission of any material, or article, as the "approved equivalent" or “approved equal” of the materials or articles set forth in the contract documents as a standard shall be accompanied by illustrations, drawings, descriptions, catalogs, records of tests, samples and any and all other information essential for judging the equality to the materials, finish and durability of that specified as standard, as well as information indicating satisfactory use under similar operating conditions.

Where the contract documents provide that the manufacturer's directions are to be followed, such printed directions shall be submitted to the Commissioner.

Samples taken from various deliveries during the progress of the work and during the maintenance period, when tested and analyzed, shall exhibit qualities equal or superior to those of the sample submitted with or described in the bid, and no change of materials shall be made without written permission of the Commissioner.

(P) NOTICE PRIOR TO MANUFACTURE

The Contractor shall give notice, in writing, to the Commissioner, sufficiently in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as a part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement, and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the Commissioner will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials, or he will notify the Contractor that the inspection will be made at a point other than the point of manufacture, or he will notify the Contractor that inspection will be waived.

(Q) NO SHIPPING BEFORE INSPECTION

The Contractor shall comply with the foregoing before shipping any material.

(R) CERTIFICATE OF MANUFACTURE

When the Commissioner so requires, the Contractor shall furnish to him authoritative evidence in the form of certificates of manufacturer that the materials to be used in the work have been manufactured and tested in conformity with the contract documents. These certificates shall include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product, or on similar products being fabricated by the manufacturer.

When materials or manufactured products comprise such small quantities that it will not be practical to make physical tests or chemical analyses directly on the products furnished, a certificate stating the results of such tests or analyses of similar materials which were concurrently produced may, at the discretion of the Commissioner, be considered as the basis for acceptance of such materials or manufactured products.

(S) TESTING COMPLIANCE

The testing Personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the contract documents, indicating thereon all analyses and/or test data and interpreted results thereof.

(T) REPORTS

Six (6) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the Commissioner as a pre-requisite for the acceptance of any material or equipment.

(U) REJECTION

If, in making any test, it is ascertained by the Commissioner, that the material or equipment does not comply with the contract documents, the Contractor will be notified thereof, and he will be directed to refrain from delivering said materials or equipment, or to promptly remove it from the site or from the work, and replace it with acceptable material without cost to the City.

Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the contract documents, the Contractor shall immediately proceed to furnish the designated material or equipment.

(V) TESTING APPARATUS AND LABORATORY

The Contractor shall provide and maintain at the plants suitable registering thermometric instruments, weighing devices and other apparatus necessary for the determination of the temperatures, the penetrations, the qualities of materials used, the grading of the mineral aggregates, and for all other tests required by the contract documents throughout the process of manufacture.

These instruments, etc., shall be of standard type and approved by the Commissioner. The Contractor shall also provide at the plant a suitable space in which a representative, designated by the Engineer, can carry out these tests under proper conditions.

1.06.32. Costs of Tests Borne and Inspection.

The City will bear the costs of inspections and the making of tests deemed necessary to determine compliance with the contract documents of materials and equipment furnished hereunder, with the following exceptions:

1. Any material or equipment to be furnished hereunder as the equal to those designated in the contract documents which is tested by the City and found unacceptable because it does not meet the contract requirements, will be rejected. When any such material is so rejected, the Contractor hereby agrees to pay the City such monies as were expended by it in the conduct of such tests. The Contractor further agrees that upon some rejection he will immediately proceed to furnish the designated material or equipment.

2. The Contractor shall bear the cost of testing material and equipment specifically called for by the contract documents to be tested by him, and the cost of these tests shall be deemed to be included in the prices bid for the related items.

3. For the testing of concrete and asphalt paving materials, the Contractor shall, at his own expense, supply at the plant a technician from an approved certified testing laboratory to perform the necessary tests to assure complete compliance with the contract documents, for all work that will become a part of the permanent construction. Any material for temporary construction, such as asphalt ramping, etc., will not require a technician at the plant.

If, in the opinion of the Engineer, said technician is not satisfactory, that technician shall be replaced.

Should the Contractor fail to provide a technician when required, the City will reduce the Contractor's final payment at a rate of $300.00 for each day that a technician is required but not provided, and the Maintenance and Guarantee period will be extended an additional one (1) year period for any asphalt and/or concrete work performed by the Contractor that utilizes materials batched without the services of a technician.

1.06.33. Delivery of Materials.

(A) GENERAL

The Contractor shall furnish to the Engineer a copy of each material order, indicating date of order and quality of material, and shall also notify the Engineer when materials have been delivered to the site and in what quantities.

(B) AMPLE QUANTITIES

The Contractor shall deliver materials in ample quantities to insure the most speedy and uninterrupted progress of the work so as to complete the work within the contract time.

(C) SEALS AND LABELS

Manufacturer's containers shall be delivered with unbroken seals and shall bear proper labels.

(D) COORDINATION OF DELIVERIES

The Contractor shall coordinate deliveries in order to avoid delay in or impeding the progress of the work.

(E) DELIVERY AND INSPECTION OF MATERIALS FOR STREET CONSTRUCTION

The materials for street construction shall not be brought to or deposited on the street in quantities greater than is necessary for convenient working, and shall be so deposited as to cause the least possible obstruction to streets and sidewalks, as may be determined by the Engineer. All new material of every description shall be carefully inspected after it is brought on the street, and all such not conforming in quality and dimensions to the contract documents will be rejected and must be immediately removed from the site of the work. Not until this has been done and the rejected materials removed entirely from the site of the work, each of which conditions must be faithfully fulfilled, will the Contractor be permitted to proceed with the work.

1.06.34. Transportation and Storing of Materials.

It shall be the duty of the Contractor to determine for himself the availability of transportation facilities and dockage for the use of his employees, equipment and materials, and the conditions under which such use will be permitted.

If transportation facilities and dockage are available and are permitted to be used by the agency having jurisdiction, the Contractor shall pay all necessary costs and abide by the agency having jurisdiction and all regulations promulgated in connection therewith.

It is understood that the Commissioner makes no warranty or representations as to the availability or adequacy of such facilities.

For storage of materials and equipment on streets, the Contractor shall comply with the New York City Administrative Code, Title 19 TRANSPORTATION, Subchapter 1, §19-121 “Construction and execavation sites; storage of materials and equipment on street”.

1.06.35. Partial Payments for Materials in Advance of Their Incorporation in the Work.

The following provisions will be applicable except when it is expressly specified in the "Special Provisions" of the contract that no partial payments will be made for materials in advance of their incorporation in the work:

In order to better insure the availability of materials, fixtures, and equipment when needed for the work, the Commissioner may authorize partial payment for certain materials, fixtures or equipment, prior to their

incorporation in the work, but only in strict accordance with and subject to all the terms and conditions set forth in the following subdivisions designated (A) to (P) inclusive, unless another method of payment is elsewhere provided in the contract for specified materials, fixtures or equipment.

(A) The Contractor shall submit to the Commissioner a written request, in quadruplicate, for payment for materials purchased or to be purchased for which he desires to be paid prior to their actual incorporation in the work. The request shall be accompanied by a schedule of the types and quantities of materials and shall state whether such materials are to be stored on or off the site.

(B) Where the materials are to be stored off the site, they shall be stored at a place other than the Contractor's premises (except with the written consent of the Commissioner) and under the conditions prescribed or approved by the Commissioner. The Contractor shall set apart and separately store at the place or places of storage all materials and shall clearly mark same "PROPERTY OF THE CITY OF NEW YORK," and, further, shall not at any time move any of said materials to another off-site place of storage without prior written consent of the Commissioner. Materials may be removed from their place of storage, off the site, for incorporation in the work, upon approval of the Engineer.

(C) Where materials are to be stored at the site, they shall be stored at such locations as shall be designated by the Engineer and only in such quantities as, in the opinion of the Engineer, will not interfere with the proper performance of the work by the Contractor or by other contractors then engaged in performing work on the site. Such materials shall not be removed from their place of storage on the site except for incorporation in the work, without the approval of the Engineer.

(D) INSURANCE

1. Storage off Site

Where the materials are stored off the site and until such time as they are incorporated in the work, the Contractor shall fully insure such materials against any and all risks of destruction, damage or loss, including but not limited to, fire, theft and any other casualty or happening. The policy of insurance shall be payable to The City of New York. It shall be in such terms and amounts as shall be approved by the Commissioner and shall be placed with a company duly licensed to do business in the State of New York. The Contractor shall deliver the original and one copy of such policy or policies marked "Fully Paid" to the Commissioner.

2. Storage on the Site

Where the materials are stored at the site, the Contractor shall furnish satisfactory evidence to the Commissioner that they are properly insured against loss, by endorsements or otherwise, under the policy or policies of insurance obtained by the Contractor to cover losses to materials owned or installed by him. The policy of insurance shall cover fire and extended coverage against windstorm, hail, explosion and riot attending a strike, civil commotion, aircraft, vehicles and smoke.

(E) All costs, charges and expenses arising out of the storage of such materials shall be paid by the Contractor, and the City hereby reserves the right to retain out of any partial or final payment made under the contract an amount sufficient to cover such costs, charges and expenses with the understanding that the City shall have and may exercise any and all other remedies at law for the recovery of such costs, charges and expenses. There shall be no increase in the Contract Price for such costs, charges and expenses and the Contractor shall not make any claim or demand for compensation therefor.

(F) The Contractor shall pay any and all costs of handling and delivery of materials to the place of storage and from the place of storage to the site of the work; and the City shall have the right to retain from any partial or final payment an amount sufficient to cover the cost of such handling and delivery.

(G) In the event that the whole or any part of these materials is lost, damaged or destroyed in advance of their satisfactory incorporation in the work, the Contractor at his own cost, shall replace such lost, damaged or destroyed materials with materials of the same character and quality. The City will reimburse

the Contractor for the cost of the replaced materials to the extent, and only to the extent, of the monies actually received by the City under the policies of insurance hereinbefore referred to. Until such time as the materials are replaced, the City will deduct from the value of the stored materials or from any other money due the Contractor, the amount paid to the Contractor for such lost, damaged or destroyed materials.

(H) Should any of the materials paid for by the City hereunder be subsequently rejected or incorporated in the work in a manner or by a method not in accordance with the contract documents, the Contractor shall remove and replace such defective or improperly incorporated material with materials complying with the contract documents. Until such materials are replaced, the City will deduct from the value of the stored materials or from any other money due the Contractor, the amount paid by the City for such rejected or improperly incorporated materials.

(I) Payment for the cost of materials made hereunder shall not be deemed to be an acceptance of such materials as being in accordance with the contract documents and the Contractor always retains and must comply with his duty to deliver to the site and properly incorporate in the work only materials which comply with the contract documents.

(J) The Contractor shall retain any and all risks in connection with the damage, destruction or loss of the materials paid for hereunder to time of delivery of the same to the site of the work and their proper incorporation in the work in accordance with the contract documents.

(K) The Contractor shall comply with all laws and regulations of any Governmental body or agency pertaining to the priority purchase, allocation and use of the materials.

(L) When requesting payment for such materials, the Contractor shall submit with the partial estimate duly authenticated documents of title, such as bills of sale, invoices or warehouse receipts, all in quadruplicate. The executed bills of sale shall transfer title to the materials from the Contractor to the City (in the event that the invoices state that the material has been purchased by a subcontractor, bills of sale in quadruplicate will also be required transferring title to the materials from subcontractor to the Contractor).

(M) Where the Contractor, with Commissioner's approval, purchased unusually large quantities of materials in order to assure their availability for the work, the Commissioner, at his option, may waive the requirements of Par. (L) provided the Contractor furnishes evidence in the form of an affidavit of the Contractor in quadruplicate, and such other proofs as the Commissioner may require, that he is the sole owner of such materials and has purchased them free and clear of all liens and other encumbrances. In such event, the Contractor shall pay for such materials and submit proof thereof, in the same manner as provided in Par. (L) hereof, within seven (7) days after receipt of payment therefor from the City. Failure on the part of the Contractor to submit satisfactory evidence that he has paid in full for all such materials shall preclude him from payments under the Contract.

(N) The Contractor shall include in each succeeding partial estimate requisition a summary of materials stored which shall set forth the quantity and value of materials in storage, on or off the site, at the end of each preceding estimate period; the amount removed for incorporation in the work; the quantity and value of materials delivered during the current period and the total value of materials on hand for which payment thereof will be included in the current payment estimate.

(O) Upon proof to the satisfaction of the Commissioner of the actual cost of such materials and upon submission of proper proof of title as required under Par. (L) or (M) hereof, payment will be made therefor to the extent of 85% provided however, that the cost so verified, established and approved shall not exceed the estimated cost of such materials included in the approved detailed breakdown estimate submitted in accordance with Article 41 of the Standard Construction Contract; if it does, the City will pay only 85% approved estimated cost.

(P) Upon the incorporation in the work of any such materials which have been paid for in advance of such incorporation in accordance with the foregoing provisions, payment will be made for such materials incorporated in the work pursuant to Article 42 or Article 45 of the Standard Construction Contract, less any sums paid pursuant to Par. (O) herein.

1.06.36. Department of Design and Construction to be in Complete Control of Entire Contract.

Whenever reference is made in the contract documents to an approval to be obtained from any agency other than the Department of Design and Construction, or when the contract documents state that the Contractor will be subject to the directions or orders of such agency in the performance of certain parts of the work, the intention is that the approvals, directions and orders will originate in the agencies but will be transmitted to the Contractor through and with the approval of the Commissioner.

The Contractor shall not act upon any communication directly sent to him by another agency relative to the prosecution of the work until he has furnished the Engineer with a copy thereof and received the approval of the Commissioner to proceed.

All communications and coordination meetings relative to the project between the Contractor and any agency, utility company or organization will be conducted and/or approved by the Engineer.

1.06.37. Maintenance Work by the City.

The Contractor agrees that, should it be necessary for City employees to do maintenance or emergency work on or near the site of the work, or to do any other work not part of the contract requirements but deemed expedient by the Engineer, he will not cause any interference thereto, and he further agrees that he will not claim any damages or extra compensation if such maintenance or emergency work should delay him in his work or cause him to move his erection equipment and other materials.

If any such work by the City should delay the Contractor and cause him to move his plant and materials, his right to an extension of time for performing the whole work under this contract, as provided in Article 13 of the Standard Construction Contract, shall be considered as sufficient compensation thereof.

1.06.38. Inspection of Existing Construction.

As the work progresses, the Contractor shall bring to the Engineer's attention any defective condition of existing construction which is not specifically subject to correction under the contract documents in their present form.

The Contractor shall afford the Engineer all cooperation and facilities to inspect existing construction during the course of field operations.

1.06.39. Inspection During Progress of the Work.

The Engineer will inspect the materials furnished and the work done to ensure that they comply with the contract documents, and he shall have free access at all times to the works, laboratories and refineries where the materials are prepared, and shall be permitted to take such samples therefrom as he may deem necessary. Materials will be tested in the laboratory of the Commissioner or in any other laboratory of the City designated by him. When deemed necessary, materials may be tested in any other recognized and approved laboratory designated by the Commissioner. The Engineer is hereby authorized and empowered to reject and refuse all labor and materials or methods of installation or application, or any part thereof, offered under or in fulfillment of this contract, that do not comply in kind, quality or quantity with the terms thereof. Any materials delivered or offered to be delivered under this contract, which are rejected by the Engineer as not conforming to the terms thereof, shall be forthwith removed by the Contractor, and materials which do so conform shall be forthwith furnished and delivered by him in place thereof.

The Contractor hereby agrees not to use any materials which have not been inspected and accepted, nor to perform any work except under inspection, to which end he further agrees to notify the Engineer when lines, grades or inspection are required, so that the Engineer may have time to provide the same. It is hereby agreed that the right of inspection herein provided for is intended solely for the benefit of the City, and the

City shall not in any manner be bound by such inspection or by failure to inspect, or by the failure to discover any defective work or materials used in the work or non-compliance with any provisions of the contract documents, to accept work which does not in fact comply with the contract documents, or relieve the Contractor of the obligation to comply with each of the provisions of this contract. No inspection, approval or acceptance of any part of the work herein contracted for, or of the materials used herein, or any payment on account thereof, shall prevent the Commissioner from refusing to accept the work or materials at any time thereafter during the existence of this contract, because the same do not comply with the requirements of the contract.

The Commissioner reserves the right at all times to undertake and perform such work as may be necessary in opening or removing portions of the work for the purpose of examination. The Contractor shall satisfactorily restore the work so disturbed. Should the work be found faulty in any respect, the portions disturbed shall be restored without cost to the City.

1.06.40. Assistance to be Furnished.

The Contractor shall furnish such laborers as may be necessary to aid the Engineer in his inspections, and in case he shall neglect or refuse to do so, such laborers as may be necessary will be employed by the Commissioner, and the expense thereof will be deducted from and paid out of any money then due or which may thereafter become due to the Contractor for work performed under this contract.

1.06.41. Rejected Work.

If, after inspection any work is rejected by the Engineer as defective or improperly done, such defective or improper work shall be taken down and rebuilt or the defects otherwise remedied as the Engineer may direct. And if the Contractor refuses or neglects to remove such rejected work, or otherwise correct the defects, as the Engineer may direct, then the Commissioner may obtain, use and employ materials, men and equipment to do the same, and the expense thereof will be deducted from any money which may then be due or thereafter become due to the Contractor for work performed under this contract.

1.06.42. Final Inspection.

When, in the opinion of the Contractor, the work is complete and ready for final inspection, he shall so notify the Commissioner in writing. The Commissioner will arrange to give the entire work a thorough inspection, either in person or by a designated representative. Before final payment will be made, any defects or omissions noted on this inspection must be corrected by the Contractor without additional compensation.

1.06.43. Restoration.

Any existing construction on or off the site of the work not required by the contract documents to be permanently altered or removed but which has been damaged, disturbed or removed by the Contractor during the course of the work, shall be repaired, restored or replaced to its original condition as of the start of the work, in accordance with standard practice of the owning Agency, at the Contractor's expense.

1.06.44. Maintenance and Protection of Traffic.

In addition to the following provisions, the Contractor shall be required to maintain and protect traffic in accordance with the requirements of **Section 6.70**.

(A) COMPLIANCE WITH LAW AND ORDINANCES

The Contractor shall observe the law and all ordinances of the City in relation to obstruction of the streets, keeping open passageways and protecting the same where they are exposed and potentially dangerous to the public travel, such passageways shall, as may be required, be planked or bridged by the Contractor and the cost thereof, except as otherwised provided, shall be deemed to be included in all items for which there are contract prices.

(B) MEETING WITH OFFICE OF CONSTRUCTION MITIGATION AND COORDINATION (O.C.M.C.)

To permit finalization of traffic control measures, the Contractor, twenty (20) days before beginning operations, shall arrange for an on-site field meeting with the N.Y.C. Department of Transportation's Office of Construction Mitigation and Coordinating (O.C.M.C.).

The Contractor shall submit a schedule of operations to the O.C.M.C., 55 Water Street, 7th Floor, New York, N.Y. 10041, prior to the start of work.

(C) MAINTAIN TRAFFIC

Where streets now in use are included within or connect with the work under this contract, the Contractor shall keep the passageways of such streets open and provide safe and convenient means of access to buildings fronting thereon. Only so much of such streets, as may be directed, shall be disturbed at one time.

(D) MAINTENANCE OF WAY

Where streets or portions of streets now in use are included for paving or repaving work under this contract, the Contractor shall be responsible for the maintenance of such streets or portions of streets prior to the performance of said paving or repaving work. The maintenance of such streets shall include any repairs, as directed, including the filling of potholes, that may be necessary due to usage of the streets by traffic, and shall start from the date of written notice to commence work or actual start of work, whichever is earlier.

(E) BARRICADES, SIGNS AND OTHER PROTECTIVE DEVICES

The Contractor shall furnish, erect and maintain at closures, intersections and at all other locations, where required, all necessary standard or approved barricades, suitable and sufficient lights, approved reflectors, danger signals, warning and closure signs, directional detour signs and whatever additional measures the Engineer may deem necessary for proper control of traffic and for the safety of all concerned, all in accordance with the rules and regulations of the NYC Department of Transportation and the National Manual on Uniform Traffic Control Devices for Streets and Highways (National MUTCD), 2009 or latest Edition. He shall indicate by day and by night the impassable and dangerous conditions existing on or adjacent to the site of the work. He shall take all necessary and legal precautions for the protection of the work and for the safety of the public, as required by the contract. All barricades, danger signals, warning signs and obstructions shall be illuminated at night and all lights shall be kept burning from sunset until sunrise.

Barricades shall be placed parallel to, adjacent to and on both sides of excavations for curbs and sidewalks in accordance with the stipulations under **Subsection 6.70.11.(C)** FOR CURB AND/OR SIDEWALK WORK. Each barricade within the roadway shall have at least one (1) battery-operated, flash-type warning device of approved manufacture affixed thereon, as directed by the Engineer.

“Regulatory” and/or “No Parking-Construction” signs used during the construction period are to be furnished by the Contractor, as required. The Contractor shall install these signs where directed by the Engineer and, when no longer required, shall carefully remove these signs and deliver them to the Bureau of Traffic. These signs will be measured for payment under Item 6.25 RS. The cost of said removing and delivering shall be deemed included in the price bid for Item 6.25 RS. A credit of fifty ($50) dollars will be taken for each sign not so delivered. Relocation of signs shall not entitle the Contractor to additional payment.

Excavations for basins, inlets, manholes, seepage basins, pipe connections, sewers and other miscellaneous structures shall be protected by installing a five (5’) feet high, two (2") inch x four (4") inch mesh, #14 gauge, welded-wire fabric fence around the periphery. Stay wires shall be two (2") inches apart; line wires four (4") inches apart. Wire fabric shall be securely attached to approved posts which are driven into the ground. Maximum post spacing shall be eight (8’) feet. The said excavation shall be further protected by the use of barricades, as specified for curb and sidewalk excavation, above.

Steel plates shall be provided over all excavations in front of driveways and excavations over which pedestrian or vehicular traffic is to be maintained. Plates shall be of a thickness sufficient for the loads to be carried and shall have not less than two (2’) feet of bearing on either side of an excavation. Width of plates for vehicular traffic shall not be less than ten (10’) feet, and for pedestrian traffic not less than four (4’) feet. Plates for pedestrian traffic shall be equipped with approved, dismountable hand rails on both sides, for the full lengths of plates. The Contractor shall be responsible for the adequacy of all plates.

Where roadway pavement excavations are not been backfilled to grade within seven (7) calendar days of excavation and the roadway is required to be opened to traffic by covering the excavation with steel plates, the Contractor must recess the steel plates into the pavement surface by either stripping or grinding the asphalt pavement around the perimeter of excavations, as required, to embed the plates flush with the adjacent pavement surface at no additional cost to the City.

(F) TEMPORARY WALKS AND BRIDGES

Where required, the Contractor shall construct and maintain as directed, suitable temporary walks and bridges for pedestrians and vehicles.

(G) USE OF ROADWAYS BEFORE FINAL ACCEPTANCE OF THE WORK

The City shall have the right before the final acceptance of all work under this contract, to open to vehicular traffic those areas adjacent to the structures upon which work has been completed, and the Contractor shall carry on his work so as not to interfere with or endanger such vehicular traffic and shall make no claim for damages on account thereof.

1.06.45. Progress Photographs.

Unless there is a scheduled item provided in the contract therefor, the Contractor shall provide a photographic record showing the conditions existing on the site prior to commencement of work, designated conditions during work operations, and conditions after the completion of the contract. Photographs shall be taken under the supervision and at the direction of the Engineer.

The estimated number of photograph sets required shall be twenty (20), unless otherwise provided in the contract. This estimated quantity may not be the number actually taken and the City will adjust the Contractor's final payment at the rate of ten dollars ($10.00) per photograph set for plus or minus deviations from the estimated quantity. A photograph set shall consist of one (1) negative and two (2) enlargement prints thereof.

Negatives shall be 2-1/4" x 2-1/4" size and shall have a permanent identification number inscribed thereon. At the conclusion of the work, they shall become the property of the City and shall be delivered to the Borough construction office designated by the Engineer.

Two (2) 7-1/2" x 9-1/2" (image area) enlargements shall be made from each negative on 8" x 10" single weight, gloss paper, and shall be mounted in approved vinyl photo pages, pre-punched for post or 3-ring binders, as directed by the Engineer. In addition to the proper identification numbers, enlargements shall be further identified on the face by appropriate permanent markings consisting of the Contract No., the date when taken, and a description of the location. Enlargements shall be delivered to the designated construction office not later than three (3) days after a photograph is taken, unless otherwise specified.

1.06.46. Project Sign

The Contractor is notified that he shall be required to furnish, install, maintain, and remove, when directed, Construction Project Information Signs (CPIS) as per Sec. 2-02(c)(4) and (5) of the NYC DOT Highway Rule and the cost shall be deemed included under all scheduled items of the contract. In addition, unless otherwise specified in the Special Provisions of the contract, the following Project Sign shall also apply:

(A) PROJECT SIGN

1. Responsibility: The Contractor shall produce and install one (1) project sign which shall be posted and maintained upon the site of the project at a point and in a position where directed by the Commissioner. The Contractor shall protect the sign from damage during the continuance of work under the Contract and shall do all patching of lettering, painting and bracing thereof necessary to maintain same in first class condition and in proper position. Prior to fabrication, the Contractor shall submit an 8-1/2" x 11" color match print proof from the sign manufacturer of completed sign for approval by the Commissioner. Sign shall remain on display where posted until the completion of the work except that, when so ordered by the Engineer, the Contractor shall remove, relocate or repost sign as directed.

2. Sign Quality: The Contractor shall provide all materials required for the production of the sign as specified herein. Workmanship shall be of the best quality, free from defects and shall be produced in a timely manner.

3. Schedule: Upon project mobilization, the Contractor shall commence production and installation of the sign.

4. Removal: At the completion of all work under the Contract, the sign shall be removed and disposed of away from the site.

5. a. Sign Construction with Image: shall be a one piece 4' x 8' x 1/8" (3mm) (minimum thickness) industrial standard type sign panel composed of double sided painted aluminum bonded to a solid polyethylene core. Paint shall be a factory applied surface that is flat white, smooth, and ready for the application of the vinyl sign graphics. Samples must be submitted for approval.

   b. Sign Construction without Image shall be a one piece 4' x 4' x 1/8" (3mm) (minimum thickness) industrial standard type sign panel composed of double sided painted aluminum bonded to a solid polyethylene core. Paint shall be a factory applied surface that is flat white, smooth, and ready for the application of the vinyl sign graphics. Samples must be submitted for approval.

6. Sign Graphics:

   a. All visual components of the sign are in an Adobe *.pdf file, which is provided by the Commissioner's representative. The file is not to be altered for composition, type font or image from the version provided by DDC. The Commissioner's representative shall provide a complete file with data and image. The digital file shall be provided by DDC to the Contractor (on a CD or via E-mail) for printing.

   b. The DDC *.pdf file with names provided by the Commissioner shall be reproduced digitally at the Sign Panel size of 4' x 8', or 4' x 4' without Image, on outdoor non-fading vinyl with matte uv laminate with 6-year lifespan made by 3M, Avery, Orical, or an approved equivalent. Vinyl shall be guaranteed for six years. Guarantee must cover fading, peeling, chipping or cracking.

c. The sign manufacturer is required to print from the Acrobat *.pdf provided, and must match the following colors specified by Pantone: 3025 C, in tints 100%, 20%, and 10% in their exact locations as indicated in the *.pdf file, and on the DDC website: www.nyc.gov/buildnyc.

d. Color shall be created in a four-color process to reproduce Pantone Colors (per Pantone formula).

Pantone color 3025 C (C-100, M-17, Y-0, K-51).

e. The typeface, Helvetica shall be used in all text-fields as is specified in the settings of the Acrobat *.pdf.

1.06.46A. Temporary Notification Signs.

The Contractor is notified that he shall be required to furnish, display, maintain, remove, relocate and dispose of temporary notification signs in accordance with the following provisions:

(A) Temporary Notification Signs shall be conspicuously displayed at the site of each street opening or at a minimum on one (1) sign per block along a series of excavations or continuous cuts. All sign locations shall be as directed by the Engineer.

(B) Temporary Notification Signs shall be of sufficient size to contain the required and appropriate text, and shall be reusable along the work site and for various stages of work.

(C) Temporary Notification Signs shall be clean, readable and in letters at least one and one-half (1-1/2") inches in height, and shall conform to the N.Y.C. Department of Transportation's specifications. A sample of the proposed notification signs must be submitted to the Resident Engineer for his approval, prior to any signs being posted.

(D) The following information shall be indicated upon the Temporary Notification Signs:

(a) Name of the Contractor doing the work.
(b) Name of the agency (Department of Design and Construction) for whom the work is being done.
(c) Names of subcontractors, when employed.
(d) Permit number.
(e) Purpose of the street opening (e.g. Construction of Sanitary/Storm Sewers).
(f) Start and scheduled completion dates of the work.
(g) The Resident Engineer's Field Office telephone number for complaints.

(E) The cost of all labor, materials, plant, equipment and samples required to furnish, display, maintain, remove, relocate and dispose of the Temporary Notification Signs all in accordance with the specifications and direction of the Engineer shall be deemed included in the price bid for all contract items of work. No separate or additional payment will be made for this work.

1.06.47. Site to be Maintained in Neat and Orderly Condition.

The Contractor shall maintain the site in accordance with the requirements of **Section 7.13**. Where no separate item is provided for this work, the cost thereof shall be deemed to be included under all scheduled contract items.

1.06.48. Additional Provisions Pertaining to Street Paving and Installation of Sidewalks.

(A) GENERAL

The Contractor shall furnish lines and grades in accordance with **Section 1.06.27**, except that survey controls established for the project may no longer exist and the Contractor shall be required to re-establish the survey control information using official Borough Survey Control Monuments and Bench Marks, where they exist. The Contractor shall check with Topographical Bureau of the Borough President's Office as to the reliability and accuracy of the data to be used for lines and grades.

All hydrants, light poles, trees or other fixed objects that are to be constructed, planted, reset, or relocated as a result of the project shall be constructed or planted so as to provide at least a one and one-half (1-1/2') feet clear distance from the face of the curb to the face of the object.

As a result of curb relocation within the contract limits, existing street appurtenances projecting above paved surfaces, such as hydrants, lampposts and traffic signal poles, bus shelters, etc., will have to be relocated. Not withstanding any construction sequence as defined by the contract documents, the Contractor shall plan his construction operations to insure that these appurtenances are constructed or relocated in conjunction with the installation of the new curb.

In particular, in the event the sidewalk is widened, the street appurtenances shall be maintained at their existing location behind the existing curb until the new sidewalk is constructed. If the sidewalk is narrowed, the street appurtenances must be moved to their new locations behind the proposed new curb prior to removal of the existing curb.

Services must be maintained by installing and energizing new appurtenances or by using temporary appurtenances, as directed by the Engineer. Unless otherwise provided for, all temporary appurtenances shall be provided at no additional cost to the City.

(B) STAGING OF CONSTRUCTION

During its progress and at its completion, the work to be done shall conform to the lines and grades given by the Engineer and shall be constructed in accordance with the plans, additional working drawings, the specifications, and the directions given by the Engineer.

The Contractor's attention is specifically directed to the following requirements regarding the staging of the construction:

Contractor shall plan and/or stage his/her work schedule using all hours/days available. Contractor is advised that all applicable unit prices shall include, for the purpose of this contract, all overtime costs, premium time costs, shift differentials required to complete construction within the specified "Time(s) of Completion" stipulated in this contract.

Contractor shall be permitted to accelerate the project, to combine stages and/or work sequences. Any such changes shall be shown in the construction schedule, to be furnished in accordance with the Progress Schedule required by Article 9 of the Standard Construction Contract and the above **Section 1.06.25.**, "Schedule of Operations", and shall be submitted for approval of the Engineer.

The Contractor shall complete all curb construction before commencing any roadway grading operations, stripping, removing or placing any pavement, unless otherwise permitted by the Engineer, in writing. Curbs and depressed curbs in driveways are to be constructed where shown on the plans or as directed by the Engineer.

When constructing curbs, the Contractor will be permitted to encroach upon the area immediately adjacent to the curb only to the extent essential for this operation. Excavation adjacent to curb shall be safeguarded and

protected as specified in Paragraph 1.06.44(E), BARRICADES, SIGNS AND OTHER PROTECTIVE DEVICES.

All excavations shall be adequately sheeted and braced in accordance with the requirements of Rule 23, Industrial Code, Department of Labor, State of New York, to the satisfaction of the Engineer and as supplemented herein. The adequacy of all sheeting and bracing shall be, solely, the responsibility of the Contractor.

All sheeting and bracing placed by the Contractor, no matter under which items, shall be removed at the completion of the work, unless it is designated on the plans to be permanently installed, and the cost shall be deemed included in the prices bid for all scheduled items.

When sheeting and bracing is removed, the rate of removal shall coincide with the rate of placement and compaction of backfill. The surface of compacted backfill shall be kept above the bottom of the sheeting until the said surface is within twelve (12”) inches below the proposed final surface.

Where permanent sheeting is designated to be installed it shall be cut off two (2’) feet below the adjacent ground surface after backfilling has been placed and compacted to within four (4’) feet of the proposed final surface, and all voids behind such sheeting shall be filled with acceptable, compacted materials.

All excavations shall be safeguarded and protected as specified in Paragraph 1.06.44(E).

When contract work is to be progressed in other than daylight hours, the Contractor shall provide auxiliary lighting equipment to illuminate the work area. Such equipment shall be self-contained, portable and of the floodlight type. Power units and floodlights shall be adequate in capacity and number to provide a minimum intensity of two and one-half (2-1/2) foot-candles over the entire work area. The Contractor shall provide an approved type of foot-candle meter which shall be available for the Engineer's use at all times. Light intensity shall be measured at the surface of the pavement.

(C) ACCESS RAMPS

Where the City has obtained slope easements or the equivalent thereof from owners whose properties abut the contract work and where it is necessary to cut or fill said abutting property in accordance with the contract requirements to effect entrance or exit to or from the property, the Contractor, when ordered by the Engineer, shall provide temporary access by ramping as indicated below or by other approved means.

Said access ramps shall have a maximum grade of one (1) vertical on three (3) horizontal and shall be hard surfaced with a minimum of two (2”) inches of asphaltic material or equivalent. The cost of installation (over and above the cost of normal sloping of cut or fill) of these access ramps will be included in the appropriate scheduled contract items.

(D) REMOVE EXISTING CURB, GUTTER, PAVING AND FLAGSTONES

Before commencing the work in any block, the Contractor shall:

1. allow any property owner, having a proper permit from the Commissioner, to remove and retain the old curb and flagstone which may be in front of his premises;

2. take up, where required, all existing curb, bridgestones, gutter, paving and flagstones not in conformity with the contract documents;

3. mark for identification curb and flagstones not claimed by property owners, and remove, store and utilize, as directed, such existing materials of construction as may be required; and

4. remove to a location designated by the Engineer, such of the existing curb, bridgestones, gutter, paving and flagstones, when and as may be directed, which are not claimed by property owners or utilized in the work as provided.

Where materials are designated to be hauled to and deposited in a specific location, alternate locations may be designated by the Engineer provided the hauling distance remains approximately the same.

(E) REMOVE SIGN POSTS

Unless otherwise provided in the contract, the Contractor shall remove, as required, all sign posts not in conformity with the work, and transport them to a location designated by the Engineer or relocate and reset them as directed; and shall backfill holes caused by such removal.

(F) REMOVE OTHER ENCUMBRANCES

Buildings, pipes, lumber and all other encumbrances or obstructions, above the ground surface, which may be upon the line of the work when it is begun, or may thereafter be placed there, shall, if and to the extent directed, be removed by the Contractor.

(G) REMOVE SURPLUS MATERIALS, RUBBISH, ETC.

All surplus materials, earth, sand, rubbish and stones shall be removed from the site of the work, block by block, as rapidly as the work progresses. The Contractor shall remove all stains or deposits of cement or bitumen from the curbs, walks and adjoining pavements. All material covering the pavement and sidewalks shall be swept into heaps and immediately removed from the line of the work. Unless this is done by the Contractor to the satisfaction of the Commissioner, within forty-eight (48) hours after being notified to do so by a written notice to be served upon the Contractor, either personally or by leaving it at his residence or with any of his agents on the work, or in the manner provided herein, the same will be removed by the Commissioner and the amount of the expense thereof will be deducted out of any moneys due or to become due to the Contractor under this contract. The work will not be accepted until the said materials are removed.

(H) RELOCATE CITY STRUCTURES

City water mains, hydrants and connections to be relocated, will be removed and reconstructed or relaid by the Bureau of Water and Sewer Operations, except as otherwise provided.

Traffic signal posts, fire alarm posts, street lighting posts and other City structures required to be relocated, shall be removed and relocated on new foundations and provided with new service connections or reconstructed by the City Agencies having jurisdiction thereover, except as otherwise provided.

All signs, meters and other equipment, belonging to the Bureau of Traffic and which have been taken down by the Contractor during the progress of the work, shall be carefully loaded by the Contractor and delivered by him to a City yard to be designated by the Bureau of Traffic or stored on the site, re-used in the work and reset in locations designated by the Bureau of Traffic as directed by the Engineer.

(I) TREE PRESERVATION, REMOVAL, RELOCATION AND PLANTING

The Contractor must submit a no fee PA-Forestry application to the respective borough office of the proposed project. Applications MUST contain the project name, proposed site plan/drawings, scope of work, and any other supplemental information the Contractor feels would help facilitate the goals of the project. An application can be found at the following link:

http://www.nycgovparks.org/pagefiles/52/P-A-Forestry-Application-Updated.pdf

No trees are to be removed unless approved by the Department of Parks and Recreation (DPR). No branches or roots are to be cut up unless approved by the Department of Parks and Recreation. Every

conscionable effort is to be made to save trees by the use of: the curb detail at existing trees, by slight modification in curb alignment, or by other methods so ordered by the Engineer, in accordance with acceptable Engineering practices. All proposed work must be clearly stated and explained on the PA-Forestry application and/or with the addition of supplemental information.

All work consisting of removing and replanting existing trees, planting new trees, constructing walls, installing iron tree guards, and all work in connection therewith shall be done by the Contractor to the satisfaction of the Department of Parks and Recreation of The City of New York. A Certificate of Acceptance shall be obtained by the Contractor from the Department of Parks and Recreation and filed with the Engineer before the final voucher is approved for payment.

Trees along the line of work shall be protected against injury or defacement by the Contractor. The Contractor shall be required to furnish, install, maintain, and subsequently remove temporary protective tree barriers along the line of work to protect the trunks of said trees which are designated to remain and said tree branches which obstruct the proper use of Contractor's equipment shall be properly restrained. Such tree protection shall be erected prior to commencement of work in any particular street as specified herein. Any trees injured or defaced which do not require replacement shall be treated by the Contractor to insure its continued growth in accordance with the recommendations of the Project's Tree Consultant and/or Department of Parks and Recreation, and at the expense of the Contractor.

Protective tree barriers shall be Type B, unless otherwise directed by the Engineer, and shall be constructed and installed as per the requirements of **Section 4.22**, and as directed by the Engineer.

Trees injured or defaced beyond treatment shall be replaced in accordance with the requirements for new trees, and at the expense of the Contractor.

No work adjacent to street trees may be performed until the Contractor has obtained the required no fee permit from the Department of Parks and Recreation and filed it with the borough office that falls within the project limits. An application can be found at the following link:

http://www.nycgovparks.org/pagefiles/52/P-A-Forestry-Application-Updated.pdf.

All new trees are to be planted in accordance with the requirements of **Section 4.16** and as shown on the Contract Drawings or as directed by the Engineer. Type of trees to be planted shall be as directed by the Engineer, in consultation with the Department of Parks and Recreation, unless otherwise specified.

If existing tree roots are exposed as a result of the project construction activity, they must be kept wet by covering with burlap saturated with NYC municipal water, until back filled and or covered with soil.

Any tree root damage, caused by the Contractor's operations, shall be evaluated thoroughly by the Contractor's Tree Consultant prior to any action being taken, and any corrective measures required shall be performed at no cost to the City.

In areas where heavy equipment or vehicles must operate within the critical root zone of a tree (under the drip line), a 12" layer of wood chips must be applied by hand and spread to a uniform depth over the entire area to create a smooth level cover to prevent soil compaction and root loss. Plywood or ground surface protection mats should also be added if requested by the Contractor's Tree Consultant and approved by the Engineer, to further abate soil compaction.

Wood chips shall be clean chips free of any deleterious material such as ash or insecticide. Chips may be of any wood except wood waste generated from an Asian Longhorned beetle infestation or an Emerald Ash borer infestation. Wood chips produced on the site through authorized fruning and tree removal may also be used for this work. Chips shall be derived from tree material, not from wood waste or by-products like sawdust, shredded paletts, or other debris.

Plywood shall be new or gently used 4' by 8' feet sheets with a minimum thickness of 1/2". CCA treated lumber is not acceptable for this work. Hardware to fasten plywood sheets shall be corrosion resistant steel.

Ground surface protection mats shall be manufactured from high-density polyethylene (HPDE), 1/2" thick minimum, measured approximately 4' by 8', be equipped with a lip on two sides that creates an overlapping joint with an adjoining mat to allow for effective load distribution between points uniformally spaced along the full length of the overlapping lips of adjacent mats with fixed locking pins, and a potential load bearing capacity of at least 60 tons dependent upon sub-surface properties. Mats shall be similar to "Dura Deck®" as manufactured by Signature Fencing & Flooring, NY, NY; "AlturnaMATS®" as manufactured by Alturnamats, Inc., Titusville, PA; or, an approved equivalent.

Plywood/Ground surface protection mats shall remain in place and not be moved or removed without written permission granted by Contractor's Tree Consultant and the Engineer, until all work which might cause compaction or root damange has been completed.

Wood chips shall be removed by hand at the completion of all work which might cause soil compaction or root damage has been completed, unless otherwise directed by the Engineer.

The Contractor shall not be permitted to operate auxiliary equipment which generates exhaust or other heat upward (e.g., generators and compressors), under the branches of trees where the branches are less than 25' above the ground, unless approved by the Engineer in consultation with the Tree Consultant.

(J) SIDEWALK OPENINGS FOR TREES

When new sidewalks are constructed and/or old sidewalks relaid, an opening of at least forty (40) square feet shall be left around existing trees or as otherwise approved by DPR, or the walk shall be constructed as directed by the Engineer.

(K) ADJUSTING MANHOLE HEADS, ETC.

All existing manhole heads and other appurtenances of subsurface structures which:

1. belong to The City shall, where required, be adjusted to the new work; be brought to the finished street surface with masonry of the same thickness as that of the existing structures; have broken iron heads or gratings replaced with heads or gratings which will be furnished by the Contractor under Item 6.22 F;

2. belong to public utility or other corporations will be adjusted to the new work by the corporations owning such appurtenances, under the supervision of the Contractor who shall be held responsible for the accuracy of such adjustments and who shall make such corrections, during the progress of the work or the maintenance thereof, as may be required.

(L) ADJUSTING EXISTING PAVEMENTS, SIDEWALKS, ETC.

Existing pavements, sidewalks, curb, gutter, flagging, and crosswalks shall be properly adjusted to the work done under this contract, as may be directed.

(M) RESETTING EXISTING CONCRETE CURB

Existing concrete curb which, in the opinion of the Engineer, is of suitable quality and dimensions shall be reset as directed to the proper line and grade.

(N) OLD MATERIALS TO BE REMOVED

Designated old useful materials, necessary to be removed in the preparation for the work (excepting earth and rock excavation, all salvageable sewer and water main materials, and materials designated by the Engineer as useless), which cannot be utilized in accordance with the terms of this contract, shall remain the property of The City and shall be delivered by the Contractor to a designated City-owned yard. All

salvageable sewer and water main materials which cannot be utilized in accordance with the terms of this contract shall become the property of the Contractor for removal and disposal, by him, away from the site.

All old steel curb, basin and inlet castings designated to be scrapped, all other metallic scrap belonging to the City, and all useless materials shall become the property of the Contractor and shall be removed and disposed of, by him, away from the site.

Materials to be re-used in the work shall be marked in such a manner as may be required for future identification.

(O) REUSE OF MATERIAL

Materials which are specially suitable for use in the work shall be collected, piled and utilized as directed by the Engineer. All the work of removing old material as specified above shall be done at the expense of the Contractor.

(P) REQUIREMENTS BEFORE ACCEPTANCE

Before the work is accepted, the Contractor shall remove all surplus material and shall:

1. crown the roadway to the uniform space specified and, if directed, thoroughly compact the roadway with an approved roller;

2. grade sidewalk areas to slopes specified;

3. cut the side slopes in earth excavation to a slope of one and one-half (1-1/2) horizontal to one (1) vertical or such other approved slope as may be rendered necessary by local conditions, and no measurement beyond such approved limits of slope will be made or allowed; and

4. drop the curb, where authorized, at private driveways, so that the top of the curb is one and one-half (1/2”) inches above the gutter line for a width of not less than eight (8’) feet, or as directed by the Engineer.

(Q) OPENING OF STREET NOT TO BE CONSTRUED AS ACCEPTANCE

Streets or parts thereof, or completed portions of pavement, within the limits of this contract, shall be open to travel as directed by the Engineer, but such openings shall not be construed as an acceptance by the City of the work done. Where thus open to public travel by direction of the Engineer, the Contractor shall repair such damage to the work caused by such travel or public use, pending the final completion as certified by the Engineer. Payment therefor will be made under the appropriate scheduled contract items.

(R) NO TEXT.

(S) NEW CURBING EXTENDED INTO CROSS STREETS

When new curbing is to be extended into cross streets, it shall be concrete curb, unless otherwise shown on the plans or directed by the Engineer. Where curb beyond the corner is not steel faced concrete curb, steel curb is to be extended to clear pedestrian ramps and/or to the new catch basins as constructed, clear of the pedestrian crosswalk. The cost of the additional tangent length of steel faced concrete curb will be paid for under the appropriate straight steel faced concrete curb item, except when there is no scheduled item for straight steel faced concrete curb. Where there is no scheduled item for straight steel faced concrete curb, then the additional tangent lengths of straight steel faced concrete curb required to clear pedestrian ramps and other street hardware shall be paid for as Corner Steel Faced Concrete Curb.

(T) NEW CURBING ADJACENT TO EXISTING CONCRETE SIDEWALK

Where new curbing is required adjacent to existing concrete sidewalk which is not to be replaced, a concrete saw-cut shall be made along a line parallel to and two (2') feet back from the new curb. The cost of the saw-cut shall be deemed to be included in the price bid for the curb item.

(U) WHERE PROPOSED TOP OF CURB LINE PROFILE VARIES FROM THE EXISTING PROFILE ALONG THE TOP OF SUBWAY/SIDEWALK VENTILATORS BY MORE THAN ONE (1") INCH

Where the proposed top of curb line profile varies from the existing profile along the top of subway/sidewalk ventilators by more than one (1") inch, the Engineer will direct the Contractor to adjust the top of the new curb, during construction, to conform with the profile of each ventilator and with the proposed grades at the points of tangency and curvature in each block. The gutter line profile shall be seven (7") inches below the proposed top of curb profile.

(V) TOP OF CURB ELEVATIONS AT CORNER PEDESTRIAN RAMPS

The top of curb elevations at corner pedestrian ramps shall be established in conjunction with roadway pavement construction so as to provide positive surface drainage from the apex to a catch basin, as directed.

(W) SIDEWALK WORK

The location and the extent of new sidewalk to be constructed shall be as shown on the Contract Drawings or as directed by the Engineer.

When new sidewalk is designated to be constructed in corner quadrants and in tee intersections, the Contractor shall be required to install pedestrian ramps with detectable warning surfaces at each location, unless otherwise directed. The cost for such is to be deemed included in the various sidewalk, embedded preformed detectable warning units, and steel faced corner or granite corner curb items used.

The Contractor shall also be required to reset/adjust anchorage for security gates within sidewalk areas, as necessary or as directed by the Engineer. Cost of this work shall be deemed included in prices bid for sidewalk work.

At all proposed bus pads new continuous sidewalk shall be constructed for the entire length of the bus pad, from the curbline to the property line/fence line or as directed by the Engineer.

1.06.49. Additional Provisions for Street Lighting and Traffic Signal Work.

The Contractor shall furnish, install and remove all necessary street lighting and traffic signal equipment prior to new paving.

All material to be furnished and all work to be performed shall conform to the latest specifications and drawings on file with the New York City Department of Transportation, Division of Traffic Operations, Signal Engineering and Street Lighting office, be subject to the approval of the Division's Engineer, and conform to the latest NEMA Standards and be UL approved. Said specifications and standard drawings are hereby made a part of this contract and the Contractor shall be responsible for strict adherence thereto. All questions as to whether materials conform to NEMA Standards or code requirements shall be resolved as determined by the Engineer.

It shall be the Contractor's responsibility to familiarize himself with the contents of the above mentioned specifications, copies of which are on file in the above office of Signal Engineering and Street Lighting.

New installations shall be energized before removal of the existing poles.

All electrical work related to street lighting and traffic signals shall be performed only by a licensed electrician registered with the Department of Buildings. The Contractor shall furnish to the Engineer the name of the licensee and his license number prior to the performance of any street lighting or traffic signal work.

All materials required for Street Lighting Facilities and Traffic Facilitites work, including but not limited to all internal pole wiring, shall be furnished by the Contractor, unless otherwise specified.

Existing street lights shall not be removed until new street lights are energized and operational. In the event that a lamppost is removed for the Contractor's convenience before a corresponding new lamppost is energized, temporary lighting must be provided at no additional cost to the City.

All existing street lighting and traffic signal equipment designated to be removed but deemed salvageable by the Borough Engineer of the Department of Transportation, must be carefully disassembled and returned to a location or locations within the five boroughs of New York City as directed by the Borough Engineer of the Department of Transportation.

Any damage to the existing street lighting and traffic control equipment, as a result of the Contractor's work and/or work force, shall be replaced or repaired by the Contractor at no cost to the City.

All pedestrian drop curbs shall clear existing lampposts and traffic signal posts.

1.06.50. Additional Provisions Should Any Railroad Facilities Pass Over, Under, or Adjacent to the Project Work.

The Contractor is cautioned that underground Transit facilities may exist within or adjacent to the project limits and these Transit structures may extend to, or near to, the street surface. These facilities may include ventilation structures, entrances, emergency exits, vaults, conduits, ducts, column foundations, etc., during the construction. These facilities shall be supported and protected by the Contractor as directed by the Transit Engineer.

No direct payment will be made for costs incurred in complying with the following provisions, unless otherwise provided. Said cost will be deemed to have been included in the prices bid for all the scheduled contract items.

The following appropriate notes shall apply, as necessary, should any railroad facilities pass over, under, or adjacent to the project work:

(1) The N.Y.C. Transit (NYCT) reserves the right to place inspectors, flagperson or other personnel in the subway structures during construction of the project linked by a telephone system, if deemed necessary, to observe the effects of the construction on the transit facilities. It is expected that such personnel will be necessary when the construction comes within twenty-five (25') feet of the subway structure. However, NYCT further reserves the right to place such personnel whenever, in its opinion, the project conditions warrant such placement, regardless of distance. The cost of such personnel, telephone installation and any re-routes, diversions of service, work trains, etc., made necessary by the project, will be paid direct to the NYCT by the City, at no cost to the Contractor. It is agreed that the furnishing of any Transit personnel shall not relieve the Contractor from any liability of payment for damage caused by his operations.

(2) All rock excavation adjacent to the Transit structure is to be channel drilled two (2') feet below subgrade.

(3) If top of rock is found below subway structure, the subway structure must be underpinned in accordance with drawings to be submitted to NYCT for approval.

(4) If rock is soft or seamy, lateral supports must be provided below the subway structure in accordance with drawings to be submitted to NYCT for approval.

(5) Blasting will be permitted only with light charges subject to the approval of NYCT's Engineer and in accordance with the regulations of the Fire Department. The Contractor shall provide a detailed monitoring plan, providing for measurements of both particle velocity and displacements at critical locations of the NYCT structure. The monitoring plan shall include threshold and upset levels of both particle velocity and settlement together with an action plan for their implementation. The Contractor shall secure an approved Seismologist to install and operate suitable velocity gauges to continuously monitor particle velocity and an independent licensed Surveyor to monitor displacements. The threshold maximum particle velocity above ambient caused by the blasting will be 0.5 inch per second. Values exceeding this level will be reviewed and evaluated by NYCT's Engineer. In no case will particle velocities exceed the upset level of two (2.0") inches per second.

(6) Before placing concrete, the subgrade of the foundations in the vicinity of the subway structure is to be inspected and approved by the NYCT's Engineer.

(7) If any portion of the subway structure or finish is damaged as a result of the Contractor's operations, it shall be repaired or replaced with the same materials in place, subject to the approval of the NYCT's Engineer and at the Contractor's own expense.

(8) Excavation embankments are to be shored and braced. Drawings indicating a suggested method of construction are to be submitted to NYCT for approval in conjunction with the Project's Contract Drawings. In case of excavation undermining the subway structure, underpinning may be required. Drawings for underpinning are to be submitted to NYCT for approval.

(9) Temporary shoring may be placed in direct contact with NYCT structures only if the NYCT structure is shown to be able to support all anticipated loads that can be transferred through the temporary structures without damaging the existing structure. At the completion of the project, these temporary shoring and bracing systems are to be removed as approved by NYCT.

(10) When piles are to be driven adjacent to the subway structure, boring data, pile layouts, specifications and installation procedures are to be submitted to NYCT for approval. Velocity meters are to be installed in the subway tunnel at critical locations to monitor induced vibrations. Induced displacements along the tunnel structure and track invert are to be monitored during driving. The threshold maximum particle velocity above ambient caused by the driving will be 0.5 inch per second. Values exceeding this level will be reviewed and evaluated by NYCT's Engineer. In no case will particle velocities exceed the upset level of 2.0 inches per second.

(11) No piles are permitted to be installed by any method within three (3') feet of subway structure, measured from the edge of the pile or casing to the wall. Closed end piles will not be permitted to be driven within ten (10') feet of the subway structure.

(12) All piles are to be placed within a preaugered cased hole to the influence line. The casing shall be cleaned without disturbing the soil outside the casing and the pile to be placed within the casing for installation. The piles may then be driven beyond the influence line within the casing.

(13) The influence line shall start at the bottom of the subway structure and extend at a 1:1 slope. For piles installed within ten (10') feet of the subway structure, the casing shall be extended up to the bottom of the subway structure.

(14) At the completion of pile installation, the space between the pile and the casing is to be filled with either clean sans or grout. If the casing is to be removed, the filling must be completed prior to removal of the casing.

(15) All piles are to be driven a minimum of ten (10') feet below the intersection of the pile center line and the influence line of the subway structure.

(16) The use of “down-the-hole-hammers” for installation of piles through overburden and fill will be permitted only to remove boulders. It will not be permitted as a matter of course to advance the hole. Their use to construct rock sockets will not be allowed within five (5’) feet of the NYCT structure.

(17) Vibratory hammers will not be permitted within 75 feet of subway structures. Hoerams will not be permitted within 25 feet of subway structures.

(18) Dynamic compaction methods using dropped heavyweights cannot be conducted within 1,000 feet of any NYCT structure unless it is shown that induced settlements and vibrations will not damage these structures. A suitable monitoring plan including settlement and vibration measurements must be approved by NYC’s Engineer for all such operations within these distances.

(19) There shall be no machine excavation within three (3’) feet of NYCT structures, power duct lines, or any other facilities until they have been carefully exposed by hand excavation.

(20) All dewatering operations conducted within 500 feet of the NYCT structure must be performed in accordance with drawings and procedures submitted to NYCT for approval. The distance from the structure to the dewatering operation can be reduced provided that soil conditions at the site indicate that the radius of influence of the dewatering is less than 500 feet. For dewatering within the radius of influence, the dewatering program must be shown to have negligible influence on settlements of the NYCT structure.

(21) Subway entrances (ventilators, etc.) are to be underpinned or shored and braced if directed by NYC’s Engineer.

(22) NYCT, at its discretion, reserves the right to require the project to close or maintain and protect existing subway entrances, ventilators, etc., adjacent to the project during construction. Such construction may include underpinning, shoring, bracing and erection of suitable barricades and/or canopies and shields. Such protection shall be in accordance with drawings submitted to NYCT for approval.

(23) If shields are to be installed to protect NYCT facilities and/or the public, plans showing the location, type and method of attachment to the Transit structure must be submitted to NYCT for approval.

(24) All lumber and plywood used for protection of subway facilities must be fire retardant.

(25) Subway emergency exists must be kept clear at all times.

(26) In excavating over or near the subway roof, special care shall be exercised so that the thin concrete protection of the subway waterproofing is not damaged.

(27) Burning of, welding to or drilling through existing steel structures will not be permitted except as shown on drawings approved by NYCT.

(28) Horizontal and vertical control survey data of the existing NYCT structure is to be taken by a licensed Land Surveyor to monitor any movements that occur during construction and to show that the induced movements are within allowables provided and approved by NYCT’s Engineer. If any movements exceed allowables, remediation as approved by NYCT shall be performed.

(29) Bus routes affected by the project will or may require bus diversions. These arrangements shall be made through:

General Superintendent, Special Operations
New York City Transit
2 Broadway, 17th Floor
New York, NY 10004
Telephone Number (646) 252-5526

When impacting any bus stop, Special Operations must be notified two weeks in advance.

(30) Duct lines must be maintained and protected during construction. Any interference with duct lines should be reported to NYCT inspector. When a duct line containing cables is to be removed, or when masonry adjacent thereot is to be removed, penetrated, or drilled, the work shall be done with hand labor entirely, using hammer and chisel. Jackhammers, bull points or other power equipment shall not be used.

(31) Where manholes are encountered:

a) They shall be protected and raised or lowered as required, to match the new street grade.

b) If manhole covers are raised or lowered, protect cables in manhole by wood sheeting of 2" nominal thickness.

c) Prior to the start of construction operations affecting manholes and duct lines, seven days notice must be given to Manager, Department of Maintenance of Way, at (718) 694-1358.

(32) Construction work done near vent gratings and hatches shall be as follows:

a) Unless approved by the NYCT's Engineer, all vent gratings and hatches should remain outside the construction site, separated by a construction fence. Protective shields must be provided over vent gratings as required by NYCT's Engineer.

b) No building material, vehicles or construction equipment is to be stored or run over vent, gratings, hatches or emergency exits.

c) Details of sidewalk reconstruction around vent grating, hatches and emergency exits are to be submitted to NYCT for approval.

(33) Tractors, cranes, excavators, etc. used in the vicinity of the elevated structures shall be isolated from the ground. Since the elevated structure is used as a negative return path, with a consequent potential between it and the ground, any contact between the structure and grounded equipment could result in burning of the steel.

(34) Temporary construction sheds, barricades or plywood partitions must be a minimum of 5'-0" from edge of finished platform.

(35) Station areas or stairway/closings: The general requirements for station areas or stairway/closings are as follows:

a) Only one stairway at each station will be permitted to be closed at the same time. Approvals for closing any stairway must be obtained from the Division of Station Operations at least three (3) weeks in advance.

b) Director, Office of Station Programs; Telephone (718) 694-1695 of the Division of Stations must be notified one (1) week prior to the actual closing and reopening of the entrance.

c) Ample signage must be supplied and posted at least one (1) week in advance, advising the public of the proposed subway stair closing.

d) The street entrance stairway should not be closed unless manpower and materials are available to commence work on dates permitted.

e) Once the closing is effected, construction signs must be placed at appropriate locations on the barricades at the street and mezzanine levels, stating the Contractor's name, 24 hour emergency telephone number, contract number, the duration of the closing, direction to an alternate entrance/exit, and an apology for the inconvenience to out customers.

f) Existing station signage must be adjusted to reflect any changes in access/egress.

g) Barricades are to be painted and kept graffiti free at all times. The Contractor must maintain the barricaded area clean of all debris.

h) All materials are to be properly stored and secured away from passenger traffic.

i) The Contractor must remove all waste material and barricades from all station areas when construction is completed.

j) Inspection of the area under construction by authorized Station Department employees shall not be inhibited.

k) If street lights on the sidewalks are affected, temporary lights shall be provided.

(36) If new concrete construction is joined to existing concrete, dowels and keyways are to be used in accordance with NYCT Standards.

(37) If the project involves construction or alteration of a subway facility on private property, the property owners will be required to enter into an agreement with NYCT pertaining to all work affecting the Transit facilities and clearly defining limits and responsibility for maintenance and liability.

(38) Wherever a new sidewalk is being placed adjacent to NYCT structures the following will be required:

a) The top of the new sidewalk shall be flush with the subway vent gratings, hatches and emergency exits.

b) The slope of the new sidewalk shall be such that the drainage will be away from these structures.

c) A one-half (1/2") inch preformed filler shall be installed between the new sidewalk and NYCT structure.

d) Where sidewalk elevations are being changed details of proposed work around NYCT structures are to be submitted for approval.

(39) Before the start of any work, the Contractor shall make an examination, in the presence of NYCT's Engineer, of the interior and exterior of the NYCT subway or other structure adjacent to the proposed work. The person or persons authorized by the Contractor to make these examinations shall be approved by the Engineer. The Contractor shall take all photographs as may be necessary or ordered to indicate the existing condition of NYCT structure. One copy of each photograph, eight inches by ten inches in size, and the negative is to be submitted to Manager, Department of Maintenance-of-Way, 130 Livingston St., Room 8044D, Brooklyn, New York 11201, telephone (718) 694-1358 before the start of construction.

(40) All architectural details (token booths, railings, doors, etc.) are to conform to the latest NYCT Standards. These Standards are available at NYCT.

(41) Standard NYCT Insurance Clauses are to be made part of the projects Special Provisions. Proof that the necessary insurance is in effect will be required before work can commence.

(42) At the close of any project involving construction or alterations to Transit facilities, one set of vellums or mylars, five sets of 35mm microfilm, and electronic copies complying to microstation.dgn format of "APPROVED AS-BUILTS" must be provided to NYCT for its records. For details of specific requirements contact NYCT Outside Projects.

(43) At least seven (7) working days prior to the start of construction operations, notification must be given to Manager, Department of Maintenance-of-Way, at (718) 694-1358. The Contractor shall provide

temporary quarters near the job site for NYCT inspectors, containing a desk and telephone. Said quarters may be added to the Engineer's Field Office at no additional cost to the City.

1.06.51. Additional Provisions Pertaining Only to Federally Funded Projects.

All work done under this contract when completed will be maintained by the City of New York in accordance with the New York State Department of Transportation agreement with the City of New York for maintenance of improvements of the State Arterial Highways System funded under the New York FAUS, Topics, Title II Programs dated February 3, 1977, or any other Federal Aid made available by Title 23, U.S.C.

All existing sanitary and other sewers not deemed to be part of the project by the New York State Department of Transportation Commissioner, Water Mains, Hydrants, and other Municipally or privately owned facilities within the limits of the Right-of-way which remain in service unchanged, and all such facilities relocated or protected as part of the work performed under the project, whether crossing, located within or adjacent to the R.O.W. will be maintained, as the case may be, by the Municipality, or by the Agency or unit having control or jurisdiction thereof, at no cost or expense to the State.

Approved pursuant to the above reference agreement and with the understanding that the State will not furnish maintenance payments.

1.06.52. Contractor Performance Evaluation.

The Contractor's performance will be evaluated by the City during the duration of the Contract. The Contractor will be evaluated on the following specific criteria: costs, schedules, quality of work, cooperativeness, record-keeping, contract changes, contract enforcement, and performance.

1.06.53. Audit by the Department and City.

All vouchers or invoices presented for payment to be made hereunder, and the books, records and accounts upon which said vouchers or invoices are based are subject to audit by the Department and by the Comptroller of the City of New York pursuant to the powers and responsibilities as conferred upon said Department and said Comptroller by the New York City Charter and Administrative Code of the City of New York, as well as all orders and regulations promulgated pursuant thereto.

The Contractor shall submit any and all documentation and justification in support of expenditures or fees under this Contract as may be required by said Department and said Comptroller so that they may evaluate the reasonableness of the charges and shall make its records available to the Department and to the Comptroller as they consider necessary.

All books, vouchers, records, reports, canceled checks and any and all similar material may be subject to periodic inspection, review and audit by the State of New York, Federal Government, and other persons duly authorized by the City.

The Contractor shall not be entitled to final payment under the Standard Construction Contract until all requirements have been satisfactorily met.

1.06.54. Schedule A

Pursuant to the several sections of the Contract, the Contractor shall observe and comply with the requirements indicated in Schedule A, a sample of which is included herein.

1.06.55. Prices to Cover.

No direct payment will be made for costs incurred in complying with the foregoing General Conditions, except as otherwise provided. Said costs will be deemed to have been included in the prices bid for all the scheduled items of the contract.

SCHEDULE A

(GENERAL CONDITIONS TO CONSTRUCTION CONTRACT INCLUDING GENERAL CONDITIONS RELATED TO ARTICLE 22 – INSURANCE)

PART I. REQUIRED INFORMATION

INFORMATION FOR BIDDERS SECTION 26 BID SECURITY The **Contractor** shall obtain a bid security in the amount indicated to the right.	Required provided the TOTAL BID PRICE set forth on the Bid Form is $1,000,000 or more. Certified Check: 2% of Bid Amount or Bond: 10% of Bid Amount
INFORMATION FOR BIDDERS SECTION 26 PERFORMANCE AND PAYMENT BONDS The **Contractor** shall obtain performance and payment bonds in the amount indicated to the right.	Required for contracts in the amount of $1,000,000 or more. Performance Security and Payment Security shall each be in an amount equal to 100% of the Contract Price.
CONTRACT ARTICLE 14. DATE FOR SUBSTANTIAL COMPLETION The **Contractor** shall substantially complete the **Work** in the number of calendar days indicated to the right.	See Page SA-4
CONTRACT ARTICLE 15. LIQUIDATED DAMAGES If the **Contractor** fails to substantially complete the **Work** within the time fixed for substantial completion plus authorized time extensions or if the **Contractor**, in the sole determination of the **Commissioner**, has abandoned the **Work**, the **Contractor** shall pay to the **City** the amount indicated to the right.	$_____for each consecutive calendar day over substantial completion time
CONTRACT ARTICLE 17. SUB-CONTRACTOR The **Contractor** shall not make subcontracts totaling an amount more than the percentage of the total **Contract** price indicated to the right.	Not to exceed _50_% of the **Contract** price
CONTRACT ARTICLE 21. RETAINAGE The **Commissioner** shall deduct and retain until the substantial completion of the **Work** the percent value of the **Work** indicated to the right.	_5_% of the value of the **Work**

SAMPLE

CONTRACT ARTICLE 22. **(Per Directions Below)**	See pages SA-5 through SA-11
CONTRACT ARTICLE 24. **DEPOSIT GUARANTEE** As security for the faithful performance of its obligations, the **Contractor**, upon filing its requisition for payment on **Substantial Completion**, shall deposit with the **Commissioner** a sum equal to the percentage of the **Contract** price indicated to the right.	1% of **Contract** price
CONTRACT ARTICLE 24. **PERIOD OF GUARANTEE** Periods of maintenance and guarantee other than the period set forth in Article 24.1 are indicated to the right.	Eighteen (18) Months, excluding Trees Twenty-four (24) Months for Tree Planting
CONTRACT ARTICLE 74. **STATEMENT OF WORK** The **Contractor** shall furnish all labor and materials and perform all **Work** in strict accordance with the **Contract Drawings**, **Specifications,** and all **Addenda** thereto**.**	See Contract Article 74
CONTRACT ARTICLE 75. **COMPENSATION TO BE PAID TO CONTRACTOR** The **City** shall pay and the **Contractor** shall accept in full consideration for the performance of the **Contract**, subject to additions and deductions as provided in Contract Article 75, this said sum being the amount at which the **Contract** was awarded to the **Contractor** at a public letting thereof, based upon the **Contractor's** bid for the **Contract.**	See Contract Article 75
CONTRACT ARTICLE 78. **PARTICIPATION BY MINORITY-OWNED AND WOMEN-OWNED BUSINESS ENTERPRISES IN CITY PROCUREMENT**	See M/WBE Utilization Plan in the Bid Booklet

SAMPLE

STANDARD HIGHWAY SPECIFICATIONS **SECTION 6.40** **LIQUIDATED DAMAGES FOR** **ENGINEER'S FIELD OFFICE** If the Contractor fails to satisfactorily provide the field office and all equipment specified in **Section 6.40 - Engineer's Field Office**, and/or if a cited deficiency exceed seventy two (72) hours after notice from the Engineer in writing, or is permitted to recur, liquidated damages will be assessed in the amount specified herein for each subsequent calendar day or part thereof that a cited deficiency resulting in nonpayment, as described in **Section 6.40.5**, is not corrected.	$ 250.00 for each calendar day of deficiency
STANDARD HIGHWAY SPECIFICATIONS **SECTION 6.70** **LIQUIDATED DAMAGES FOR** **MAINTENANCE AND PROTECTION OF TRAFFIC**	$ 250.00 for each instance of failure to comply with the Maintenance and Protection of Traffic requirements within three (3) hours after written notice from the Engineer $ 500.00 for each and every hour of failing to open the entire width of roadway to traffic the morning following a night/weekend work operation
STANDARD HIGHWAY SPECIFICATIONS **SECTION 7.13** **LIQUIDATED DAMAGES FOR** **MAINTENANCE OF SITE** If the Contractor fails to comply, within three (3) consecutive hours after written notice from the Engineer, with the requirements of **Section 7.13 - Maintenance of Site**, the Contractor shall pay to the City of New York, until such notice has been complied with or rescinded, the sum specified above per calendar day, for each instance of such failure, as liquidated damages and not as a penalty, for such default.	$ 250.00 for each calendar day, for each occurrence

SAMPLE

Date for Substantial Completion (Reference: Article 14)

The Contractor shall substantially complete the Work within the Final Contract Duration determined in accordance with the terms and conditions set forth herein.

The Base Contract Duration for this project is_____consecutive calendar days ("ccds").

The Final Contract Duration shall be the Base Contract Duration when a check mark is indicated before the word "NO", below, and shall be the Base Contract Duration adjusted by the table set forth below when a check mark is indicated before the word "YES", below.

___√___ YES _____ NO

When the Final Contract Duration is indicated above to be adjusted by the table below, the table may increase the Base Contract Duration depending on the date of scheduled substantial completion to avoid a scheduled substantial completion of the Work during the winter months. The date of scheduled substantial completion shall be determined by adding the Base Contract Duration to the date specified to commence work in the written Notice to Proceed. The Final Contract Duration shall then be determined as follows:

(a) Find the row that corresponds to the month of substantial completion based on the Base Contract Duration added to the date specified to commence work in the written Notice to Proceed.

(b) Find the number of days to be added to the Base Contract Duration in the table below. Add that number of days to the Base Contract Duration to obtain the Final Contract Duration in consecutive calendar days.

Month of Substantial Completion based on the Base Contract Duration	Number of Days of adjustment
January	150
February	120
March	90
April	60
May	30
June	0
July	0
August	0
September	0
October	0
November –December 15	0
December 16 – December 31	180

In addition, should Item No. 9.30, "Storm Water Pollution Prevention," exist in the Contract and the required Storm Water Pollution Prevention Plan (SWPPP) does not conform to NYSDEC's recommended Standards, an additional 60 ccd shall be added to the above Final Contract Duration.

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SAMPLE

(GENERAL CONDITIONS RELATING TO ARTICLE 22 – INSURANCE)

PART II. TYPES OF INSURANCE, MINIMUM LIMITS AND SPECIAL CONDITIONS

Note: All certificate(s) of insurance submitted pursuant to Contract Article 22.3. 3 must be accompanied by a Certification by Broker consistent with Part III below and include the following information:

- **For each insurance policy, the name and NAIC number of issuing company, number of policy, and effective dates;**
- **Policy limits consistent with the requirements listed below;**
- **Additional insureds or loss payees consistent with the requirements listed below; and**
- **The number assigned to the Contract by the City (in the "Description of Operations" field).**

Insurance indicated by a blackened box (■) or by X in a □ to left will be required under this contract

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
■ Commercial General Liability Art. 22.1.1	The minimum limits shall be $ 3,000,000 per occurrence and $ 6,000,000 per project aggregate applicable to this **Contract.** Additional Insureds: 1. City of New York, including its officials and employees, with coverage at least as broad as ISO Form CG 20 10 and CG 20 37, and 2. All person(s) or organization(s), if any, that Article 22.1.1(b) of the **Contract** requires to be named as Additiona Insured(s), with coverage at least as broad as ISO Form CG 20 26. The Additional Insured endorsement shall either specify the entity's name, if known, or the entity's title (e.g., Project Manager).

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■ Workers' Compensation Art. 22.1.2 ■ Disability Benefits Insurance Art. 22.1.2 ■ Employers' Liability Art. 22.1.2 ☐ Jones Act Art. 22.1.3 ☐ U.S. Longshoremen's and Harbor Workers Compensation Act Art. 22.1.3	Workers' Compensation, Employers' Liability, and Disability Benefits Insurance: Statutory per New York State law without regard to jurisdiction. **<u>Note</u>:** The following forms are acceptable: (1) New York State Workers' Compensation Board Form No. C-105.2, (2) State Insurance Fund Form No. U-26.3, (3) New York State Workers' Compensation Board Form No. DB-120.1 and (4) Request for WC/DB Exemption Form No. CE-200. The City will not accept an ACORD form as proof of Workers' Compensation or Disability Insurance. Jones Act and U.S. Longshoremen's and Harbor Workers' Compensation Act: Statutory per U.S. Law. ☐ Additional Requirements: (1) NYCT "OUTSIDE CONTRACT" INSURANCE REQUIREMENTS: Workers' Compensation Insurance (including Employer's Liability Insurance) with limits of not less than $2,000,000, which limit may be met by a combination of primary and excess insurance meeting the statutory limits of New York State. (2) Two (2) certificates of such insurance shall be furnished to the Director, Risk Management, MTA Risk and Insurance Management Standards, Enforcement and Claims Unit, 2 Broadway, 21st Floor, New York, NY 10004.

SAMPLE

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☐ Builders' Risk Art. 22.1.4	100 % of total value of **Work** **Contractor** the Named Insured; the **City** both an Additional Insured and one of the loss payees as its interests may appear. If the **Work** does not involve construction of a new building or gut renovation work, the **Contractor** may provide an installation floater in lieu of Builders Risk insurance. Note: Builders Risk Insurance may terminate upon **Substantial Completion** of the **Work** in its entirety.
■ Commercial Auto Liability Art. 22.1.5	$ 2,000,000 per accident combined single limit If vehicles are used for transporting hazardous materials, the Contractor shall provide pollution liability broadened coverage for covered vehicles (endorsement CA 99 48) as well as proof of MCS 90 Additional Insureds: (1) City of New York, including its officials and employees, and

SAMPLE

☐ Contractors Pollution Liability Art. 22.1.6	$_____ per occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
☐ Marine Protection and Indemnity Art. 22.1.7(a)	$_____ each occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
☐ Hull and Machinery Insurance Art. 22.1.7(b)	$_____ per occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
☐ Marine Pollution Liability Art. 22.1.7(c)	$_____ per occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____

SAMPLE

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[OTHER] Art. 22.1.8 ☐ Railroad Protection Liability Policy (ISO-RIMA or equivalent form) approved by Permittor covering the work to be performed at the designated site and affording protection for damages arising out of bodily injury or death, physical damage to or destruction of property, including damage to the Insured's own property and conforming to the following: • Policy Endorsement CG 28 31 - Pollution Exclusion Amendment is required to be endorsed onto the policy when environmental-related work and/or exposures exist. • Indicate the Name and address of the Contractor to perform the work, the Contract # and the name of the railroad property where the work is being performed and the Agency Permit. • Evidence of Railroad Protective Liability Insurance, must be provided in the form of the Original Policy. A detailed Insurance Binder (ACORD or Manuscript Form) will be accepted pending issuance of the Original Policy, which must be provided within 30 days of the Binder Approval.	$ 2,000,000 per occurrence $ 6,000,000 annual aggregate Named Insureds: 1. New York City Transit Authority (NYCTA), the Manhattan and Bronx Surface Transit Operation Authority (MaBSTOA), the Staten Island Rapid Transit Operation Authority (SIRTOA), MTA Capital Construction Co., the Metropolitan Transportation Authority (MTA) including its subsidiaries and affiliates, and the City of New York (as Owner) and all other indemnified parties.

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[OTHER] Art. 22.1.8

☐ Professional Liability

A. The Contractor's Professional Engineer shall maintain and submit evidence of Professional Liability Insurance in the minimum amount of $1,000,000 per claim. The policy or policies shall include an endorsement to cover the liability assumed by the Contractor under this Contract arising out of the negligent performance of professional services or caused by an error, omission or negligent act of the Contractor's Professional Engineer or anyone employed by the Contractor's Professional Engineer.

B. Claims-made policies will be accepted for Professional Liability Insurance. All such policies shall have an extended reporting period option or automatic coverage of not less than two (2) years. If available as an option, the Contractor's Professional Engineer shall purchase extended reporting period coverage effective on cancellation or termination of such insurance unless a new policy is secured with a retroactive date, including at least the last policy year.

[OTHER] Art. 22.1.8	
■ Engineer's Field Office **Section 6.40, Standard Highway Specifications**	Fire insurance, extended coverage and vandalism, malicious mischief and burglary, and theft insurance coverage in the amount of $40,000

[OTHER] Art. 22.1.8

☐ The Following Additional Insurance Must Be Provided:

Umbrella/Excess Liability Insurance - The Contractor shall provide Umbrella/Excess Liability Insurance in the minimum amount of $10,000,000 per Occurrence and $10,000,000 in Aggregate. The policy terms and condition should be at least as broad as the underlying policies. The underlying policies should comply with the insurance provision as outlined by the contract. Defense cost should be in addition to the limit of liability. The City of New York, including its officials and employees, should be included as additional insured as respects to the noted project.

SAMPLE

SCHEDULE A
(GENERAL CONDITIONS TO CONSTRUCTION CONTRACT)
(GENERAL CONDITIONS RELATING TO ARTICLE 22 – INSURANCE)

PART III. CERTIFICATES OF INSURANCE

All certificates of insurance (except certificates of insurance solely evidencing Workers' Compensation Insurance, Employer's Liability Insurance, and/or Disability Benefits Insurance) must be accompanied by one of the following:

(1) the Certification by Insurance Broker or Agent on the following page setting forth the required information and signatures;

-- OR --

(2) copies of all policies as certified by an authorized representative of the issuing insurance carrier that are referenced in such certificate of insurance. If any policy is not available at the time of submission, certified binders may be submitted until such time as the policy is available, at which time a certified copy of the policy shall be submitted.

SAMPLE

CERTIFICATION BY INSURANCE BROKER OR AGENT

The undersigned insurance broker represents to the City of New York that the attached Certificate of Insurance is accurate in all material respects.

_____
[Name of broker or agent (typewritten)]

_____
[Address of broker or agent (typewritten)]

_____
[Email address of broker or agent (typewritten)]

_____
[Phone number/Fax number of broker or agent (typewritten)]

_____
[Signature of authorized official, broker, or agent]

_____
[Name and title of authorized official, broker, or agent (typewritten)]

SAMPLE

State of …….)
) ss.:
County of …….……)

Sworn to before me this _____ day of _____, 20____

_____
NOTARY PUBLIC FOR THE STATE OF _____

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SCHEDULE A

(GENERAL CONDITIONS TO CONSTRUCTION CONTRACT)

PART IV. ADDRESS OF COMMISSIONER

Wherever reference is made in Article 7 or Article 22 to documents to be sent to the **Commissioner** (e.g., notices, filings, or submissions), such documents shall be sent to the address set forth below or, in the absence of such address, to the **Commissioner's** address as provided elsewhere in this **Contract**.

DDC Director, Insurance Risk Manager

30 – 30 Thomson Avenue, 4th Floor (IDCNY Building)

Long Island City, NY 11101

SAMPLE

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DIVISION II - BASIC MATERIALS OF CONSTRUCTION

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DIVISION II

BASIC MATERIALS OF CONSTRUCTION

SECTION 2.01 - Definitions

2.01.1. All definitions of materials shall be in accordance with the latest revisions of the Specifications on Nomenclature of the American Society for Testing and Materials, unless otherwise specified herein.

2.01.2. **Aggregate**--Mineral materials: sand, gravel and broken stone. Fine Aggregate--Mineral materials all of which pass a 3/8 inch sieve. Coarse Aggregate--Mineral materials all of which pass a 3 inch sieve and usually not more than ten (10) percent passing a No. 4 sieve.

2.01.3. **Asphalt**--Any solid natural bitumen or a residue from the distillation of an asphaltic petroleum.

2.01.4. **Asphalt--Emulsified**--A liquid mixture in which minute globules of bitumen are held in suspension in water or a watery solution.

2.01.5. **Asphaltic Cement**--A fluxed or unfluxed asphalt specially prepared as to quality and consistency for direct use in the manufacture of bituminous pavements.

2.01.6. **Asphalt, Liquid**--An asphaltic residuum which has been fluxed with distillate.

2.01.7. **ASTM**--American Society for Testing and Materials.

2.01.8. **Bitumen**--A class of black or dark colored cementitious substances, composed principally of high molecular weight hydrocarbons, of which asphalts, tars, pitches and asphaltites are typical.

2.01.9. **Cement, Portland**--The product obtained by pulverizing clinker consisting essentially of hydraulic calcium silicates and usually containing one or more forms of calcium sulfate interground with the clinker.

2.01.10. **Clay**--An earthy or stony mineral aggregate consisting essentially of hydrous silicates of alumina, plastic when sufficiently pulverized and wetted, rigid when dry, and vitreous when fired at a sufficiently high temperature.

2.01.11. **Concrete**--A homogeneous mixture consisting essentially of cement, fine aggregate, coarse aggregate and water.

2.01.12. **Concrete, Air-entrained**--Concrete in which air has been incorporated by the use of air-entraining agents.

2.01.13. **Consistency**--The degree of plasticity or workability of freshly mixed concrete as indicated by the slump test.

2.01.14. **Field Mix**--A concrete mixture whose proportions are expressed in terms of a sack of cement (1 cu. ft.) and of separated volumes of damp-loose aggregates measured on the job. Damp-loose aggregates are considered to be materials as delivered on the job.

2.01.15. **Fire Clay**--Sedimentary clay of low flux content.

2.01.16. **Flux**--Bituminous material, generally liquid, in which the predominating constituent is bitumen, used in combination with asphalts for the purpose of softening the latter.

2.01.17. **Gravel**--A coarse aggregate resulting from the natural erosion of rock.

2.01.18. **Mineral Aggregate in Bituminous Mixture**--The entire inorganic part or percentage of the bituminous mixture which is insoluble in chloroform.

2.01.19. **Pavement**--Shall consist of all the courses above the subgrade. This shall consist of monolithic concrete or a base course consisting of concrete or broken stone and a wearing course of a thickness as specified. In addition, a pavement may contain a stabilizing sub-base and/or a binder levelling course.

2.01.20. **Penetration**--Consistency, expressed as the distance in hundredths of a centimeter, that a standard needle vertically penetrates the asphaltic material under known conditions of loading, time and temperature. Where the conditions of test are not specifically mentioned, the load, time and temperature shall be 100 grams, 5 seconds and 77° Fahrenheit (25° Celsius) respectively.

2.01.21. **Proportion Strength Concrete**--Concrete whose constituent materials are proportioned in accordance with specification requirements to produce a required strength.

2.01.22. **RC**--Rapid Curing.

2.01.23. **MC**--Medium Curing.

2.01.24. **Sand**--The fine granular material (usually less than one quarter (1/4") inch in diameter) resulting from the natural disintegration of rock or from the crushing of rock.

2.01.25. **Shale**--A thinly stratified, consolidated sedimentary clay with well marked cleavage parallel to the bedding.

2.01.26. **Sieve**--An apparatus in which the apertures are square for separating sizes of material.

2.01.27. **Sieve Analysis**--Analysis of aggregates by sieves in accordance with "Sieve Analysis of Fine and Coarse Aggregates," ASTM Designation C 136.

2.01.28. **Slump**--The settlement of the top surface of a truncated cone of freshly mixed concrete as determined in accordance with the "Test for Slump of Portland Cement Concrete," ASTM Designation C 143.

2.01.29. **Surface Clay**--An unconsolidated, unstratified clay, occurring on the surface.

2.01.30. **Surface Moisture**--All water carried by the aggregate other than that absorbed by the aggregate particles.

2.01.31. **Viscosity**--The measure of the resistance to flow of bituminous material expressed as the number of seconds required for a given volume of the material to flow through a given orifice at a given temperature.

2.01.32. **Water Cement Ratio**-- The ratio of the amount of water, exclusive only of that absorbed by the aggregates, to the amount of cement in a concrete or mortar mixture; preferably stated as a decimal by weight.

2.01.33. **Standard Drawings and/or Standard Specifications**--Whenever any reference is made to a standard drawing and/or standard specification of any agency or authority, it shall mean the latest edition or revision in effect at the time of invitation to bid.

SECTION 2.02 - Aggregate - Coarse (Broken Stone and Gravel)

2.02.1. This section describes Coarse Aggregate.

2.02.2. (A) Coarse aggregate shall consist of crushed stone, crushed gravel, screened gravel, or crushed air-cooled blast furnace slag, conforming to the requirements of these specifications. Coarse aggregate shall be of the following types:

Type 1--Broken Stone
Type 2--Gravel

(B) Type 1 shall be of the following grades:

Grade A--Highly Resistant to Abrasion
Grade B--Moderately Resistant to Abrasion

Type 2 shall be of Grade B--Moderately resistant to abrasion.

(C) Coarse aggregate shall be of the size numbers and nominal sizes shown in Tables 2.02-I and 2.02-II.

(D) Type, grade, size number and corresponding nominal size shall be as specified.

2.02.3. (A) GENERAL REQUIREMENTS

Type 1 aggregate shall be broken, clean, hard, unweathered stone of uniform quality. It shall consist of fragments roughly cubical or pyramidal in shape and shall be crushed from ledge rock.

Type 2 aggregate shall be crushed and/or uncrushed, clean, washed, sound, hard gravel of uniform quality. It shall be free from injurious amounts of soft, thin, elongated, weathered or decomposed pieces, loam, clay lumps, organic or other foreign matter.

(B) SIEVE ANALYSIS

Coarse aggregate of each size number shall comply with the requirements of Tables 2.02-I and 2.02-II.

(C) OTHER TEST REQUIREMENTS

Coarse aggregate shall comply with the following requirements:

	Percent Loss by Weight-Maximum	
	Grade A	Grade B
Los Angeles Machine Test	28	40
*Soundness, by magnesium sulfate test, after five cycles	10	10

**The soundness test shall be made only when required by the Engineer.*

TABLE 2.02-I - COARSE AGGREGATE - SIEVE ANALYSIS

Percent By Weight Passing Sieves (Square Sieve Openings)

Size No. (ASTM) (C 33)	Nominal Size (inches) (except) (as) (noted)	4 inch	3-1/2 inch	3 inch	2-1/2 inch	2 inch	1-1/2 inch	1 inch	3/4 inch	1/2 inch	3/8 inch	#4	#8	#16
1	3-1/2 to 1-1/2	100	90-100	-	25-60	-	0-15	-	0-5	-	-	-	-	-
2	2-1/2 to 1-1/2	-	-	100	90-100	35-70	0-15	-	0-5	-	-	-	-	-
3	2 to 1	-	-	-	100	90-100	35-70	0-15	-	0-5	-	-	-	-
357	2 to #4	-	-	-	100	95-100	-	35-70	-	10-30	-	0-5	-	-
4	1-1/2 to 3/4	-	-	-	-	100	90-100	20-55	0-15	-	0-5	-	-	-
467	1-1/2 to #4	-	-	-	-	100	95-100	-	35-70	-	10-30	0-5	-	-
5	1 to 1/2	-	-	-	-	-	100	90-100	20-55	0-10	0-5	-	-	-
56	1 to 3/8	-	-	-	-	-	100	90-100	40-85	10-40	0-15	0-5	-	-
57	1 to #4	-	-	-	-	-	100	95-100	-	25-60	-	0-10	0-5	-
6	3/4 to 3/8	-	-	-	-	-	-	100	90-100	20-55	0-15	0-5	-	-
67	3/4 to #4	-	-	-	-	-	-	100	90-100	-	20-55	0-10	0-5	-
7	1/2 to #4	-	-	-	-	-	-	-	100	90-100	40-70	0-15	0-5	-
8	3/8 to #8	-	-	-	-	-	-	-	-	100	85-100	10-30	0-10	0-5
*EF	#4 to #8	-	-	-	-	-	-	-	-	-	100	50-80	5-20	0-5

** NOTE: Size No. EF used in mixes for bituminous park sidewalks, tennis courts, playgrounds, etc.*

TABLE 2.02-II - SCREENINGS AND STONE BASE MIXES

Percent By Weight Passing Sieves (Square Sieve Openings)

Type of Mix	Nominal Size	2 inch	1 inch	1/2 inch	3/8 inch	#4	#8	#100	#200
Screenings	#4 to #200	-	-	100	50-100	-	40-70	8-15	-
Dense Graded Stone Base	1" to #200	100	80-100	-	-	25-60	-	-	0-10
Dense Graded Gravel Base*	1" to #200	100	80-100	-	-	25-60	-	-	4-12

**NOTE: Gravel base mix to have Plasticity Index of 0-5, as determined in accordance with ASTM Designation D 4318.*

SECTION 2.03 - Asphalt, Liquid

2.03.1. This section describes Liquid Asphalt.

2.03.2. (A) Rapid curing liquid asphalt shall be of the following grades:

Grade	Recommended Uses (See ASTM Designation D 2028)
RC-70	Surface Treatment, Seal, Carpet Coat and Cold Mix
RC-250	Bitumen-sand Bed, Cold Laid Plant Mix
RC-800	Road Mix

(B) Medium curing liquid asphalt shall be of the following grades:

Grade	Recommended Uses (See ASTM Designation D 2027)
MC-30	Priming Material, Temporary Surfacing
MC-70	Surface Treatment Binder
MC-250	Surface Treatment Binder, Cold Laid Plant Mix
MC-800	Cold Laid Plant Mix, Open or Dense Aggregate

(C) Grade shall be as specified.

2.03.3. (A) Liquid asphalt shall be a product of fluxing an asphaltic residuum with a distillate.

(B) Liquid asphalt made from an asphalt whose value for paving purposes has not been demonstrated by practical experience in the United States will not be accepted.

2.03.4. Liquid asphalt shall be homogeneous, free from water and shall comply with the requirements for the corresponding grade of ASTM Designation D 2028, Rapid Curing, and Designation D 2027, Medium Curing.

SECTION 2.04 - Asphalt, Emulsified

2.04.1. This section describes Emulsified Asphalt.

2.04.2. (A) Emulsified asphalt shall be of the following types:

RS-1 Quick-setting, low consistency, for penetration and surface treatment.

RS-2 Quick-setting, high consistency, for surface treatment only, particularly for high crowned or steep graded surfaces.

MS-1 Medium-setting, low consistency, for retread mixes with coarse aggregate.

MS-2 Medium-setting, medium consistency, for plant mixes with coarse aggregate.

MS-3 Medium-setting, high consistency, for heavy pre-mix with coarse aggregate.

(B) Type shall be as specified.

2.04.3. (A) Emulsified asphalt shall be a liquid mixture in which minute globules of bitumen are held in suspension in water or in a watery solution.

(B) Emulsified asphalt shall show no separation of asphalt after thorough mixing, within thirty (30) days after delivery, provided separation has not been caused by freezing. Asphalt separation caused by freezing is unacceptable at any time.

(C) Emulsified asphalt made from an asphalt whose value for paving purposes has not been demonstrated by practical experience in the United States will not be accepted.

2.04.4. Emulsified asphalt shall comply with the requirements of ASTM Designation D 977.

SECTION 2.05 - Asphaltic Cement

2.05.1. This section describes Asphaltic Cement for use in the construction of pavements.

2.05.2. Asphaltic cement shall be Viscosity Grade AC-10 or AC-20, meeting the requirements given in Table 2.05-I. Alternatively, Asphaltic Cement meeting the requirements of NYS DOT Standard

Specifications, latest version, Section 702, grades PG58-28 or PG64-22 may be used. Unless otherwise specified, Viscosity Grade AC-10 (or PG58-28) shall be used.

2.05.3. (A) Asphaltic cement shall be either fluxed natural asphalt or residual asphalt derived from the distillation of asphaltic petroleum.

(B) Asphaltic cement whose value for paving purposes has not been demonstrated by practical experience in the United States will not be accepted.

2.05.4. (A) Asphaltic cement shall comply with the requirements of ASTM Designation D 946, except that the ductility test shall be run at 60 degrees Fahrenheit and that the petroleum derivative in the Spot Test (Oliensis) with standard naphtha solvent in 24 hours shall be negative.

TABLE 2.05-I ASPHALT CEMENT

VISCOSITY GRADE	AC-10		AC-20	
Test Requirements	Min.	Max.	Min.	Max.
Viscosity, 140 F (60C), poises	800	1,200	1,600	2,400
Viscosity, 275 F (135C), cSt	250*	-	300**	-
Penetration, 77 F (25C), 100g., 5 sec.	70*	120	60**	100
Flash Point, COC, F (C)	425 (219)	-	450 (232)	-
Solubility in Trichloroethylene, %	99	-	99	-
Test on residue from Thin-film oven test (TFOT):				
Viscosity, 140 F (60 C), P	-	5,000	-	10,000
Loss on heating, %	-	0.50	-	0.50
Ductility, 77 F (25 C), 5 cm./min., cm.	75*	-	50**	-
Viscosity Ratio: poises @ 140F (60C) after TFOT / poises @ 140F (60C) before TFOT	-	4***	-	4***

NOTE * For asphalt cements refined from Domestic Mid-continent or Canadian crudes, the following limits shall apply: Visc., 275F, Cs. - 200 min.; Pen. 77F, 100g, 5 sec. - 60 min.; and TFOT residue Duct. 60F, 5 cm./min. - 10 min.

NOTE ** For asphalt cements refined from Domestic Mid-continent or Canadian crudes, the following limits shall apply: Visc., 275F, Cs. - 250 min.; Pen 77F, 100g., 5 sec. - 50 min.; and TFOT residue Duct. 60F, 5 cm./min. - 5 min.

NOTE *** For asphalt cements refined from Boscan crude, the following limits shall apply: Viscosity Ratio - 5 max.

SECTION 2.06 - Block, Granite

2.06.1. This section describes Granite Block.

2.06.2. (A) Granite blocks shall be of the following grades:

Grade 1--Standard five (5”) inch
Grade 2--Redressed

(B) Grade shall be specified.

2.06.3. (A) GENERAL REQUIREMENTS

Blocks shall be of fine or medium grained granite showing an even distribution of constituent minerals. They shall be of uniform quality and texture throughout, and free from seams or disintegrated materials.

Color shall be gray, unless otherwise specified or required to match existing savaged block.

(B) ABRASIVE RESISTANCE

Blocks shall show a loss by the Los Angeles Machine Test of not more than thirty-two (32%) percent by weight. The test shall be made on hand-broken, approximately cubical fragments.

(C) SIZE

Blocks shall be of the following sizes:

	Grade 1 -- Standard Five (5”) inch			Grade 2 -- Redressed		
	Dimensions, Inches	Tolerance, Plus or Minus, Inches		Dimensions, Inches	Tolerance, Plus or Minus, Inches	
Length	9 to 10-1/2	1/2”	1”	8-1/2	2-1/2”	2-1/2”
Width	4 to 4-1/2	1/2”	0”	4	1/2”	3/4”
Depth	4 to 5	1/2”	0”	4-1/2	1”	3/4”

Each delivery of Grade 1 Blocks shall average not less than ten (10”) inches in length.

When blocks of special size are required, the dimensions and permissible tolerances shall be as specified.

(D) DRESSING

Blocks shall be so dressed that each face is approximately a rectangle and adjacent faces are approximately at right angles to each other.

Blocks shall have no depressions greater than three-eighths (3/8”) inch on the top and for one (1”) inch down from the top on the ends and sides, as measured from the edge of a square laid in any direction.

The top one (1”) inch of the blocks shall be of the length and width specified and below the top one (1”) inch the dimensions of any block shall not exceed the dimensions of the top one (1”) inch. No side or end shall be more than one-half (1/2”) inch off the rectangle.

Upon examination of one (1) percent of a delivery, not less than eighty-five (85) percent of all blocks so examined shall comply with the above requirements for dressing.

No drill holes shall be permitted in the wearing surfaces of the blocks and not more than ten (10) percent of the blocks shall show drill holes or bull wedge marks along the top edges.

Blocks shall be inspected either (a) at the quarry or plant, or (b) at the dock or siding as unloaded, before delivery on the street, or (c) at both locations.

If the sample taken does not comply with the requirements for size and dressing, the Engineer may, at his discretion, permit an inspection of a second sample lot equal in number to the first, and, if this lot is satisfactory, may accept the shipment. All deliveries will be subjected to further inspection at the place of use, and blocks which do not comply with the specification requirements will be rejected.

SECTION 2.07 (NO TEXT)

SECTION 2.08 - Calcium Chloride

2.08.1. This Section Describes Calcium Chloride.

2.08.2. Calcium Chloride shall comply with the requirements of ASTM Designation D 98.

SECTION 2.09 - Admixtures

2.09.1. This section describes material requirements for air-entraining, water-reducing and retarding, and water-reducing admixtures used in the manufacture of Portland Cement concrete.

2.09.2. All admixtures shall be in liquid form having a consistency that flows readily. The admixtures shall not contain chemicals which, when mixed with concrete, produce a condition that is injurious to the quality and durability of the concrete or reinforcing steel. This applies specifically to compounds which, when used in manufacturing process, produce a significant amount of chloride ions in the final product. Admixtures manufactured from carbohydrates such as sucrose (table sugar), glucose, and maltose when used alone will not be permitted.

Approval of any manufactured product or brand of concrete admixture shall be obtained from the Engineer prior to use. The concrete admixture shall be added to the concrete mix in accordance with the manufacturer's recommendations. The air content in the concrete mix shall comply with the requirements of **Section 3.05, Concrete**.

2.09.3. (A) AIR-ENTRAINING

The air-entraining agent shall entrain air in the concrete and the concrete containing an air-entraining agent shall conform to the following requirements:

1. Bleeding. The bleeding of concrete made with the admixture under test shall not exceed that of concrete made with the reference admixture by more than two (2) percentage points, the bleeding being computed as a percentage of the net amount of mixing water in each concrete. The net mixing water is the water in excess of that present as absorbed water in the aggregate.

2. Time of Setting. The initial time of setting of concrete containing the admixture under test shall not deviate from that of the concrete made with the reference admixture by more than ±1 hour and 15 minutes.

3. Compressive Strength. The compressive strength of concrete containing the admixture under test shall be not less than 90 percent of that of similar concrete containing the reference admixture at 48 hours, 7 days, and 28 days.

4. Resistance to Freezing and Thawing. The hardened concrete containing the admixture under test shall not exceed a weight loss of 4.0 percent in 25 cycles in a 10% NaCl solution.

5. Length Change. The length change on drying of concrete containing the admixture under test shall not be greater than ±20 percent of that of similar concrete without the admixture under test. The specimens shall be moist cured for 14 days followed by 14 days of air drying. Length changes shall be based on initial measurements taken at the time of removal of the specimens from the molds and final measurements shall be taken at the end of the 14 days of air drying.

(B) WATER-REDUCING AND RETARDING ADMIXTURES

The water-reducing and retarding admixtures shall reduce the quantity of mixing water required to produce concrete of a given consistency, and retard the setting of concrete. Concrete containing this admixture shall conform to the following requirements:

1. Water Reduction. The mixing water required for concrete containing the admixture under test shall be reduced at least five (5.0%) percent when compared to that of the reference concrete without the admixture under test.

2. Time of Setting. The initial set time of the concrete containing the admixture under test shall be increased by at least fifty (50%) percent when compared to that of the reference concrete without the admixture under test.

3. Compressive Strength. The compressive strength of the concrete containing the admixture under test when compared to concrete without the admixture under test, shall be equal or greater at 48 hours, 7 days, and 28 days.

4. Resistance to Freezing and Thawing. The hardened concrete containing the admixture under test shall not exceed a weight loss of 4.0 percent in 25 cycles in a 10% NaCl solution.

5. Length Change. The length change on drying of concrete containing the admixture under test shall not be greater than ±35 % of that of similar concrete without the admixture under test. The specimens shall be moist cured for 14 days followed by 14 days of air drying. Length changes shall be based on initial measurements taken at the time of removal of the specimens from the molds and final measurements shall be taken at the end of the 14 days of air drying.

(C) WATER-REDUCING ADMIXTURES

The water-reducing admixtures shall reduce the quantity of mixing water required to produce concrete of a given consistency. Concrete containing this admixture shall meet the requirements of the water-reducing and retarding admixtures above except that the time of setting of the concrete containing the admixture under test shall not deviate from that of similar concrete without the admixture under test used as a reference by more than $\pm$1 hour and 15 minutes.

(D) SAMPLING AND TESTING.

A quart sample of admixture shall be submitted to the Engineer by the manufacturer applying for approval. Along with the sample, the manufacturer shall include data from tests performed in accordance with these specifications. Data from tests performed in accordance with ASTM C 260 for air-entraining agents and ASTM C 494 for water-reducing and retarding admixtures and water reducing admixtures may be substituted.

In addition to sample and test data, information on the formulation of the product, including the raw materials from which it is compounded and a description of the manufacturing process, shall be submitted.

Only for purposes of testing the acceptability of a retarder, a maximum reduction of five (5%) percent in minimum compressive strength will be allowed for concrete treated with a concrete retarder as compared to concrete which is not treated with a concrete retarder. In no event shall the concrete treated with a concrete retarder or concrete colored with pigment have a minimum compressive strength less than the compressive strengths as specified in **Section 3.05, Concrete**.

The Department reserves the right to monitor the performance of any previously approved admixture. Samples of admixture may be taken from actual concrete operations and may be tested by the Department's Quality Assurance and Construction Safety Bureau or its agent.

(E) BASIS OF ACCEPTANCE.

The approval of the admixture shall be based upon the submitted information and tests performed by the Department's Quality Assurance and Construction Safety (QACS) Bureau. Upon approval by the Department's QACS Unit, the name of the product will be placed on the Department's Approved List. Such products shall then be accepted on the basis of the brand name labeled plainly on the containers.

Any admixture sampled from actual concrete operations and retested by the Department's QACS Unit shall give substantially the same results, at the same dosage rates, as the original tests. Any significant change will be cause for rejection of that material and may require a resubmission of the admixture by the manufacturer for a complete retest to determine specification compliance. The admixture may be withdrawn from the Approved List during the retest period.

2.09.4. The cost of all labor, materials and equipment required to incorporate concrete admixtures in the work shall be included in the contract prices for the respective items under which the concrete admixture is used.

SECTION 2.10 - Cement, Portland

2.10.1. This section describes Portland Cement.

2.10.2. (A) Portland Cement shall comply with the requirements of ASTM Designation C 150 and shall be of the following types:

Type I	Normal
Type IA	Air-entraining Normal
Type II	Moderate Sulphate Resistant
Type IIA	Air-entraining Moderate Sulphate Resistant
Type III	Moderate Sulphate Resistant for High Early Strength Concrete
Type IIIA	Air-entraining Moderate Sulphate Resistant for High Early Strength Concrete
Type V	High Sulphate Resistant

(B) Type shall be as specified.

2.10.3. (A) Portland Cement shall be uniform in color. The brand shall have an established reputation of uniformity of character and have been successfully used in the United States for at least two (2) years unless otherwise approved by the Engineer.

(B) Portland Cement shall be stored in such a manner as to permit easy inspection and to protect the cement from dampness and minimize warehouse set.

SECTION 2.11 (NO TEXT)

SECTION 2.12 - Curbs and Headers, Granite and Bluestone

2.12.1. This section describes Granite and Bluestone Curbs and Headers for streets and highways.

2.12.2. (A) Curbs and headers shall be of the types and corresponding classes shown in the following Table:

CURBS AND HEADERS

Type	Description	Class	Size, Inches Box Dimensions
1	Granite Curb	Class A	6 x 16
2	Granite Curb	Class A	5 x 16
3	Granite Curb	Class B	5 x 16
4	Granite Curb	Class B	6 x 16
5	Bluestone Curb	Class A	5 x 16
6	Bluestone Curb	Class B	5 x 16
7	Granite Header	-------	4 x 12
8	Granite Header	-------	6 x 12
9	Bluestone Header	-------	4 x 12

(B) Type shall be as specified.

2.12.3. (A) GENERAL REQUIREMENTS

Granite curbs and headers shall be of fine or medium grained granite showing an even distribution of constituent minerals. They shall be of uniform quality, color and texture throughout, and free from seams or disintegrated materials.

Bluestone curbs and headers shall be of tough, sound, durable, fine-grained sandstone or quartzite. They shall be uniform in color, and free from injurious seams and other imperfections.

(B) ABRASIVE RESISTANCE

Curbs and headers shall show a loss by the Los Angeles Machine Test as follows:

Granite . . . . . 32 percent maximum
Bluestone . . . . . 25 percent maximum

The test shall be made on hand-broken, approximately cubical fragments.

(C) DIMENSIONS

Dimensions shall be in conformity with the following table:

DIMENSIONS OF CURBS AND HEADERS

Type	Description	Length in Feet* Straight	Length in Feet* Curved	Matched Top Width Inches	Bottom Width Minimum Inches	Depth** Inches	Depth Tolerance Inches
1	Granite Curb	4-12	3-8	6	4	16	±1
2	Granite Curb	4-12	3-8	5	3	16	±1
3	Granite Curb	4-12	3-8	5 ±1/4	3	16	±1
4	Granite Curb	4-12	3-8	6 ±1/4	4	16	±1
5	Bluestone Curb	3-8	3-8	5	3	16	±1
6	Bluestone Curb	3-8	3-8	5 ±1/4	3	16	±1
7	Granite Header	3-5	---	4	3	12 min.	---
8	Granite Header	3-5	---	6	3	12 min.	---
9	Bluestone Header	3-5	---	4	3	12 min.	---

** At least eighty (80%) percent of straight curb shall be furnished in the longest length specified. At least eighty (80%) percent of corner curb shall be furnished in lengths of four (4') feet or greater. At least eighty (80%) percent of transition curb (straight or curved) at corners shall be furnished in lengths of five (5') feet or greater.*

***Depth shall be the distance between parallel lines at the top and bottom extremities, normal to the face of the curb or header.*

(D) CUTTING AND DRESSING

Curbs of all types shall be not less than the full box width for at least four (4") inches down from the top. They shall have the top and the front face out of wind. Unless otherwise specified, top of curbs shall be cut to a bevel of one (1) in twelve (12), bottom shall be roughly parallel to the top. Curbs shall be cut to

true radii for corners and curves; top ends adjacent to driveways shall be rounded or splayed, as specified; curbs adjacent to receiving basins or other structures shall be cut to special shapes, as specified.

Curbs of all types shall have the top sawed and dressed with a bush hammered or thermal finish, as specified, with no drill holes, and with no projections or depressions greater than one-eighth (1/8”) inch as measured from a straight edge along the length of the stone.

Back shall be dressed squared to the top for a depth of not less than one (1”) inch. Below that point the back face may have the natural quarry face, with no projections greater than one-half (1/2”) inch and no depressions greater than one (1”) inch down to a point four (4”) inches below the top, and with depressions or projections not greater than one and one-half (1-1/2”) inches for the remaining depth.

Ends shall be dressed radially for curved curbs, and dressed squared to the top and face for straight curbs.

Granite and bluestone curb of Class A shall have the front face sawed and dressed like the top for a depth of ten (10”) inches below the top. The remaining depth shall have no projections or depressions greater than one and one-half (1-1/2”) inches.

Ends of Class A granite and bluestone curb shall be cut square down for their full width to a line at least four (4”) inches below the top and for six (6”) inches below this line, one (1”) inch in from the front face of the stone, so as to give a joint not greater than one-quarter (1/4”) inch. The remaining end area shall have no slackness greater than one (1”) inch and no projections.

Granite curb of Class A shall have the top front edge dressed to a one (1”) inch radius or to a well-defined arris, as specified, and the top back edge dressed to a well-defined arris. Bluestone curb of Class A shall have top front and top back edges pitched true to well-defined arrises.

NY Historical granite curb and bluestone curb of Class B shall have the front face quarry split. For a distance of ten (10”) inches below the top, the front face shall have no drill holes and shall have all projections greater than one-half (1/2”) inch pointed off.

Ends of NY Historical granite curb and bluestone curb shall be cut square down for their full width to a line at least ten (10”) inches below the top. The remaining end area may break back not over eight (8“) inches and have no projections greater than the length of curb, so as to give a joint not greater than one-quarter (1/4”) inch.

NY Historical granite curb of Class B shall have the top front edge dressed to a one (1”) inch radius or to a well-defined arris, as specified, and the top back edge dressed to a well-defined arris. Bluestone curb of Class B shall have top front and top back edges pitched true to well-defined arrises.

Granite headers shall be dressed or sawn on top to a surface free from irregularities greater than one-quarter (1/4”) inch and free from drill holes.

Bluestone headers shall be dressed on top to a surface free from irregularities greater than three-eighths (3/8”) inch and free from drill holes.

Granite and bluestone headers shall have the sides quarry split or sawn. For a distance of six (6”) inches below the top they shall be not less than the full box width, with no projections on the sides greater than three-quarters (3/4”) inch. Sides of bluestone headers shall be free from bunches.

Granite and bluestone headers shall have the ends cut square down to give a joint not greater than one-quarter (1/4”) inch for their full width for a depth of at least four (4”) inches below the top. The remaining end area shall be pitched off to have no slackness greater than one (1”) inch. Both top edges shall be pitched true to well-defined arrises.

SECTION 2.13 - Curb--Steel Facing

2.13.1. This section describes Steel Facing for Concrete Curbs.

2.13.2. Steel facing shall be Type D -- Bent Plate.

2.13.3. (A) Type D -- Bent plate facing shall be of the thickness and bent to the dimensions shown on the Standard Steel Curb detail.

(B) Each length of straight steel facing shall be twenty (20') feet, unless otherwise specified or provided.

If straight steel facing cannot be fabricated in single twenty (20') feet lengths, two (2) lengths ten (10') feet long shall be butt-welded to provide a center-welded twenty (20') feet length. Center-welded lengths shall be straight and true in all planes, unless otherwise required and directed by the Engineer. Welds which will be exposed after installation shall be ground flush with adjacent metal.

(C) Curved steel facings shall be bent to a twelve (12') feet radius, unless othewise shown on the plans or directed by the Engineer, and provided with straight tangents at the ends three (3') feet in length, unless otherwise specified or provided. All curved steel facing shall be shop fabricated.

(D) Special steel facing for drop curbs, splays, etc., shall be fabricated as shown on the plans. If the length exceeds twenty (20') feet, the steel facing shall be spliced by welding at the point indicated on the plans.

(E) Anchors provided for securing the steel faced curb in position shall be of such shape and size and attached in such manner and at such points as designated on the plans.

(F) Unless otherwise specified, steel shall comply with the requirements of ASTM Designation A 36.

The Contractor may be required to furnish mill certificates which shall certify that the materials furnished comply with the requirements of the reference specifications.

2.13.4. All surfaces of steel facing, including anchors, fastenings, etc., shall be thoroughly cleaned of all rust, oil, grease, scale, or foreign matter and painted with one (1) shop coat of Primer. All steel facing which will be exposed to view after installation shall be given one (1) shop coat of Intermediate and one (1) shop coat (rolled field coat permitted) of Finish topcoat. The color of the Finish paint shall be gray, as approved by the Engineer. All paints shall be applied in compliance with the paint manufacture's data sheets. All components of paint shall be compatible and supplied by a single manufacturer. Prior to field painting, the surfaces to be painted shall be clean, dry, and lightly sand papered.

Approved paint types and their manufacturers shall be as listed in the NYS Department of Transportation's, Materials and Equipment Approved List for "A. STRUCTURAL STEEL PAINTS CLASS 1 (708-01)".

SECTION 2.14 - Curing Materials

2.14.1. This section describes membrane curing materials.

2.14.2. (A) Membrane curing shall be of the following types:

Type 1-D, Clear or translucent with fugitive dye. Shall be used at the rate of one hundred fifty (150) square feet per gallon. It shall be sprayed on sidewalks, curbing, walks and other exposed concrete surfaces.

Type 2, White Pigmented. Shall be sprayed at the rate of two hundred (200) square feet per gallon. It shall be used on cement concrete pavements.

Type 3, Tinted to Match Pigmented Concrete. Shall be sprayed at the rate recommended by the Pigment Admixture manufacturer. It shall be used on integrally colored concrete pavements, sidewalks, curbs, and other exposed concrete surfaces.

Type 4, Bituminous. Shall be sprayed at the rate of one hundred (100) square feet per gallon. It shall be used on all base concrete.

(B) Type shall be as specified. All curing compounds shall be sprayed prior to the hardening of the concrete and just after the water sheen has disappeared.

2.14.3. (A) Membrane curing materials Type 1-D and 2 shall comply with ASTM Designation C 309 for Type 1-D and 2, respectively.

(B) Membrane curing materials Type 3 shall be of a type recommended by the Pigmented Admixture manufacturer and shall conform to both ASTM C 309 and all local, State and Federal regulations concerning volatile organic compounds (VOC).

(C) Type 4, Bituminous Curing Material, shall comply with the requirements of **Section 2.03**, Grade RC-70, Liquid Asphalt, or **Section 2.04**, Type RS-1, Emulsified Asphalt. RS-1 shall be used when the ambient temperature is 40° Fahrenheit and over. RC-70, Liquid Asphalt, shall be used when ambient temperature is below 40° Fahrenheit.

2.14.4. The concrete shall be cured in such a manner as to give a non-glaring surface by an application of curing material as soon as possible after free surface water has disappeared from the finished surface, before the concrete shows any signs of excessive drying as evidenced by lighter surface color or by the appearance of surface cracks or checks.

Curing material shall be applied by means of approved spraying equipment as a fine mist or spray in such manner as not to mar the surface and to form a continuous, uniform water-impermeable film.

Single-spray equipment of an approved type will be permitted if the coverage secured is even and satisfactory to the Engineer. On any work where the coverage is not even or is, for any reason, unsatisfactory to the Engineer, multiple-spray equipment of an approved type must be used.

SECTION 2.15 - Filler, Expansion Joint, Preformed

2.15.1. This section describes Preformed Expansion Joint Filler.

2.15.2. (A) Preformed expansion joint filler shall be nonextruding, and shall be of the following types:

Type I -- Sponge rubber, conforming to ASTM Designation D 1752, Type I
Type II -- Cork, conforming to ASTM Designation D 1752, Type II
Type III -- Self expanding cork, conforming to ASTM Designation D 1752, Type III
Type IV -- Bituminous fiber, conforming to ASTM Designation D 1751

(B) Type shall be as specified.

(C) Type I, II or III shall be used in concrete pavements.

Type I shall be used in structures.
Type IV shall be used in sidewalk and curbing.

SECTION 2.16 - Filler, Joint; Asphaltic, Blown

2.16.1. This section describes Asphaltic Joint Filler.

2.16.2. Asphaltic Joint Filler shall be of the blown type.

2.16.3. (A) Joint filler shall consist of asphaltic cement derived from the distillation of asphaltic petroleum and blown to obtain the desired characteristics.

(B) Joint filler made from an asphalt whose value for paving purposes has not been demonstrated by practical experience in the United States will not be accepted.

2.16.4. Asphaltic Joint Filler shall be homogeneous and free from water. It shall not foam when heated to 350° Fahrenheit, and shall comply with the following requirements:

Flash Point ^{o}F., Minimum 469

Softening Point ^{o}F. (Ring-and-Ball Method) . . . . . 167 to 185

Penetration:

32°F., 200 g., 60 sec., Minimum 15
77°F., 100 g., 5 sec. . . . . 30 to 40
115°F., 50 g., 5 sec., Maximum 80

Loss on Heating at 325°F., 5 hrs.-- percent, Maximum 1.0

Total Bitumen -- Soluble in Carbon Disulfide or
Chloroform, percent, Minimum 99

Proportion of Bitumen -- Soluble in Carbon
Tetrachloride, percent, Minimum 99

Ductility at 77°F. -- cms., Minimum 3

SECTION 2.17 - Iron Castings, Gray and Malleable

2.17.1. This section describes Gray Iron and Malleable Iron Castings.

Gray Iron and malleable iron are not to be used for valves, cast iron pipe or castings subject to high temperatures.

2.17.2. KIND.

(A) Iron castings shall be of the following types:

Type 1 - Gray Iron Castings
Type 2 - Malleable Iron Castings

(B) Gray iron castings shall be at least Class No. 30B, ASTM A 48, with a minimum tensile strength of thirty thousand (30,000) pounds per square inch. The flexural test described in ASTM A 377 shall be the primary test used in testing the iron. The Engineer, however, may require that the tensile test be made.

(C) Malleable iron shall be Grade 32510, ASTM A 47.

(D) The iron shall be such as will make castings which are of close and even grain and easily machined.

2.17.3. SIZE, WEIGHT AND LOT NUMBER.

(A) Castings shall conform to either the drawings or patterns or both as specified.

(B) The weight of each casting shall be conspicuously painted thereon in white oil paint.

(C) Each casting shall have the initials of the manufacturer's name, the date of manufacture and the initials of the plant of manufacture integrally cast on it at time of manufacture.

2.17.4. WORKMANSHIP AND FINISH.

(A) Casting shall be true to pattern, free from cracks, gas holes, flaws and excessive shrinkage. Surfaces of castings shall be free from burnt on sand and shall be reasonably smooth after cleaning. Runners, risers, fins and other cast on pieces shall be removed. Plugging and filling will not be allowed.

(B) When "machining" is specified or shown on the drawings, it shall mean the use of a machine or machines having cutting tool or tools to produce such surfaces and dimensions to a true and even surface.

(C) The underside of the seating rim of manhole covers shall be machined. The upper side of the cover seating rims of manhole heads shall also be machined.

2.17.5. CHEMICAL AND PHYSICAL REQUIREMENTS.

(A) Gray iron castings shall comply with the requirements of ASTM Designation A 48.

(B) Malleable iron castings shall comply with the requirements of ASTM Designation A 47.

(C) When a particular chemical composition is required in gray iron castings, it shall be as specified.

SECTION 2.18 - Mineral Dust

2.18.1. This section describes Mineral Dust.

2.18.2. Mineral Dust shall be of one grade.

2.18.3. (A) Mineral Dust shall be limestone or other approved dust. It shall be thoroughly dry when delivered and shall contain not more than 50% free silicon dioxide and conform to the following requirements:

Dust shall have a record of satisfactory performance in pavements for not less than three (3) years.

It shall be uniform in quality, satisfactorily reduce voids, produce density, stability and durability in the pavement according to tests as described in Asphalt Institute Research Bulletin No. 1, and any other tests approved by the Engineer.

The use of dusts of a siliceous nature shall conform to the requirements of Industrial Bulletin No. 33 of the New York State Department of Labor, Board of Standards and Appeals.

(B) Mineral Dust shall comply with the following sieve analysis:

Passing No. 30 Sieve	100%
Passing No. 200 Sieve	70% - 100%

SECTION 2.19 - Pigmented Admixture for Portland Cement

2.19.1. This section describes Pigmented Admixture for coloring Portland cement mixtures.

2.19.2. It shall be certified by the manufacturer that the Pigmented Admixture shall consist of pure synthetic mineral oxide only, and shall comply with ASTM Designation C 979 and the requirements of ACI 316.

The Pigmented Admixture shall produce a color equivalent to that required under Subsection 4.13.4.(H) and the standards on file at the office of the New York City Department of Design and Construction, Division of Infrastructure, 30-30 Thomson Avenue, Long Island City, New York 11101 and the Office of New York City Landmarks Preservation Commission, unless otherwise specified.

2.19.3. (A) The Pigmented Admixture manufacturer shall certify that when used at the recommended dosage, the pigmented admixture has no effect on or increases the compressive strength of the concrete by 5-10% when compared with a control batch of the same mix design and slump but without the Pigmented Admixture. Testing shall be done at 28 days after depositing, and shall be measured in pounds per square inch. The test results shall be an average of at least three (3) cores or cylinders per test.

(B) Calcium Chloride shall not be used in the composition of the admixture nor in the composition of the concrete.

(C) The Pigmented Admixture shall be packaged by the manufacturer in incremental amounts by weight for a single cubic yard of concrete, with the designated dosage clearly marked on each package.

2.19.4. (A) Air entraining agent complying with ASTM Designation C 260 shall be used in combination with the Pigmented Admixture.

Water reducering admixtures comply with ASTM Designation C 494 may also be used in combination with the Pigment Admixture as per the Pigment manufacturer's instructions.

(B) No other agents or admixtures shall be used with the Pigmented Admixture in the concrete, unless stated in writing by the manufacturer of the Pigmented Admixture to be of no consequence to the colorfastness of the concrete mixture.

(C) The Pigmented Admixtures shall be mixed and delivered in accordance with ASTM Designation C 94. The quantity of concrete being mixed in a mixer shall be no less than 40% of the capacity of the mixing drum (a minimum of 4 yards in a 10-yard truck). Before placing the Pigmented Admixture in a mixer drum, the drum must be thoroughly cleaned and wetted with approximately 35 gallons of mix water and a portion of the aggregate added. This mixture shall mix for 3-4 minutes while the truck hopper and fins are washed with 5 gallons of water. After adding the remainder of the concrete to the truck, the load shall mix at mixing speed for a minimum of 80 revolutions or 10 minutes.

At the Contractor's option, Pigmented Admixtures may be added at the site, in which case:

The truck shall be charged and mixed at the plant, as previously specified, with the required cement, aggregate and admixtures (excluding pigmented admixtures), but only eighty (80%) percent to ninety (90%) percent of the required water shall be added. The truck shall leave the plant with 0 revolutions on its counter.

Once the truck arrives on site, the remaining water and the Pigmented Admixture shall be added and the load mixed a minimum of 90 revolutions.

Concrete will then be sampled and tested. If the consistency of the mix is not acceptable, additional water may be added not more that twice and mixing resumed for 30 revolutions each time. Once the mix is acceptable, it shall be discharged directly into the forms.

The total number of revolutions allowable after the truck has left the plant shall not exceed 150 and the mix shall be discharged within 90 minutes from when the truck has left the plant in order to achieve the correct workability.

(D) The same type and brand of cement, source of sand and water/cement ratio shall be maintained for each load of concrete used in the entire project.

(E) The slump of the concrete shall remain consistent throughout the project at four (4") inches and should not exceed five (5") inches. If held-back water is added at the job site, the concrete should be mixed at mixing speed for an additional five minutes or 30 revolutions, whichever comes first, after addition of the water as per requirements of **Subsection 2.19A.4.(C)**, above, and before depositing.

(F) Before providing the following sample panel(s), the Contractor shall prepare pairs of 6 inch x 6 inch x 4 inch samples of pigmented concrete, one with and one without the color matched curing membrane. As many samples as necessary shall be produced until the color is satisfactory to the Engineer. The Contractor shall then furnish for approval and on site a concrete sample for each color specified using the Pigmented Admixture. The sample shall be at least 4' x 4' x 4" and shall be given the specified surface texture and cured with the methods specified for the concrete installation. The Contractor shall not order the admixture until the samples are approved by the Engineer. Once approved, the samples shall be used for assessing color conformance of pigmented concrete installed.

2.19.5. (A) Water must not be sprinkled or otherwise added to the surface of the slab during finishing. Evaporation retardants may be fog-sprayed provided they are not detrimental to the finished color of the concrete.

(B) Curing Membrane. If the concrete is pigmented as per this **Section 2.19**, the curing membrane shall be of the liquid-membrane forming type and shall be color-matched to the pigmented concrete. Additionally, the curing membrane shall be of a type recommended by the Pigmented Admixture manufacturer and shall conform to both ASTM C 309 and all local, State, and Federal regulations concerning volatile organic compounds (VOC). Plastic sheeting, burlap, paper, or other unspecified material shall not be used as a curing membrane.

2.19.6. Prior to making any field samples and the placing of any colored concrete, the Contractor, concrete supplier, Engineer-in-charge, and/or City representative shall meet and discuss methods of handling the colored concrete.

SECTION 2.20 (NO TEXT)

SECTION 2.21 - Fine Aggregate - Sand (for Asphalt, Concrete, Mortar and Plaster)

2.21.1. This section describes Sand.

2.21.2. (A) Sand shall be of the following types:

Type 1A -- Concrete Sand, Natural Sand
Type 2A -- Asphalt, Mortar and Plaster Sand; Natural Sand
Type 2B -- Asphalt Sand, Crushed Stone Sand

(B) Type shall be as specified. If type of Asphalt Sand is not specified, either Type 2A or Type 2B may be used.

2.21.3. (A) GENERAL REQUIREMENTS

Sand shall consist of clean, hard, durable, angular, rough-surfaced mineral particles.

If the sand is a crushed stone product, the original material from which it is derived shall show a loss of not more than twenty-eight (28) percent in the Los Angeles Machine Test.

(B) SIEVE ANALYSIS

Sand shall comply with the following requirements:

Sieve Number	Total Passing -- Percent by Weight Concrete Sand Type 1A	 Asphalt, Mortar and Plaster Sand Type 2A or Type 2B
3/8 inch	100	----
No. 4	95-100	100
No. 8	80-100	85-100
No. 16	50-85	45-85
No. 30	25-60	---
No. 50	5-30	10-30
No. 100	0-10	0-10
No. 200	0-3	---

(C) Fineness Modulus of all sands shall not vary more than plus or minus 0.20 from the first approved test sample.

(D) DELETERIOUS SUBSTANCES

Sand shall not contain any deleterious substances in excess of that shown in Table 1 of ASTM Designation C 33. The calculated quantity of sodium chloride in Type 1A sand shall not exceed three-tenths (0.3) of one percent, by weight.

(E) SOUNDNESS

For natural sand, intended for use in Portland cement mixtures, the loss by magnesium sulfate test after five (5) cycles shall not exceed ten (10) percent by weight. The soundness test shall be made only when required by the Engineer.

(F) ORGANIC IMPURITIES

Natural sand, intended for use in Portland cement mixtures, which, when subjected to the color test for organic impurities, produce a color in the sodium hydroxide solution darker than the standard color, will not be accepted, unless the subsequent test for structural strength indicates it to be suitable for use.

(G) STRUCTURAL STRENGTH

Natural sand, intended for use in Portland cement mixtures, when subjected to the mortar strength test, shall produce a mortar having a compressive strength at the age of three (3) days and seven (7) days of not less than ninety (90) percent of that developed by an Ottawa sand mortar when tested in accordance with ASTM Designation C 87.

SECTION 2.22 - Sealer, Concrete Expansion Joint, Elastic Type

2.22.1. This section describes Elastic Type Concrete Expansion Joint Sealer for sealing expansion and contraction joints in concrete pavements and structures. (For asphaltic joint filler see **Section 2.16**.)

2.22.2. Expansion sealer shall be of the following types:

Type 1 -- Hot poured sealer
Type 2 -- Cold application sealer

2.22.3. (A) Expansion joint sealer shall be a resilient and adhesive material which, when applied to the joints of concrete pavements and structures, will form an effective and continuous seal against infiltration of water through the joints during expansion and contraction.

(B) Type 1 Expansion Joint Sealer shall be suitable for melting in an oil jacketed kettle. When uniformly heated to a safe temperature, it shall melt to such a consistency that it can be readily poured into a horizontal joint one-half (1/2") inch in width. Upon cooling to atmospheric temperature, it shall adhere to the sides of the joint and shall not crack or break or separate from the sides of the joint when exposed to freezing temperatures and extended.

Type 2 Expansion Joint Sealer shall be capable of pouring or extruding at 70° Fahrenheit into joints one-quarter (1/4") inch in width. It shall be resilient and adhesive to concrete. It shall not flow from the joint or be picked up by vehicle tires at summer temperatures.

(C) Expansion joint sealer shall have at least one (1) year of field service satisfactory to the Engineer.

2.22.4. Type 1 -- Hot Poured Sealer shall comply with the requirement of ASTM Designation D 6690, Type III.

Type 2 -- Cold Application Sealer shall be a one-component, cold-applied, silicone material that cures with atmospheric moisture to form a flexible, low-modulus 100% silicone rubber joint seal which meets or exceeds both Federal Specifications TT-S-001543A Class A (one-part silicone sealants) and TT-S-00230C Class A (one-part silicone sealants), and listed in the NYS Department of Transportation's Materials and Equipment Approved List for "SILICONE JOINT SEALANTS FOR PAVEMENTS (705-05)".

SECTION 2.23 - Steel Bars for Concrete Reinforcement

2.23.1. This section describes Steel Bars for Concrete Reinforcement.

2.23.2. (A) Steel bars shall be of the following types:

Type I -- Deformed Billet Steel Bars complying with the requirements of ASTM Designation A 615, Grade 40 [280] or 60 [420].

(B) Steel bars shall be Grade 60 [420], unless otherwise specified.

2.23.3. (A) Size of bars shall be as specified.

(B) Unless exact lengths are specified, bars shall be furnished in stock lengths in multiples from 20 feet up.

SECTION 2.24 (NO TEXT)

SECTION 2.25 - Welded Steel Wire Fabric for Concrete Reinforcement

2.25.1. This section describes Welded Steel Wire Fabric for Concrete Reinforcement.

2.25.2. Welded steel wire fabric shall be of one kind.

2.25.3. Welded steel wire fabric shall be of the weight per one hundred (100) square feet specified.

2.25.4. Welded steel wire fabric shall comply with the requirements of ASTM Designation A 185, Welded Steel Wire Fabric for Concrete Reinforcement.

SECTION 2.26 - Topsoil

2.26.1. This section describes Topsoil.

2.26.2. Topsoil shall be of one grade only.

2.26.3. Topsoil material shall consist of friable natural sandy loam topsoil with the addition of humus only, and no other soil type, such as a sand or clay soil type, shall be accepted. It shall be acquired from a verifiable source and must be free from subsoil, obtained from an area which has never been stripped. It shall be removed to a depth of one (1') feet, or less if subsoil is encountered.

2.26.4. Topsoil shall be of uniform quality. It shall be free from stones over two (2") inches in size, plant stumps, sticks, roots, sod, trash of every description, hard clods, stiff clay, hardpan, partially disintegrated stone, lime, cement, ashes, slag, concrete, tar residues, tarred paper, boards, chips, sticks or any other undesirable material.

If a truck load of topsoil is considered by the Engineer to contain too much undesirable material to be corrected on the site, the entire truck load shall be rejected. No topsoil shall be delivered in a frozen or muddy condition.

2.26.5. Topsoil shall comply with the following requirements:

Topsoil for trees, shrubs and groundcover shall be natural sandy loam and shall contain between seven (7) and twelve (12) percent organic matter, as determined by loss on ignition of moisture-free samples dried in accordance with the current method of the Association of Official Agricultural Chemists.

Topsoil for sod and seed lawns shall be natural loam and shall contain between four (4) and six (6) percent organic matter, as determined by loss on ignition of moisture-free samples dried in accordance with the current method of the Association of Official Agricultural Chemists.

Acidity range shall be pH 6.0 to pH 7.0 inclusive.

Sieve Analaysis: in accordance with ASTM designation D 422 Standard Test Method for Particle-Size Analysis of Soils

Sieve Size	Percent Passing
1”	99-100%
1/4”	40-60%
No. 100	40-60%
No. 200	12-15%

Electrical conductivity shall be less than 1500 mhos/cm. A higer level would indicate excessive salt content. The testing method must be the saturated paste method.

Nutrients: The Nitrogen level shall be a minimum of 25 parts per million. The phospohorus levels shall be a minimum 5 parts per million and the Potassium level shall be 20 parts per million.

No topsoil shall be delivered until the approval of samples by the Engineer, but such approval shall not constitute final acceptance. The Engineer reserves the right to reject on or after delivery any material that does not, in their opinion, meet these specifications.

When the topsoil otherwise complies with the requirements of the specification but shows a deficiency of not more than one (1) percent in organic matter content, humus, or other approved organic matter may be incorporated when and as permitted by the Engineer.

The Contractor shall at the direction and discretion of the Engineer furnish a certified report of an approved analytical chemist showing the analysis of representative samples of the topsoil proposed for use. The Engineer reserves the right to reject on or after delivery any materials which do not, in his opinion, meet these specifications. If the Engineer directs, topsoil which varies only slightly from the specifications may be made acceptable by such corrections as the Engineer deems necessary.

At final inspection, if the soil does not appear to meet specifications, the Contractor will not receive a final sign off of its permit from the Department of Parks and Recreation (DPR) Forestry. If directed, topsoil which varies only slightly from the specifications may be made acceptable by such corrections as the inspector deems necessary.

SECTION 2.27 - Riprap, Stone Ballast, Broken Stone and Slope Pavement

2.27.1. This section describes riprap, stone ballast, broken stone and slope pavement.

2.27.2. (A) RIPRAP - Riprap shall consist of stones of acceptable size and quality, placed in embankments or to form foundations. All riprap shall be granite, dolomite, gneiss, traprock or other approved hard and durable stone. No riprap stone shall be smaller than the commercial two and one half (2-1/2”) inch stone. In general, riprap stone shall be graded from two and one half (2-1/2”) inches to eighteen (18”) inches so that voids between the larger stones shall be filled by the smaller stones. When available and suitable for the purpose larger stones will be permitted. Larger stones will be required for slope facing.

(B) STONE BALLAST - Stone ballast shall be broken stone, sound, hard and roughly cubical in shape, or gravel of sizes known as commercial two and one half (2-1/2”) inch.

(C) BROKEN STONE - Broken stone shall be broken stone, sound, hard and roughly cubical in shape, or gravel of sizes known as commercial one and one half (1-1/2”) inch.

(D) SLOPE PAVEMENT - Slope pavement shall be not less than eighteen (18”) inches in depth, normal to the slope and shall be composed of sound quarried or split stones. Except when used for pinning or wedging, the stones shall be not less than six (6”) inches thick and from twelve (12”) to eighteen (18”) inches long.

SECTIONS 2.28 THRU 2.30 (NO TEXT)

SECTION 2.31 – Bluestone Flags

2.31.1. **INTENT.** This section describes Bluestone Flags for sidewalks.

2.31.2. **MATERIAL REQUIREMENTS.** Bluestone flags shall consist of either new or existing salvaged flags.

(A) Existing bluestone flags to be cleaned, dressed and reset, shall have a minimum thickness of two (2”) inches. Existing flags to be dressed and reset are to be removed and handled with the utmost care.

Existing flags to be relaid shall be rectangular in shape, not be less than two (2’) feet wide and not less than five (5) square feet in area.

(B) New bluestone flags to be furnished as replacement flags, or as required to complete the work, shall be bluestone which match the existing bluestone in color and original rectangular size of flags. New bluestone shall be not less than three (3”) inches nor more than four (4”) inches in thickness, unless otherwise directed by the Engineer.

New flags shall be rectangular in shape, not less than four (4’) feet wide and not less than ten (10) square feet in area, unless otherwise required to match the existing stone pattern.

New bluestone shall be "North River bluestone" or "Hudson River bluestone" quarried in either Ulster, Albany, and Greene Counties of New York State along the Hudson (North) River, or an approved equivalent, meeting the requirements of **Subsection 2.31.3**, below.

2.31.3. All bluestone, whether existing or new, shall be solid, sound, durable, reed-free stone, free from tool marks, hollows, ridges, spalls, weaves, or any other defects which impair strength, durability, or appearance.

All exposed surfaces to be naturally cleft, with a variation in smoothness not exceeding 1/8 inch. Edges can be sawn, rubbed, or thermal.

2.31.4. **BASIS OF ACCEPTANCE.** Before proceeding with any bluestone work under this contract, the Contractor must submit for approval two or more sets of samples of proposed new stone, which are typical of the extremes of color, texture, and quality of stock and finish. Samples are to be at least 4” by 6” by 2” thick. Each sample must be labeled with the type of stone, finish, source, and supplier. Bluestone delivered must be equal in all respects to the approved samples. The color range is to approximate as closely as possible the existing bluestone sidewalk. Bluestone must be carefully shipped, handled, stored, and set to prevent breakage, staining, or other damage.

SECTIONS 2.32 AND 2.33 (NO TEXT)

SECTION 2.34 - Galvanizing

2.34.1. This section describes Galvanizing.

2.34.2. All galvanizing shall be done by the hot-dip process, or, the electrolytic process.

2.34.3. WORKMANSHIP.

(A) Zinc coating shall be adherent, smooth, continuous and thorough. It shall be free from such imperfections as lumps, blisters, gritty areas, uncoated spots, acid and black spots, dross and flux.

(B) Metal to be galvanized shall be thoroughly cleaned and pickled.

(C) Threading shall be done before galvanizing. The coating shall not interfere with the intended use of the material.

2.34.4. CHEMICAL AND PHYSICAL REQUIREMENTS.

(A) GENERAL REQUIREMENTS - Galvanizing shall comply with the requirements of ASTM Designation A 123.

(B) WEIGHT OF COATING - The weight of zinc coating per square foot of actual surface shall average not less than two (2.0) ounces and no individual specimen shall show less than one and eight tenth (1.8) ounces as determined in accordance with ASTM Designation A 90.

(C) UNIFORMITY OF COATING - Coating shall be uniform as determined by visual inspection. If, in the opinion of the Engineer, visual examination is not conclusive, uniformity of coating shall be determined in accordance with ASTM Designation A 239. Galvanized articles, so tested, shall withstand seven (7) one (1) minute dips without exposing base metal or showing adherent copper deposit.

(D) ADHERENCE - The coating shall be so adherent as not to be removable by any reasonable handling and erection. Light blows with a one half (1/2) pound hammer shall not cause peeling of the coating adjacent to the area deformed by the hammer blows.

SECTION 2.35 - Structural Steel

2.35.1. This section describes Structural Steel.

2.35.2. Structural steel shall be of one kind, and unless otherwise specified, shall have a minimum yield strength (Fy) of thirty six thousand (36,000) pounds per square inch.

Structural steel shall comply with the requirements of ASTM Designation A 36. Steel for structural rivets shall comply with the requirements of ASTM Designation A 502.

2.35.3. Structural steel sizes and shapes shall be as shown on the Contract Drawings, specified or required by the Engineer.

2.35.4. Test specimens and every finished piece of steel shall be stamped with melt or blow number, except that small pieces may be shipped in bundles securely wired together, with melt or blow number on a metal tag attached.

2.35.5. The steel shall be finished straight and smooth and shall be free from all seams, flaws, cracks, defective edges or other defects. Sufficient discard shall be made by cropping ingots to insure sound material, free from piping or excessive segregation.

2.35.6 All exposed surfaces of structural steel shall be thoroughly cleaned of all rust, oil, grease, scale or foreign matter and painted in accordance with the requirements of **Subsection 2.13.4**.

SECTION 2.36 - Wrought Iron

2.36.1. This section describes Wrought Iron.

2.36.2. Wrought iron shall be of one kind.

2.36.3. Wrought iron shall be tough, fibrous, uniform in quality, ductile and malleable, thoroughly welded in rolling and free from surface defects.

2.36.4. Wrought iron shall comply with the requirements of ASTM Designation E 350.

SECTION 2.37 (NO TEXT)

SECTION 2.38 - Wood and Timber Posts and Timber Blockouts

2.38.1. **INTENT.** This section covers wood posts used as witness posts, timber posts, and blockouts used in guiderail construction.

2.38.2. **MATERIALS REQUIREMENTS.** Wood posts, timber posts, and timber blockouts shall comply with the requirements of **Section 2.39, Stress Graded Timber and Lumber**. Using the clean wood properties of ASTM D 2555, the bending stress (Modulus of Rupture) shall not be less than 4,000 pounds per square inch. They shall be surfaced on four sides and the dimensions shall be actual or nominal as indicated on the plans. If the dimensions are indicated to be nominal, the actual dimensions provided shall be in accordance with current trade practice. Surface dried redwood, red cedar, cypress or black locust may be used untreated. Other lumber including douglas fir, pine, oak, birch, apple, and beech may also be used but shall be pressure treated as specified in **Subsection 2.38.3**, below, after all the holes have been drilled and all other woodwork operations have been performed. Bituminous preservative treatments will not be permitted. Before using, the Contractor shall submit to the Engineer, for approval, information as to the species of timber to be used and method of preservative treatment to be employed.

2.38.3. PERSERVATIVE TREATMENT. All wood components shall be pressure preservation treated in strict accordance with the provisions of the American Wood-Preserves' Association (AWPA) Standards. Wood shall be seasoned, either by air-drying or kiln drying, and the moisture content prior to treatment shall be not more then 25%. Wood shall be treated to a net retention of 0.40 pounds per cubic foot with ACQ (ammoniacal copper quaternary), Coper Azole preservation, or an approve equivalent. The preservative shall penetrate 2.5 inches quateary), Coper Azole preservation, or an approved equivalent. The preservative shall penetrate 2.5 inches or 85% of the sapwood. All details of treatement methods, quality, control and production testing shall be in accordance with the appropriate AWPA standards. In accordance with New York State law, Bills A102 and §7167, CCA (chromate copper arsenate) treatment is prohibited as a wood treatment material.

If any other preservative treatment is proposed, the Contractor shall submit documentation that such treatment conforms to the AWPA Standards for treatment of the wood for the intended use.

Posts shall be dried at least thirty (30) days after treatment and prior to installation. All fabrication shall be performed prior to treatment. Where field cuts have to be made, the cut ends shall have two coats of concentrated preservative brushed on.

2.38.4. BASIS OF ACCEPTANCE. Acceptance will be based on the manufacturer's certificate with supplementary sampling and testing at the discretion of the Department's Quality Assurance and Construction Safety Bureau.

SECTION 2.39 - Stress Graded Timber and Lumber

2.39.1. INTENT. Stress graded timber and lumber shall be graded for the stress grade selected, in accordance with grading rules for the indicated stress grade, developed from ASTM D 245.

Commercial stress grades of timber and lumber, with grade descriptions providing material which will meet the indicated stress requirements under rules conforming to ASTM D 245, will be acceptable.

2.39.2. MATERIAL REQUIREMENTS. Stress graded timber and lumber will be subject to inspection by representatives of the Department whom the manufacturer shall furnish copies of his certification of inspection and piece tally in triplicate. Each piece must be clearly branded with the stress grade mark of the manufacturer's inspector.

The Contractor shall furnish all facilities for the inspection of this material by the Department's representatives and shall allow them free access to all premises where inspections can be made.

2.39.3. BASIS OF ACCEPTANCE. The manufacturer shall certify that the timber and lumber has been inspected under grading rules which conform to the requirements of ASTM D 245 and shall show on the certificate the identifying mark used by his inspector.

SECTION 2.40 - Timber and Lumber

2.40.1. This section describes timber and lumber.

2.40.2. All timber and lumber shall be yellow pine or Douglas fir.

2.40.3 Timber and lumber shall be of the sizes shown, specified or required. Sizes given are nominal sizes.

2.40.4. Each piece of wood shall be stamped with standard grade marks.

2.40.5. MATERIAL, WORKMANSHIP AND FINISH.

(A) YELLOW PINE - Yellow pine timber and lumber shall be either Structural Square Edge and Sound Longleaf or Dense Structural Square Edge and Sound Shortleaf grade.

(B) DOUGLAS FIR - Douglas fir timber and lumber shall be Select Structural grade.

2.40.6 CHEMICAL AND PHYSICAL REQUIREMENTS.

(A) YELLOW PINE - Yellow pine timber and lumber shall conform to the requirements of the Southern Pine Association Standard Specifications.

(B) DOUGLAS FIR - Douglas fir timber and lumber shall conform to the requirements of the West Coast Lumberman's Association Standard Grading and Dressing Rules.

DIVISION III - COMBINED MATERIALS OF CONSTRUCTION

(NO TEXT ON THIS PAGE)

DIVISION III

COMBINED MATERIALS OF CONSTRUCTION

SECTION 3.01 - Asphalt Paving Mixtures (BINDER, ASPHALTIC CONCRETE)

3.01.1. This section describes Asphalt Paving Mixtures which are to be laid hot.

3.01.2. (A) Asphalt paving mixtures shall be of the following kinds:

Rut Avoidance Binder Mixture, Type 3 RA;
Rut Avoidance Asphaltic Concrete Mixture, Type 6F RA;
Extra Fine Asphaltic Concrete Mixture

(B) Kind of mixture shall be as specified.

3.01.3. Asphalt paving mixtures shall consist of mineral aggregate thoroughly coated with asphaltic cement.

(A) GENERAL. The Contractor shall obtain Department approval of materials before any material is mixed at any bituminous mixing plants. Approval of sources of supply of the coarse and fine mineral aggregates shall be obtained from the Department's Quality and Construction Safety Bureau.

All laboratories, asphalt mix designs, all vendors including bituminous (asphalt) plants proposed by the Contractor shall be subject to approval by DDC's Quality Assurance and Construction Safety (QACS) Bureau and in accordance with their "MIX DESIGN, LABORATORY AND PLANT APPROVAL PROTOCOL". Copies of this protocol may be obtained at the pre-construction meeting or from the Engineer. The minimum requirement for approval of the proposed plant is that it must be on the New York State Department of Transportation (NYSDOT) approved list for the current construction season.

(B) COMPOSITION OF MIXTURES. The bituminous plant mix shall generally be composed of a mixture of aggregate, filler if required, and bituminous material in accordance with Table 3.01—III - Ingredient Materials.

For any bituminous mixture required by the plans or itemized proposal, the Contractor shall formulate and submit, in writing, to the Engineer, a job mix formula that satisfies the design general limits listed in Table 3.01-I - Composition of Bituminous Plant Mixtures. The production tolerances in Table 3.01-I will be permitted to exceed the design general limits. In addition, the formula shall state the mineral aggregate sources, and the grade of bituminous material used in the mixture.

The optimum asphalt cement content for the proposed gradation of Type 3RA binder course and Type 6F RA top course mixtures shall be determined by the Contractor using the Marshall Mix Design Method specified in **Subsection 3.01.3.(E)**. The resultant mixture for each type course shall meet the Marshall Properties shown in Table 3.01-II, herein.

Marshall specimens shall be prepared, mix properties determined, and completed mix design submitted to the Engineer for approval a minimum of four (4) weeks prior to the scheduled start of paving work.

The approved formula shall not be changed without the written permission of the Department's Quality Assurance and Construction Safety Bureau.

Should the Contractor desire to use new deliveries of materials received during the life of the contract, he shall so inform the Engineer and he shall modify the formula as directed by the Engineer. The order to modify the formula shall be confirmed in writing.

	Binder		Top		
	Type 3 RA		Type 6F RA		Extra Fine*
Screen Size	Design General Limits % Passing	Production Tol. %	Design General Limits % Passing	Production Tol. %	Design General Limits % Passing
1 1/2”	100	--			
1”	95-100	--	--		
3/4”	74-93	±5	100	--	
1/2”	58-73	±5	95-100	--	100
3/8”					98-100
1/4”	38-53	±5	58-72	±5	
1/8”	26-40	±4	36-54	±4	
4					70-90
8					38-65
20	9-23	±4	15-32	±4	
40	4-18	±4	8-25	±4	
50					6-25
80	3-13	±3	4-16	±3	
200	2-6	±2	2-6	±2	2-8
% Asphalt	4.0-6.0	±7 of Design A.C. %	5.0-6.2	±7 of Design A.C. %	5.0-8.0

TABLE 3.01-I
COMPOSITION OF BITUMINOUS PLANT MIXTURES

NOTES:

1. All aggregate percentages are based on the total weight of the aggregate. The asphalt content is based on the total weight of the mix.

2. The “F” designation in the mix type indicates that high friction coarse aggregates are required.

3. When slag aggregates are used in the mix, the asphalt content shall be increased accordingly -- minimum 25 percent for an all slag mix.

4. The asphalt cement shall be introduced into the pugmill at a temperature compatible with that of the aggregate as determined by the Engineer, between the limits of 225° and 350° Fahrenheit.

** Used for park walks, playgrounds, tennis courts, etc.*

Once approved, the mix shall be produced within the job mix formula tolerances set forth in Table 3.01-I. The aggregate tolerances shall be based on the total weight of the aggregate and the bituminous material tolerances shall be based on the total weight of the mix.

If for any reason, a change in gradation or materials occurs or is contemplated, a separate job mix formula and Marshall Design, when appropriate, shall be prepared to fit each change in materials or gradation. The Engineer may order increases or decreases in the bituminous material quantity without changing the job mix formula providing that any change stays within the approved job mix formula range for the bituminous material. Changes in asphalt content for mixtures requiring Marshall Design, can be made by the Engineer providing the resultant mixture has properties within the specified Marshall criteria and the asphalt content is within the general limits listed in Table 3.01-I.

Two sets of Marshall plugs shall be prepared for every 800 tons, or portion thereof, of material placed each day. One set of Marshall plugs shall be delivered to the Department's Quality Assurance and Construction Safety laboratory under supervision of the Engineer. The other set of Marshall plugs shall be prepared and tested by the Contractor's approved independent testing laboratory (see **Subsection 4.02.4.(B)** for certification requirements) accordingly for gradation, asphalt cement content, theoretical maximum density in accordance with the requirements of ASTM Designation D 2041, and for stability, flow, and air voids. These tests are required to be performed by the Contractor for its quality control program and therefor shall be completed so that the results are available at the job site as far in advance of the end of shift as possible. In addition, test results may be used for payment and acceptance in accordance with the requirements of **Subsection 4.02.4.(S)**.

The aggregates shall be those approved for use by the approved job mix formulas and will be accepted at the plant site. The bituminous material will be conditionally accepted at the supplier's source and at the plant on the basis of certification. Samples taken at the plant will be tested by the City or its representative to determine specification compliance. The gradation of the plant mixed material will be tested to determine compliance with the job mix formula during the production of the material. The plant mixed material will be judged for acceptance after blending and mixing at the plant. The pavement courses will be judged for acceptance after all paving operations are completed.

(C) AGGREGATES. Fine aggregate shall consist of materials conforming to the requirements of **Section 2.21, Sand**.

Coarse aggregate shall consist of crushed stone, crushed gravel, or crushed slag conforming to the requirements of **Section 2.02, Coarse Aggregate**, except for gradation.

When aggregates from approved natural fine sand sources are combined with coarse aggregates in the mixture, aggregate particles shall meet additional requirements as follows:

Particles retained on the No. 1 Sieve shall meet the quality requirements of **Section 2.02** and shall have a minimum of 85 percent, by weight, of the particles with at least two fractured faces.

In addition to the above requirements, coarse aggregate shall meet the following high friction requirements:

1. COARSE AGGREGATES. Top Course Type 6F RA asphalt concrete mixtures shall meet one of the following high friction requirements:

   (a) Coarse aggregates shall be crushed limestone having an acid insoluble residue content of not less than 20% (excluding particles of chert and similar siliceous rocks), or crushed dolomite (excluding Wappinger Dolomite as defined by the Department).

(b) Coarse aggregates shall be crushed sandstone, granite, chert, traprock, ore tailings, slag or other similar materials.

(c) Coarse aggregates shall be crushed gravel or blends of two or more of the following types of materials: crushed gravel, limestone, dolomite, sandstone, granite, chert, traprock, ore tailings, slag, reclaimed asphalt pavement, or other similar materials. These aggregates shall meet the following requirements:

Type 6FRA Mixes - Not less than 20% (by weight with adjustments to equivalent volumes for materials of different specific gravities) of the total coarse aggregate particles (plus 1/8" material) shall be non-carbonate. In addition, not less than 20% of the plus 1/4" particles shall be non-carbonate.

Non-carbonate particles are defined as those having an acid insoluble content not less than 80%.

The proportion of reclaimed asphalt pavement permitted within each mix shall be not less than 30 percent for the top and and not less than 30 percent to a maximum of 70% for the bottom courses as per Local Law #71 of 2011.

2. SOURCE OF AGGREGATE AND SAMPLING.

(a) Virgin Aggregate.

i. Sources of virgin aggregates shall be selected well in advance of the time the materials are required for the construction. When the aggregates are obtained from a previously approved source, random hot bin samples shall be submitted, if requested by the Engineer, 14 days prior to the start of production and if from a source not previously approved, random hot bin samples shall be submitted 45 days prior to the start of production. Sampling of the hot bin materials for job mix formulation will be observed by the Engineer and identical samples shall be obtained for verification of the job mix formulation by the Department's QACS Unit. The Engineer may require the proposed mix formulation to be batched at the asphalt plant and tested in the presence of the Engineer.

ii Where previously used or concurrent job mix formulations are to be used, the taking of hot bin samples may be waived by the Engineer.

(b) Reclaimed Asphalt Pavement.

i. Where reclaimed asphalt pavement material is permitted, it shall be a mixture of only coarse aggregate, fine aggregate, and asphalt cement, free of solvents or other contaminating substances. The fine aggregate contained in the reclaimed asphalt pavement shall have a plasticity index not greater than 4 when tested in accordance with ASTM D 4318.

The stockpiles of reclaimed asphalt pavement shall be maintained in a manner to prevent contamination with other aggregates and shall be covered in order to maintain a low moisture content of the reclaimed asphalt pavement.

ii. Contractor's reclaimed asphalt pavement will be considered for use provided the Engineer is notified of the intended use and the reclaimed asphalt pavement is approved. A minimum of six representative samples, each at least 7 pounds, shall be taken from each stockpile. A stockpile shall not exceed 3,000 tons. Sampling shall be done by the Contractor in accordance with ASTM D 75, and will be observed by a representative of the Engineer. Duplicate samples shall be taken and submitted with mix design for verification. Samples shall be tested by the Contractor in accordance with ASTM D 2172 to determine asphalt content and the recovered aggregate shall be tested by the Contractor in accordance with ASTM C 136 for gradation.

iii. Once a reclaimed asphalt pavement stockpile has been approved for use, the stockpile shall be dedicated to the Contract and no reclaimed asphalt pavement may be added to the stockpile. If there is an insufficient amount of reclaimed asphalt pavement in the stockpile to complete the work, a new, separate stockpile, may be made and shall be tested for acceptance as aforementioned.

(c) The Contractor shall submit certified test data, location of each type aggregate to be used and quantities to be obtained from each location and make arrangements for the Engineer to obtain samples from each such location for checking against the samples submitted. Take all samples in accordance with requirements of ASTM D 75 and ASTM D 242.

If requested, submit to the Engineer samples of each type aggregate to be used and from each source with proper identification as to source, type of aggregate and Contract number. Submit in clean, sturdy bags and in the following amounts for each sample when requested:

Reclaimed Asphalt Pavement (when used) - 50 lbs.
Coarse Aggregate - 25 lbs.
Fine Aggregate - 25 lbs.
Mineral Filler - 5 lbs.

If requested the Contractor shall submit to the Engineer for approval four one-quart samples of the asphalts proposed for use together with the following data:

i. The name of the supplier(s).
ii. An analysis of such asphalts by the supplier, certifying that the results of tests comply with the requirements of AASHTO MP1 and this Section.

(d) Stockpiles of reclaimed asphalt pavement and that of new aggregate shall be located so as to prevent intermingling.

(e) When more than one asphalt plant is to be used to supply asphalt concrete to the construction site, each asphalt plant shall use the same materials and a similar job mix formula.

(f) Locations and timing of random sampling shall be determined in accordance with Section 6 of FAA ERLPM or as otherwise approved by the Engineer.

3. BLENDING. Where coarse aggregates for these mixes are from more than one source or of more than one type of material, they shall be proportioned and blended to provide a uniform mixture.

(D) MIX PROPERTIES. The mixtures shall meet the Marshall property criteria appearing in Table 3.01-II - Marshall Mix Property Criteria.

	Mix Criteria	
Mix Property	Type 3RA	Type 6FRA
Stability, lb. min.	1500	1500
Flow, 0.01 in.	8 - 12	8 - 12
Marshall Quotient lb./0.01 in., min.	150	150
Air Voids, percent	3.0 -5.0	3.0 -5.0
Voids in Mineral Agg. (VMA), percent min.	13.5	15.5
Voids Filled with Asphalt (VFA), percent	65-75	65-75

Table 3.01-II - Marshall Mix Property Criteria

(E) MIX PREPARATION. The Marshall specimens shall be prepared, mix properties determined, and completed mix design submitted in accordance with the procedures outlined by Department's written instructions with the following modifications:

(1) Compactive effort shall be 75 blows per side.

(2) Five point asphalt cement content Marshall design is required prior to production. One point designs are not acceptable.

(3) The minimum specified VMA shall be met at each of the five mix design asphalt cement contents.

(4) The Marshall quotient is calculated as the corresponding ratio of corrected stability (lbs.) to flow (0.01 in.).

(5) The optimum asphalt cement content shall be determined by the "Range" method. Graphs shall be constructed for each of the specified mix design properties (stability, Marshall quotient, air voids, VMA and VFA) using each property as the vertical axis and percent asphalt cement content as the horizontal axis. The plotted values in each graph shall be fitted with a smooth curve that obtains the "best fit" for all values. A vertical line is drawn at the point where the asphalt cement content provides the acceptable lower and upper limits for the properties of stability, flow, Marshall quotient, and air voids. The mid-point of the common overlap is the optimum asphalt cement content provided it does not fall on the positive slope of the VMA curve. When this occurs the low point of the VMA curve shall be the optimum asphalt cement provided it falls within the common overlap of the specified stability, flow, Marshall quotient, and air voids ranges.

If, for any reason, a change in gradation or materials occurs or is contemplated or when field conditions dictate, a separate job mix formula and Marshall Design shall be prepared to fit each change in materials or gradation.

Also, two sets of Marshall plugs shall be prepared for every 800 tons, or portion thereof, of material placed each day. One set of Marshall plugs shall be delivered to the City's laboratory under supervision of the Engineer. The other set of Marshall plugs shall be prepared and tested by the Contractor's independent testing laboratory accordingly for gradation, asphalt cement content, theoretical maximum density in accordance with the requirements of ASTM Designation D 2041, and for stability, flow, and air voids. These tests are required to be performed by the Contractor for its quality control program and therefor shall be completed so that the results are available at the job site as far in advance of the end of

shift as possible. In addition, test results may be used for payment and acceptance in accordance with the requirements of **Subsection 4.02.4.(Q).**

(F) RECLAIMED ASPHALT PAVEMENT.

(1) Where reclaimed asphalt pavement is being used as a substitute for some of the virgin aggregate, the Contractor shall take a sample of freshly mixed recycled asphalt concrete in accordance with ASTM D 979 and determine the moisture content at least twice daily. Moisture determinations shall be based on the weight loss by heating an approximately 4 pound sample of the freshly mixed materials for one hour in an oven at 280 plus or minus 5 degrees Fahrenheit. The moisture content of the freshly mixed bituminous concrete shall not exceed 0.8 percent.

(2) The Contractor shall take a sample of reclaimed asphalt pavement from the approved stockpile at least once daily and test in accordance with ASTM D 2172 to determine asphalt content and gradation in accordance with ASTM C 136. The resulting asphalt content and aggregate gradation shall be similar to the average test results of the reclaimed asphalt pavement submitted with Design Job Mix Formula. If there is a variation of plus or minus 1.0 percent in the asphalt content or, plus or minus 10 percent in aggregate graduation on any sieve, a second sample shall be taken and tested in the same manner as the first sample, appropriate measures shall be taken to adjust the mixture to compensate for the variation in the reclaimed asphalt pavement.

(G) MOISTURE CONTENT OF AGGREGATE. The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C 566.

(H) MOISTURE CONTENT OF MIXTURE. The moisture content of the mixture shall be determined once per lot in accordance with ASTM D 1461.

(I) PERFORM ADDITIONAL TESTING AS REQUIRED to ensure that mixtures produced meet the requirements of this Section.

(J) MIXING PLANT REQUIREMENTS FOR RECYCLED ASPHALT CONCRETE.

1. Batch Plants shall have an appropriately located metering device for adding the reclaimed asphalt pavement to the heated new aggregate and shall provide an accurate method for proportioning the reclaimed asphalt pavement into the mixture.

2. The batch plant's dryer may have to be operated at temperatures higher than with all new materials. Modifications to the dryer and the dust collection system may be necessary to prevent damage.

3. Drum-mix plants shall have an appropriately located metering device for adding the reclaimed asphalt concrete to the dryer-mixer in a manner that does not damage the asphalt in the reclaimed material. An accurate method for proportioning the reclaimed asphalt pavement into the mixture shall be provided. The Contractor shall make provisions for compensating for the moisture in the reclaimed asphalt concrete.

4. The mixing time for a drum-mix plant shall be such as to achieve an intimate blending of the new and reclaimed materials and a complete coating of all aggregate particles.

5. The batch or drum-mix plant may be equipped with a surge-storage bin at the mixture discharge point.

(K) MINERAL FILLER. Mineral filler, if required in the mix to meet gradation requirements, shall conform to the requirements of **Section 2.18**.

(L) BITUMINOUS MATERIALS. The type and grade of bituminous material shall be as specified in the Table 3.01-I, Composition of Bituminous Plant Mixtures, unless otherwise indicated on the plans or in the itemized proposal.

The bituminous material shall meet the applicable requirements of **Section 2.05, Asphalt Cement**.

3.01.4. Asphalt paving mixtures shall comply with the requirements of Tables 3.01-I, 3.01-II, and 3.01-III and shall produce satisfactory surfaces.

TABLE 3.01-III - INGREDIENT MATERIALS

Kind of Mixture	Applicable Sections			
	Asphaltic Cement	Sand	Broken Stone	Mineral Dust
Rut Avoidance Binder, Type 3 RA	Section 2.05*	**Section 2.21** Type 2A or Type 2B	**Section 2.02** Type 1 Grade B Size as per Section 3.01, Table 3.01-I	--
Rut Avoidance Asphaltic Concrete Type 6F RA	**Section 2.05***	**Section 2.21** Type 2A or Type 2B	**Section 2.02** Type 1 Grade A Size as per **Section 3.01**, Table 3.01-I	**Section 2.18**
Extra Fine Mix Asphaltic Concrete	**Section 2.05***	**Section 2.21** Type 2A or Type 2B	**Section 2.02** Type 1 Grade A Size EF	**Section 2.18**

** The penetration of the asphaltic cement in stone mixes shall be 85 to 100.*

3.01.5. (A) HEATING AND STORING INGREDIENTS.

The asphaltic cement shall be heated in approved receptacles to a temperature between 275° and 325° Fahrenheit. It shall be kept uniform in composition and consistency by thorough mixing and agitation, and, if required by the Engineer, it shall be agitated both before and during use. Approved methods of agitation, which will not injure the cement, shall be used.

The broken stone and sand shall be heated in approved revolving driers and delivered to separate storage bins. If the broken stone and sand are heated together in the same drum they shall be screened and delivered to separate storage bins. The broken stone shall be delivered to the proportioning box at a temperature not exceeding 350° Fahrenheit. The sand shall be delivered to the proportioning box at a temperature not exceeding 400° Fahrenheit.

The mineral dust, as used, shall be thoroughly dry. It may be heated in an approved manner to a temperature not exceeding 325° Fahrenheit.

(B) PROPORTIONING INGREDIENTS

The materials comprising the charge for each batch shall be proportioned accurately by weight or by volume. The proportioning apparatus shall be of approved design, kept in good working order and accurate to 0.5 percent.

Fluid materials may be measured by approved fluidometers.

(C) MIXING INGREDIENTS

After proportioning, the ingredients shall be incorporated in an approved mixer. When mixed in a batch mixer prior to the addition of the asphaltic cement, the aggregate shall be deposited in the mixer and thoroughly mixed for a period of not less than ten (10) seconds for binder mixture and fifteen (15) seconds for sheet asphalt and asphaltic concrete mixtures. The asphaltic cement shall then be added and the mixing continued for a period of not less than thirty (30) seconds. When mixed in a batch or continuous mixer, the mixing shall be continued until a homogeneous mixture is produced in which all particles of the mineral aggregate are completely coated with asphaltic cement.

The size of batch shall not exceed the rated capacity of the mixer.

(D) TEMPERATURE OF MIXTURE

The temperature of the mixture and rolling time available for placement of bituminous paving mixtures shall be regulated according to the temperature of the surface on which the mat is placed (called base temperature) and the mat thickness to be placed. The maximum temperature of any batch immediately after mixing shall in no case exceed 350° Fahrenheit at the plant, and unless otherwise specified, the minimum laydown temperature and rolling time available for placement of bituminous paving mixtures shall be as given in the following table:

	Minimum Laydown Temperature (^{o}F)					
Base Temp.(^{o}F)	1/2”	3/4”	1”	1-1/2”	2”	3” and Greater
+32-40	-	-	-	305	295	280
+40-50	-	-	310	300	285	275
+50-70	310	300	290	285	275	265
+70-80	300	290	285	280	270	265
+80-90	290	280	275	270	265	260
+90	280	275	270	265	260	255
Rolling Time Available (Minutes)	4	6	8	12	15	15

All temperatures shall be measured on the surface where the paving is to be placed and the controlling temperature shall be the average of three temperature readings taken at locations 25± feet apart in accordance with the Engineer’s instructions.

The above temperature limits are based on the use of residual petroleum asphalt. If the Contractor uses asphalt derived from other sources, the Engineer shall fix appropriate temperature limits within which the mixture must be confined.

SECTION 3.02 - Bed, Bitumen-sand

3.02.1. This section describes Bitumen-sand Bed.

3.02.2. Bitumen-sand bed shall be of one kind.

3.02.3. (A) Bitumen-sand bed shall consist of sand coated with liquid asphalt combined in definite proportions by weight so as to produce a mixture containing 94 to 96 percent by weight of mineral aggregate and 4 to 6 percent by weight of liquid asphalt.

(B) Liquid asphalt shall comply with the requirements of **Section 2.03**, Grade RC-250.

(C) Sand shall comply with the requirements of **Section 2.21**, Type 2A.

3.02.4. (A) HEATING INGREDIENTS.

Liquid asphalt shall be used at atmospheric temperature or it may be heated in an approved manner to a temperature not exceeding 150° Fahrenheit.

Sand shall be heated and dried in approved revolving driers and delivered to the weight box at a temperature not exceeding 200° Fahrenheit.

(B) PROPORTIONING INGREDIENTS.

The materials comprising the charge for each batch shall be measured accurately by weight and shall be weighed separately by dial scales attached to the receptacle or bucket used for such proportioning. The weighing apparatus shall be of approved design, kept in good working order and accurate to 0.5 percent.

(C) MIXING INGREDIENTS.

After weighing, the ingredients of each mixture shall be incorporated in an approved mixer. Mixing shall be continued until a homogeneous mixture is produced.

(D) TEMPERATURE OF MIXTURE.

The temperature of the mixture shall be regulated according to the temperature of the atmosphere and the character of the materials employed. The temperature of any batch after mixing and when delivered on the street shall be between 110° and 175° Fahrenheit.

SECTION 3.03 - Bed, Mortar

3.03.1. This section describes Mortar Bed.

3.03.2. (A) Mortar bed shall be of the following types:

Type 1-- Normal Portland Cement Mortar Bed
Type 2-- Extra Strength Portland Cement Mortar Bed

(B) Type shall be as specified.

Type 1 shall be used unless Type 2 is specified.

3.03.3. Mortar bed of each type shall comply with the requirements of **Section 3.07** for the corresponding type of mortar.

SECTION 3.04 - Block, Asphalt

3.04.1. This section describes Asphalt Blocks.

3.04.2. (A) Asphalt blocks shall be of the following types and sizes:

Type		Size	Dimensions - Inches		
Number	Name		Depth	Width	Length
1	Rectangular Block	A B	2-1/2 3	5 5	12 12
2	Rectangular Tile	-	1-1/2	8	16
3	Hexagonal Tile	-	2	8 inches between parallel sides	

(B) Type and size of block and penetration of asphalt cement shall be as specified.

(C) When blocks of special size are required, the dimensions shall be as specified.

3.04.3. Asphalt blocks shall consist of a homogeneous mixture of broken stone, mineral dust and asphaltic cement.

3.04.4. If required, the Contractor shall, before he begins to manufacture the asphalt blocks, secure the Engineer's approval of the formula he proposes to use. He shall submit for this purpose a statement, in writing, of the sources of all ingredient materials, the penetration of the asphaltic cement, the percentages by weight and the number of pounds of each of the materials making up one batch.

The approved formula shall not be changed without the written permission of the Engineer.

Should the Contractor desire to use new deliveries of materials received during the life of the contract, he shall so inform the Engineer and he shall modify the formula as directed by the Engineer. The order to modify the formula shall be confirmed in writing.

3.04.5. (A) ASPHALTIC CEMENT. Asphaltic cement shall be a high melting point oxidized asphalt conforming to ASTM Designation D 312 for Type 3 asphalt.

(B) BROKEN STONE

Broken stone shall be clean, hard, unweathered stone of uniform quality. It shall consist of fragments roughly cubical or pyramidal in shape and shall be crushed from ledge rock. The stone shall conform to the sieve analysis for Size No. 8 under ASTM Designation C 33.

(C) MINERAL DUST

Mineral dust shall comply with **Section 2.18**.

3.04.6. (A) COMPOSITION. Asphalt blocks shall comply with the following composition requirements:

		(Percent by Weight)
Bitumen Soluble in Chloroform		6.0 to 9.0
Mineral Aggregate		91.0 to 94.0
Sieve Analysis of Mineral Aggregate:		
Total Passing Sieve	3/8"	100
	No. 4	95 to 100
	No. 10	60 to 80
	No. 40	40 to 60
	No. 80	25 to 40
	No. 200	15 to 25

Provided the final composition remains within the limits prescribed above, the following maximum plus or minus deviations from composition percentages as determined by the formula approved by the Engineer shall be allowed:

Passing No. 200 Sieve	2.0%
Bitumen	0.5%

(B) SPECIFIC GRAVITY

The specific gravity of the blocks at a temperature between 65° and 80° Fahrenheit shall be not less than 2.40.

(C) ABSORPTION OF WATER

The average absorption of a set of four (4) blocks shall be not more than one-fourth of one percent (0.25%).

(D) TOLERANCE IN DIMENSIONS

Depth and Width -- plus or minus 1/8 inch.
Length -- plus or minus 1/4 inch.
Distance Between Parallel Sides of Hexagonal Block -- plus or minus 1/8 inch.

3.04.7. (A) PLANT

Asphalt blocks shall be manufactured in an approved, modern, well equipped and scientifically operated plant.

(B) HEATING INGREDIENTS

The asphaltic cement and broken stone shall be heated separately to a temperature not exceeding 350° Fahrenheit for asphaltic cement and 400° Fahrenheit for broken stone. The mineral dust may be heated to a temperature not exceeding 350° Fahrenheit.

The temperature of the ingredients shall be so regulated that the temperature of the mixture as delivered to the press molds shall be not less than 225° Fahrenheit and not more than 325° Fahrenheit.

(C) PROPORTIONING INGREDIENTS

Asphaltic cement and mineral dust for each mixer charge shall be measured separately by weight.

Broken stone for each mixer charge may be measured by weight or by struck volume, provided that suitable means are readily available at all times for segregating and check-weighing volumetrically measured batches of broken stone.

Measuring devices shall be of approved design and always kept in good working order.

(D) MIXING INGREDIENTS

After proportioning, the broken stone and mineral dust shall be deposited in an approved mixer and thoroughly mixed for not less than fifteen (15) seconds for each ton or part of a ton. The asphaltic cement shall then be added and the mixing continued for not less than sixty (60) seconds or longer, if required, until a homogeneous mixture is produced in which all the mineral particles are completely coated with asphaltic cement.

(E) PRESSURE ON BLOCKS

The mixture shall be conveyed into molds of the shape and size of the blocks specified in approved presses, where the mixture shall be subjected to a hydraulic pressure upon the wearing surface of the block of not less than two (2) tons per square inch.

(F) COOLING

After leaving the press, the blocks shall be cooled by automatically conveying them through clean cold water or by other approved methods.

SECTION 3.05 - Concrete

3.05.1. INTENT.

This section describes Concrete.

3.05.2. CLASSES AND TYPES.

(A) Concrete shall be of the classes and types shown in Table 3.05-I.

Note: Based on dry-rodded volumetric measurement of ingredient materials:

High Early Strength Concrete is approximately equal to a 1 : 1-1/4 : 2-1/4 mix.
Class A-40 Concrete is approximately equal to a 1 : 1-3/4 : 2-3/4 mix.
Class B-32 Concrete is approximately equal to a 1 : 2 : 3-1/4 mix.

TABLE 3.05-I

Class Designation	Nominal Mix	Concrete Type	Type of Portland Cement Concrete
High-Early Strength	7-1/2 Bag Mix	Type IIIA	Moderate Sulphate Resistant Air-entrained
Class A-40	7-Bag Mix	Type IA Type IIA	Normal Air-entrained Moderate Sulphate Resistant Air-entrained
Class B-32	6-Bag Mix	Type IA Type IIA	Normal Air-entrained Moderate Sulphate Resistant Air-entrained

Note: The above proportions shown for non-High-Early mixes shall be modified by pozzolan substitutes as per **Subsection 3.05.4**.

(B) Concrete shall be mixed by the following methods:

Method A -- Central Plant Mix
Method B -- Transit Mix
Method C -- Truck Mix
Method D -- Mixed by hand or in job mixers not exceeding one-half (1/2) cubic yard capacity when permitted by the Engineer.

Central Plant Mix Concrete is concrete produced at an approved plant, ready for use prior to discharge into a transporting vehicle.

Transit Mix Concrete is concrete whose constituent materials are proportioned at a central plant and mixed with water in transit to or at the point of deposition in a transporting vehicle.

Truck Mix Concrete is concrete whose constituent materials are proportioned at a central plant and transported to the point of deposition where water is added and mixed in a transporting vehicle.

Unless otherwise specified, concrete may be mixed by Method A, Method B or Method C.

(C) Class, type and method of mixing concrete shall be as specified.

Type, grade, size number and corresponding nominal size of coarse aggregate shall be as specified.

Concrete shall be pigmented when specified.

3.05.3. MATERIAL. Concrete shall be a homogeneous mixture consisting essentially of cement, fine aggregate, coarse aggregate, water, and admixtures and pozzolan (when used). It shall be proportion-strength concrete whose constituent materials are proportioned in accordance with specification requirements to produce a required strength. Air-entrained concrete shall be concrete which in addition to the above shall have a specified air content resulting from the use of an admixture in the concrete.

(A) CEMENT

Cement shall be dry, free from lumps and have a temperature less than 170° Fahrenheit when used.

For concrete exposed to view, the Contractor shall not use more than one (1) brand, unless otherwise permitted.

Cement shall be measured by weight or in full bags of 94 pounds each for Portland cement.

When cement is measured by weight, it shall be weighed on a scale separate from those used for the other materials. After weighing, the entire contents of the hopper shall be completely discharged.

When the cement is measured in bags, no fractions of bags shall be used unless weighed. Bags of cement shall be taken from the place of storage and placed adjacent to the mixer, in separate piles containing the exact number of bags for each mixer charge. Each pile shall be emptied into the mixer for each charge.

(B) AGGREGATES

Aggregates shall be measured by weight. Batch weights shall be based on saturated surface-dry materials and shall be corrected to take into account the weight of surface moisture contained in the aggregate.

When volumetric measurements are permitted, the Engineer shall require such increase in the volumes of fine and coarse aggregates as will compensate for the bulking. Only approved measuring devices shall be used.

NOTE: When aggregates are measured in the damp-loose condition (for use in Mixing Method D), they will occupy greater volume than when dry-rodded and the percentage bulking shall be determined by test. Approximate average bulking value for sand is twenty-five (25) percent and for coarse aggregate six (6) percent. Volumes may also be determined from the Contractor's approved weight formula by dividing by the damp-loose weight of aggregates per cubic foot. Average weight of damp-loose sand is 85 pounds per cubic foot and average weight of damp-loose coarse aggregate is 95 pounds per cubic foot.

(C) WATER

Water shall be measured by volume or by weight. The device for the measurement of the water shall be readily adjustable and, under all operating conditions, shall be accurate within one (1.0%) percent of its maximum capacity.

Water shall be potable and drawn from municipal water mains.

(D) PIGMENTED ADMIXTURE

When pigmented concrete is specified, the concrete shall be colored with an approved pigment conforming to the requirements of **Section 2.19**. The final color of the concrete shall be as approved by the Engineer. Pigments used shall not vary the air content of the concrete by more than ±0.5%. The concrete mix shall be adjusted to provide that the air content of the concrete remains within the specified tolerances.

Pigmented admixture shall be measured by weight. Water present in pigment shall be taken into account in measuring the quantity of water required for each batch.

(E) POZZOLANS

Fly ash shall conform to the chemical and physical requirements for Mineral Admixture, Class F listed in AASHTO M 295 and shall meet the requirements of the NYS Department of Transportation, Standard Specifications, **Section 711-10, FLY ASH**, except that no alternate Class of fly ash will be acceptable. Any fly ash hardened by moisture will be rejected. Fly ash stored over the winter at the concrete producing plant will be retested for specification compliance by the Department or its agent.

Ground granulated blast-furnace slag (GGBFS) shall conform to the chemical and physical requirements for Grade 100 or 120 slag, as classified in AASHTO M 302, and shall meet the requirements of the NYS Department of Transportation, Standard Specifications, **Section 711-12, GROUND GRANULATED BLAST- FURNACE SLAG**. Any GGBFS hardened by moisture will be rejected. GGBFS stored over the winter at the concrete producing plant will be re-tested for specification compliance by the Department or its agent.

Microsilica (Silica fume) shall conform to the standard and optioal physical and chemical requirements of AASHTO M 307 and shall meet the requirements of the NYS Department of Transportation, Standard Specifications, **Section 711-11, MICROSILICA**. Microsilica shall be used wherever increased early compressive strength, reduced permeability and increased abrasion resistance is required.

(F) ADMIXTURES

Admixtures shall comply with the requirements of **Section 2.09, Admixtures**.

3.05.4. CONTRACTOR'S FORMULA. All concrete mix designs shall be subject to approval by DDC's Quality Assurance and Construction Safety (QACS) Bureau and in accordance with their "MIX DESIGN, LABORATORY AND PLANT APPROVAL PROTOCOL". Copies of this protocol may be obtained at the pre-construction meeting or from the Engineer. Before the Contractor begins to manufacture concrete, he shall secure DDC's QACS approval of the mix design he proposes to use. He shall submit for this purpose a statement, in writing, of the sources of all ingredient materials, the type and brand of the cement, pozzolans and the number of pounds of each of the materials in a saturated surface-dry condition making up one (1) cubic yard of concrete. The calculated yield of the mix shall be within ± 2% of the Theoretical one (1) cubic yard. The range of water-cement (W/C) ratios within which the concrete will be manufactured and the method of mixing to be employed shall also be stated. The mix design submittal shall include gradation of aggregates, specific gravities of ingredients, unit weight, mix proportion for each batch (a minimum of 4 batches except in case of precast plants where one specific mix may be proposed), compressive strength test results for each mix at 7 days, 28 days (high early strength mixes may require 6 hrs, 24 hrs, 3 days and shrinkage test as per the requirements), and graphical representation of strength vs. W/C projected in hours/days.

With the exception of high-early strength concrete, the Contractor shall be required to substitute Portland cement with pozzolans (Fly Ash and/or GGBFS) such that the maximum amount of Portland cement per cubic yard of concrete does not exceed 400 pounds, and with the use of an approved non-corrosive, non-chloride admixture as required to obtain a minimum compressive strength of 3,000 psi in seven (7) days. For high-early strength concrete the Contractor may substitute Portland cement with pozzolans (Fly Ash and/or GGBFS), pound for pound, up to 20% (or up to 25% for tidal/sea water spray areas) of the weight of cement specified for any concrete mixture provided the Contractor can obtain a minimum compressive strength of 3,000 p.s.i. in three (3) days. The Contractor, immediately following but not later than eight weeks after the date of the Contractor's Notice to Proceed, shall file with the Engineer, Age-Strength data of the job mix he proposes to use for the various ambient temperatures anticipated during the period of concrete placement. This data shall be presented in both tabular and graphical form for those various ambient temperatures with a maximum setting period of seven (7) days for Class B-32 concrete or seventy-two (72) hours for High-Early Strength Concrete.

Also, for high-early strength concrete, at no additional cost, the Contractor may be allowed to use a water reducing admixture to achieve an additional one (1") inch slump, for a maximum slump of four (4") inches, to enhance workability and to help in surface finishing of the concrete. The admixture shall conform to the requirements of **Section 2.09, Admixtures**. If such an admixture is used the concrete shall have a minimum compressive strength of 3,200 psi at three (3) days as determined by the average compressive strength of one set of three (3) concrete cylinders for each day's work. The Contractor shall submit his mix design for approval by the Engineer; however, such approval by the Engineer shall not relieve the Contractor of his responsibility for meeting the minimum three (3) day strength requirements specified herein, when admixtures for slump and enhanced workability have been used.

The approved mix design shall not be changed without the written permission of the Engineer.

The approval of materials shall not preclude subsequent withdrawal of such approval in case of development of qualities objectionable to the Engineer.

On receipt of new deliveries of materials during the period of the contract, the Contractor shall inform the Engineer and he shall modify the mix design as directed by the Engineer. The order to modify the mix design shall be confirmed in writing.

The relative amounts of fine and coarse aggregates in any class of concrete may be changed within the limits given in Table 3.05-II by the Engineer at any time in order to secure maximum density and to promote workability, provided the sum of the absolute volumes of the aggregates is unchanged. Such changes shall be made when required without extra compensation, regardless of the quantity of concrete affected thereby.

3.05.5. MIX DESIGN.

(A) Unless otherwise specified elsewhere herein, concrete shall comply with the applicable requirements of Tables 3.05-II, 3.05-III, 3.05-IV, 3.05-V, and 3.05-VI.

TABLE 3.05-II -- PROPORTIONS

Class of Concrete	Nominal Size of Coarse Aggregate Used - Inches	Fine Aggregate Percentage By Weight of Total Aggregate (See Note 1)
High-Early Strength	5/8 or 3/4	29 to 37
	1-1/2	26 to 34
Class A-40	5/8 or 3/4	29 to 37
	1-1/2	26 to 34
Class B-32	3/4	32 to 40
	1-1/2	29 to 37

Note 1--Quantity of fine aggregate may be varied within the limits indicated according to the type of coarse aggregate used, in order to obtain a smooth, dense, homogeneous and plastic mixture.

TABLE 3.05-III -- INGREDIENT MATERIALS

	Applicable Sections						
Type of Concrete	Portland Cement	Pozzolans	Sand Fine Aggregate)	Coarse Aggregate	Air-entraining Admixture	Pigment	Retarder
IA	2.10 Type I*	3.05.3.(E)	2.21 Type 1A	2.02**	2.09	2.19	2.09
IIA	2.10 Type II*	3.05.3.(E)	2.21 Type 1A	2.02**	2.09	2.19	2.09
IIIA	2.10 Type II* or III*	3.05.3.(E) Type 1A	2.21	2.02**	2.09	2.19	2.09

**To be used with an approved air-entraining admixture, which shall be added at the time concrete ingredients are mixed with water.*

***Coarse aggregate shall be Type 1, Grade A or Grade B, or Type 2, Size No. 357, Size No. 57 or Size No. 67 of ASTM Designation C 33, as specified.*

TABLE 3.05-IV
COMPRESSIVE STRENGTH IN LBS. PER SQ. INCH, MIN.
AVERAGE OF NOT LESS THAN THREE CYLINDERS OR CORES

Concrete--Type IA, Type IIA & Type IIIA at 28 Days	
Class of Concrete	Cylinders or Cores
High-Early Strength	4,000***
Class A-40	4,000
Class B-32	3,200

****Concrete shall be required to obtain a minimum of 3,200 psi compressive strength at 3 days as determined by one set (3 cylinders) of concrete cylinders for each days work*.

The above date limitations concerning cores refer to the date on which the concrete represented by the cores was deposited.

No reduction in minimum compressive strength will be allowed for concrete colored with pigment or any other additives.

TABLE 3.05-V

TIME STRENGTH TABLE
PORTLAND CEMENT CONCRETE

When compressive strength tests are made after the standard 28-day period following placing of the concrete, the strength at 28 days shall be determined from the actual compressive strength in accordance with the following table:

Tested at Days	Divide by	Tested at Days	Divide by	Tested at Days	Divide by	Tested at Days	Divide by
28	1.000	44	1.071	60	1.120	76	1.157
29	1.005	45	1.075	61	1.122	77	1.159
30	1.010	46	1.078	62	1.125	78	1.161
31	1.014	47	1.081	63	1.127	79	1.163
32	1.019	48	1.084	64	1.129	80	1.165
33	1.023	49	1.087	65	1.132	81	1.167
34	1.027	50	1.090	66	1.134	82	1.169
35	1.032	51	1.093	67	1.136	83	1.171
36	1.036	52	1.096	68	1.139	84	1.173
37	1.040	53	1.099	69	1.141	85	1.175
38	1.045	54	1.102	70	1.143	86	1.177
39	1.049	55	1.105	71	1.146	87	1.179
40	1.053	56	1.108	72	1.148	88	1.181
41	1.058	57	1.111	73	1.150	89	1.183
42	1.062	58	1.114	74	1.152	90	1.185
43	1.066	59	1.117	75	1.155	over 90	1.185

Concrete of Type IA, IIA and IIIA shall have an air-entrainment of 4 to 7 percent when the coarse aggregate is 1-1/2” stone and 5 to 7 percent when the coarse aggregate is 3/4” stone, with 6.5 percent desired in either case.

When an air-entraining admixture is added to the concrete it shall comply with the requirements of ASTM Designation C 260.

3.05.6. CONCRETE BATCHING PLANT REQUIREMENTS. The batching plant shall be so designed, operated and coordinated as to produce a sufficient quantity of concrete for the construction specified.

(A) ACCEPTANCE

Each Portland cement concrete batching plant shall be subject to approval by DDC's Quality Assurance and Construction Safety (QACS) Bureau and their "MIX DESIGN, LABORATORY AND PLANT APPROVAL PROTOCOL". The minimum requirement for approval is that the proposed Portland cement concrete batching plant must be on the New York State Department of Transportation (NYSDOT) approved list for the current construction season.

The minimum requirement for approval of a pre-cast concrete plant is that the proposed plant must be on the NYSDOT approved list. A waiver for this requirement may be granted by the DDC's Quality Assurance and Construction Safety (QACS) Director for special products that no NYSDOT approved plant is capable of producing.

Each Portland cement concrete batching plant shall also be subject to auditing and approval of the DDC's Director of Quality Assurance and Construction Safety (QACS). The Director of QACS may at any time discontinue the use of any previously approved equipment if non-conformance with the specifications result during the progress of the work. When the Director of QACS discontinues the use of the plant, production will not be acceptable for Department work until corrective measures satisfactory to the Director are carried out.

(B) BINS

The plant shall contain a sufficient number of aggregate storage or holding bins to produce the class of concrete specified. The bins shall have adequate separations for fine aggregate and for the various sizes of coarse aggregates.

Separate storage or holding bins shall be provided for cement of different types except that Type I or Type II may be combined in common storage. The bins shall protect the cement from rain and moisture.

Pozzolan shall be stored at the batch plant in a separate storage or holding bin and it shall be protected from rain and moisture.

(C) WEIGHT HOPPERS AND DISCHARGE CHUTES

The batching plant shall include separate weight hoppers for aggregate and cement. The cement weight hopper shall be enclosed to protect the cement against moisture and to reduce escaping dust.

All discharge chutes shall be arranged so that materials will not lodge or be lost on discharge. The chutes shall not be suspended from any part of the weighing system.

Vibrators arranged so that no significant vibrations are transmitted to the scales or other plant control equipment during the weighting process.

TABLE 3.05-VI

SLUMP VALUES

Concrete Placement	Design Slump Range, Inches	Maximum Slump, Inches
Sidewalks	1-1/2 to 3-1/2	3-1/2
Pavement		
Slipform Paving	1-1/2 to 2-1/2	2-1/2
Form Paving	1-1/2 to 2-1/2	3
Pavement bases	1-1/2 to 4	4
Structural Slabs	3 to 4	4
Piers, Pedestals, Rigid Frames or Arches Box Culverts throughout, Footing and Headwalls, general purpose structural.	2-1/2 to 3-1/2	4
Cast-in-Place Piles	2-1/2 to 3-1/2	5
Underwater Concrete 6 inch minimum slump	6 to 7	8
High early strength pavement slabs or structural sections	2 to 3	3
Structural placement 3 inches thick or less	2-1/2 to 3-1/2	3-1/2
Slip formed median barriers, parapet walls, curbs	1/2 to 1-1/2	1-1/2

NOTE: Maximum slump for pumping applications shall be 4 inches. When a slump test is conducted on concrete produced by a mobile mixing unit, the slump shall be measured 3 to 5 minutes after discharge from the unit.

The above slump requirements shall apply at the point of discharge.

The Contractor shall supply at each point of concrete delivery a slump cone and rod conforming to the requirements of ASTM Designation C 143 for use by the Engineer.

(D) SCALES

Each facility requires:

- Scales installed on or after January 2, 2003 for weighing materials shall be load cell type and shall indicate the load at all stages of the weighing operation from zero to full capacity.
- Scales shall meet the requirements of the National Institute of Standards and Technology, Handbook 44, with no less than 500 nor greater than 2000 scale divisions.
- Digital displays shall match the primary scale within one (1) division.

- The minimum resolution of digital displays shall be equivalent to or less than the minimum graduations on the primary scale.

- Digital displays shall be easly readable and located in direct sight from the operator's normal work station.

All plant scales shall be tested at the Contractor's expense by a competent scales technician as follows:

1. Annually, prior to use for Department work.

2. At intervals of not more than 90 calendar days.

3. Whenever a plant changes location.

4. At any time ordered by DDC's Director of Quality Assurance and Construction Safety, or his/her representative.

A cradle or test platform, approved by the Director of Quality Assurance and Construction Safety (QACS) or his representative, for each scale and at least 20 standard 25 pound test weights shall be provided for testing. The use of a set of tests weights for two or more plants will be permitted only when they can be made readily available within one (1) hour.

If directed by the Director of QACS or his representative, provisions shall be made for locking scales against tampering.

(E) PROPORTIONING CONTROL EQUIPMENT

The materials, including admixtures, shall be proportioned by automatic proportioning devices, approved by the Director of Quality Assurance and Construction Safety unless otherwise indicated on the plans or in the proposal.

The automatic proportioning equipment shall be installed in an area enclosed for protection against dust and inclement weather.

The requirements for these devices are specified under **Subsection 3.05.7, Handling, Measuring and Batching Materials**.

(F) INSPECTION FACILITIES

Each Portland cement concrete plant site supplying concrete for Department work shall have a building or room available for Department use as an office and testing facility. The facility shall be located such that the testing and inspection can be performed in a reasonable manner. The building or room shall be ventilated, lighted, and adequate heating and cooling equipment shall be provided to maintain an ambient air temperature of 70^0 F $\pm 5^0$. The facility shall contain tables, benches, shelves, running water and the necessary equipment required for testing concrete aggregates according to the Department's written instructions. A telephone or other approved means of communication shall be provided at the plant site for the Department's use. A toilet and a lavatory shall also be available at the plant site.

The following equipment is the required minimum and shall be properly installed and maintained in good operating condition:

1. A power driven coarse aggregate sieve shaker with a minimum clear sieve area of 324 Square inches and equipped with an automatic shut-off timing device. A dust cover shall be provided when the shaker is installed inside the facility. The shaker shall be anchored to a firm base.

2. A fine aggregate sieve shaker, power driven independently of the coarse aggregate shaker, for eight-inch diameter sieves and equipped with an automatic shut-off timing device.

3. An aggregate sample splitter adjustable for splitting samples ranging in maximum aggregate size from one-half inch to two inches.

4. A scale, fifty pounds minimum capacity, with maximum 0.02 pound graduations.

5. A scale, one thousand gram minimum capacity, with maximum 0.5 gram graduations.

6. A stove or hotplate suitable for sample drying.

7. A two drawer, legal size, file cabinet with lock and two keys for the exclusive use of the inspector.

8. Necessary accessory test equipment including sieves suitable for all types of aggregates to be used and sample containers.

When the testing facility is shared with others, the Department shall be given priority during production for Department use. The suitability of the inspection facility and the condition of the equipment shall meet the approval of DDC's Director of Quality Assurance and Construction Safety.

A laboratory, office and testing equipment will not be required for plants which are erected for the sole purpose of supplying one project with less than 500 cubic yards of structural and pavement concrete combined unless otherwise specified on the plans or in the proposal. The plant facilities for inspection personnel are the property of the Contractor or his supplier and they shall be provided and maintained in clean condition by the Contractor or his supplier during the course of the work.

3.05.7. HANDLING, MEASURING AND BATCHING MATERIALS. The batch plant site, layout and equipment shall be such as to assure a continuous supply of material to the work.

The aggregates shall be batched at the batch plant site according to these specifications. When approved by the Director of Quality Assurance and Construction Safety, bagged cement may be incorporated into the mixture. The batch size shall be adjusted to use whole bags of cement.

(A) STOCKPILES

Stockpiles shall be formed on bases approved by the Director of Quality Assurance and Construction Safety or his representative. The bases shall have adequate drainage and may consist of prepared aggregate bases, concrete, metal or wood surfaces, or barge floors. The stockpiles shall be built by methods which do not cause particle segregation. Aggregates from different sources and of different sizes shall be stockpiled separately in a manner such that the aggregates will not be contaminated by other sizes or aggregates from other sources. Department approved aggregates shall be stockpiled separately from the non-approved aggregates.

Aggregates shall be handled throughout the batching process in a manner such as to maintain uniform grading of the material. In case the aggregates contain a high or non-uniform moisture content, the aggregates shall be stockpiled a sufficient length of time to stabilize the moisture content.

Each plant shall be equipped with an approved moisture sensing device that will indicate on a readily visible scale or chart the moisture content of the fine aggregate as it is batched. The free moisture content of the fine aggregate at the time of batching shall not exceed 8 percent of its saturated-surface dry weight.

(B) HEATING MATERIALS FOR COLD WEATHER CONCRETING

The aggregates and/or water shall be heated prior to batching to obtain a plastic concrete temperature not less than 50^0F or more than 70^0F, at the time the mixture is placed in the forms. When the air temperature is 32^0F or above, and when the aggregates are free of ice and frozen lumps, the desired temperature of the plastic concrete may be obtained by heating the mixing water only, unless otherwise ordered by the Engineer or his representative. When the air temperature is below 32^0F, or whenever ordered, both mixing water and aggregates shall be heated as herein specified.

For additional requirements to permit the placement of concrete base, curb and sidewalks during cold weather conditions, see **Section 9.04 - Allowance for Anti-freeze Additive in Concrete**.

All water used for mixing concrete shall be heated to a temperature of at least 70^0 Fahrenheit but not over 180^0 Fahrenheit. Aggregates shall be heated either by steam or by dry heat to a temperature of at least 40^0 Fahrenheit but not over 100^0 Fahrenheit. To avoid the possibility of flash set, when water is heated to a temperature in excess of 100^0 Fahrenheit, water and aggregate shall be mixed together in the mixer in such a way that the high temperature of the water is reduced before cement is added. The heating equipment shall be such as to heat the mass uniformly and preclude the possibility of the occurrence of hot spots which will overheat the material.

(C) BATCHING

All plants shall be equipped with an approved automatic weighing, cycling and monitoring system installed as part of the batching equipment, unless otherwise indicated in the specifications, on the plans or in the proposal. The system shall include equipment for accurately proportioning the various components of the mixture by weight, or by volume for admixtures and water, in the proper order and shall include equipment for controlling the cycle sequence. In addition, timing of the mixing operations for central mix plants shall be required. The automatic proportioning system shall be capable of consistently delivering each constituent within the tolerances indicated in Table 3.05—VII, Batching Tolerances. The system shall be designed so that the only manual operation(s) required to produce a preprogrammed batch within these specifications shall be a switch or button to initiate the batching sequence and discharge the completed batch.

There shall be auxiliary interlock cutoff circuits to interrupt and stop the automatic batching operations whenever an error exceeding the acceptable tolerance occurs in proportioning for all material components except water. DDC's Director of Quality Assurance and Construction Safety or his representative may require the locking or sealing of any automated proportioning equipment that may be manually manipulated.

When the aggregate sizes are weighed cumulatively, the tolerance for each bin draw weight shall be based on the total aggregate batch weight. If aggregate sizes are weighed separately, the percentage shall apply to each scale weight. When a pozzolan is weighed cumulatively with the cement, the pozzolan shall be last in the weighing sequence and the tolerance for each material draw weight shall be based upon the total weight of cement plus pozzolan. The electrical circuits used to check delivery tolerances may be set at any span within the full allowable tolerance for any approved batch size. For plants not equipped to automatically adjust tolerances, the tolerance span shall be set for the minimum approved batch size wherever varying batch sizes are being produced.

TABLE 3.05-VII
BATCHING TOLERANCES

Cement & Pozzlan	± 1% (by weight)
Aggregate	± 2% (by weight)
Water (Note 1)	± 1% (by weight or volume)
Admixtures	± 3% (by weight or volume or ± 1 oz.(Note 3), whichever is greater)
Zero Return (Aggregate)(Note 2)	± 2%
Zero Return (Cement & Pozzolan) (Note 2)	± 1%
Zero Return (Water)(Note 1, 2)	± 1%

NOTES: 1: Tolerance applies to water added at central mix plants only.
2: Zero Tolerance is based on the minimum allowable batch size.
3: Based on the preprogrammed target quantity.

The system shall be interlocked during the batching of cement and aggregates so that:

1. No inlet gate can be opened while the weigh hopper discharge gate is open.

2. No weigh hopper discharge gate can be opened-
   (a) While the hopper is being filled.
   (b) Until the full batch weight is within the delivery tolerance.

3. No new batch can be weighed until the hopper is entirely empty of the previous batch and the scale has returned to zero.

When manual batching is permitted, the constituents shall be batched within the indicated delivery tolerances for the automatic proportioning system.

(D) ADMIXTURE DISPENSING SYSTEMS

Plants shall be equipped with the number of dispensing systems necessary to incorporate the required admixtures into the concrete. At least two admixture dispensing systems shall be required for plants supplying structural concrete. These systems shall be capable of accurate measurement within the tolerance limits specified in Table 3.05-VII, Batching Tolerances. The measuring devices shall be equipped with a bypass valve suitable for obtaining a calibrated sample of admixture. Admixtures shall be dispensed in a manner that shall insure uniform distribution of the material throughout the mixture within the specified mixing period. When multiple admixtures are added to the concrete, they shall not come in direct contact with each other prior to mixing. Plants equipped with automatic proportioning systems shall include an approved automatic mechanical admixture dispensing system. The dispensing system shall consist of a volumetric measuring device, interlocked with the plant automated proportioning equipment in such a manner that will positively insure that the quantity of admixture preset into the system has been actually measured and completely discharged. The admixture system shall be interlocked with the automated system so that:

1. Aggregate and/or cement weigh hopper discharge gates cannot be opened until the preset quantity of admixture has been satisfactorily batched or discharged.

2. The recordation of the presence of admixture shall be dependent upon the completion of the admixture discharge.

All plants shall provide at the operator's normal work station readable indication of the actual quantity of admixture batched.

(E) RECORDING OF BATCHING

All concrete batching plants equipped with automatic proportion systems shall have digital recording instruments approved by DDC's Director of Quality Assurance and Construction Safety (QACS) and shall be so located as to be readily accessible and readable to the operator from his normal work station. The recording instruments shall be designed to record the quantities of each aggregate component, cement, pozzolan (when used), water (at central mix plants) and the presence of admixture for each batch of concrete produced. All records of batches shall show the batch number, the day, the month, year, and time of day to the nearest minute for each batch and they shall be imprinted on the record so that each batch may be permanently identified. The Department shall be provided with a clear and legible copy of all batch records.

Cement, pozzolan and aggregate component weights quantities shall be recorded separately. Water at central mix plants may be recorded by weight or volume.

Weights and/or volumes shall be recorded as indicated on the batching scale or meter within an accuracy of $\pm$1 scale or meter gradation. The minimum recorder resolution shall be equivalent to or less than the minimum gradation on the scale or meter, unless otherwise approved by the Director of QACS.

When the automation system is capable of producing other than standard size batches (full, half or quarter cubic yard increments), the recordation requirements shall be in accordance with written directives from the Director of QACS.

On automation systems installed on or after January 2, 1987, a clear and identifiable indication shall appear on the recordation, whenever a batch is initiated without all conditions being satisfied for fully automated production under these specifications or a system is taken out of the fully automated mode during the batching sequence.

Each plant site shall be equipped with an approved instrument capable of automatically applying a time-date stamp to each delivery ticket as the delivery vehicle departs from the plant site.

(F) FAILURE OF AUTOMATIC BATCHING, ADMIXTURE DISPENSING AND RECORDING EQUIPMENT

If at any time the automatic proportioning, admixture dispensing or recording instruments become inoperative, the plant may be allowed, with the approval of DDC's Director of Quality Assurance and Construction Safety, or his representative, to batch and mix concrete mixtures for a period not exceeding 48 hours from the time of breakdown. Written permission of the Director of Quality Assurance and Construction Safety, will be required to operate without these instruments for periods longer than 48 hours.

3.05.8. CONCRETE MIXING, TRANSPORTING AND DISCHARGING.

(A) GENERAL

Concrete may be mixed at a central plant, in truck mixers or at the site as described in these specifications. When mixed at a central plant, the concrete shall be transported in vehicles acceptable to the NYSDOT. All concrete shall be discharged from the discharge openings directly into the forms or into approved conveyance equipment while fresh and before there is evidence of initial set. No retempering of the concrete will be permitted. Retempering is defined as the addition of water after the mix has attained its desired initial slump. Temperature of the concrete mixture upon discharge shall not exceed 90° Fahrenheit.

The Contractor shall supply concrete at a rate consistent with placement operations as determined by the Engineer. The Engineer, or its representative, may discontinue the use of any type of concrete mixing or

transporting units when unsatisfactory results are obtained. The requirements of this section shall apply unless otherwise stated in the specific item.

A summary of time limitations for the various types of Portland Cement concrete mixing equipment from the beginning of batching to the completion of discharge is given to Table 3.05-X, Summary of Concrete Batching, Mixing, Hauling and Discharging.

(B) CONCRETE UNIFORMITY

Mixing shall be performed in an approved mixer capable of combining aggregates, cement, water and admixtures into a thoroughly mixed and uniform mass within the specified mixing period, and discharging the mixture without segregation. Each mixer shall display, in a clearly visible location, a manufacturer's supplied plate(s) stating the capacity of the mixer and the recommended drum speeds for each operation.

All concrete produced shall meet the uniformity requirements in Table 3.05-VIII, Concrete Uniformity. Tests shall be performed by the Department when required by the specifications or requested by the Engineer. It will not be necessary to verify that mixing equipment meets the uniformity requirement unless evidence of non-uniform concrete is found or unless the Contractor requests a reduced mixing time for central mixers. In order to obtain uniformity the Contractor may reduce the batch size below the rated mixer capacity or reduce the mixing speed tolerance limit.

(C) CENTRAL MIXED CONCRETE

Central mixed concrete is defined as concrete mixed in a stationary mixer and transported in approved agitating or non-agitating units to the point of deposition. Central mixed concrete may be used for mixing all concrete mixtures unless otherwise specified on the plans or in the proposal. Batch sizes for any mixer shall be no larger than the rated capacity of the drum indicated on the manufacturer's plate.

Mixing units shall be equipped with an acceptable timing device that will not permit a batch of concrete to be discharged until the specified mixing time has elapsed. Mixing units and control devices will be disapproved by DDC's Director of Quality Assurance and Construction Safety (DQAC), or his representative if at any time they are found unfit to function properly. When the blades inside the drum have become loose, broken, bent, scalloped or worn away 20 percent in any dimension, they shall be properly repaired or replaced.

The constituents of the concrete mix shall be charged into the mixer in a manner approved by the Director of QACS or his representative. The minimum mixing time after all materials are in the drum shall be 90 seconds, unless it can be demonstrated through tests that uniformity of the concrete meeting the requirements of Table 3.05-VIII, Concrete Uniformity, can consistently be obtained at lesser time as approved by the Director of QACS. Central mixers shall discharge the entire batch in an unrestricted manner into a hopper or directly into a delivery unit. The delivery unit shall transport the thoroughly mixed concrete to the point of use without loss of uniformity. Each delivery unit must be approved by the Director of QACS or his representative prior to use and subjected to frequent inspections during its use. If found unfit, it will be disapproved until the proper operating condition has been restored. Both the agitating and non-agitating delivery units shall be completely emptied, clean and free from concrete and wash water before receiving the next load of concrete.

Delivery agitating units shall rotate at a drum speed of 2 to 6 revolutions per minute unless otherwise approved by the Director of QACS. Agitating units shall conform to the requirements for truck mixers under **Subsection 3.05.8.(E), Truck Mixed Concrete**, as they pertain to operating condition and condition of the drum. When central mixed concrete is transported in units approved for truck mixing, a minimum of 90 percent of the design water shall be added to the mix by the batch plant water system. The addition of water to obtain initial slump will be permitted at the work site in not more than two additions. After each addition, the concrete shall be mixed at least 30 revolutions in accordance to truck mix requirements before discharging.

The haul road used by non-agitating concrete delivery units shall be free from holes washboarding or any other features that would cause segregation in the mix. In addition, non-agitating concrete delivery units shall have cover, when ordered by the Engineer, to protect the concrete from adverse drying conditions and precipitation.

TABLE 3.05-VIII
CONCRETE UNIFORMITY

TEST	Permissible Variation concrete samples taken at two locations in the batch
1. Weight per cubic foot calculated to an Air-Free Basis	2.0 lbs. per C.F.
2. Air Content, % by volume of concrete	1.0 percent
3. Slump:	
Average slump 4 inches or less	1.0 inches
Average slump greater than 4 inches	1.5 inches
4. Coarse aggregate content, portion by weight of each sample retained on a No. 4 sieve	6.0 percent
5. Unit weight of air-free mortars based on average for all comparative samples tested	1.6 percent
6. Average compressive strength of 7 days for each sample based on average strength of all comparative test specimens	10.0 percent

NOTE: Samples shall be taken at the point of discharge of the concrete mixer. Sampling and testing procedures shall be as approved by the DDC's Director of Quality Assurance and Construction Safety.

The time interval between completion of mixing at the central mix plant and completion of discharge shall be as noted in Table 3.05-IX, Time Limits for Delivery of Central Mixed Concrete.

TABLE 3.05-IX
TIME LIMITS FOR DELIVERY OF CENTRAL MIXED CONCRETE

Delivery Unit	Type of Placement	Maximum Time Minutes	Notes
Non-agitating including all open top units	All	30	
Agitating - rotating drum	Structural	90	1
Agitating - rotating drum	Pavement	60	1 & 2

NOTE 1. The concrete will be rejected if there is evidence of setting up in the mixer. The Engineer may reduce the total time limit in hot weather or under unusual conditions if unsatisfactory results are obtained.

NOTE 2. The Engineer may increase the allowable time to 90 minutes maximum for small or irregular sections of pavements where placing and finishing operations can be completed rapidly.

(D) TRANSIT MIXED CONCRETE

Transit mixed concrete is defined as concrete mixed completely in a truck mixer; mixing may occur at the following locations or combinations thereof: at the plant, while in transit, or at the point of deposition. Transit Mix may be used for all concrete items unless otherwise specified on the plans or in the proposal.

The truck mixer shall be the inclined axis rotating drum type equipped with a water tank(s) and water system having a measuring a device to measure water (U.S. gallons) introduced into the drum within an accuracy of two percent. In addition, each truck mixer shall be equipped with a hatch in the periphery of the drum shell of such design as to permit access to the inside of the drum for inspection.

Each truck mixer used for transit mixed concrete shall be equipped with an approved electrical revolution-counting device mounted in a clearly visible position.

The device shall show on separate counters (1) the number of drum revolutions at speeds within the mixing range and (2) the total number of drum revolutions. Both counters shall be legible to one revolution and shall be designed to accept a non-standard electric plug for resetting each counter to read zero at the time of loading at the batch plant. The revolution counting device shall be tamperproof such that if tampering occurs the counters will become inoperative or the device will otherwise indicate tampering including the interruption of electric power.

The revolution counting device shall be installed to count the number of revolutions of the drum in the direction of mixing. The device shall be adjusted so that it counts the number of revolutions specified for the mixing and agitating drum speed within the tolerances indicated on the manufacturers rating plate, but not to exceed the following requirements for truck mixers:

Mixing - 6 RPM minimum to 18 RPM maximum
Agitating - 2 RPM minimum to 6 RPM maximum

These limits may be adjusted for individual mixing units upon approval of the DDC's Director of Quality Assurance and Construction Safety (QACS).

Each truck mixer unit shall be inspected and approved annually by the Director or QACS or his representative for use in Department work. During its use, additional inspections will be made by the Director of QACS or his representative to determine the operating condition of the equipment. Whenever improper conditions exist, the truck mixer unit shall be satisfactorily repaired or replaced. This will include blades inside the drum which have become heavily caked with mortar, loose, broken, bent, scalloped, worn 20 percent in any dimension or otherwise damaged.

Truck mixers will not be permitted to mix concrete batches having volumes greater than the maximum cubic yard capacity indicated on the manufacture's rating plate(s). The drum shall be drained of wash water before charging with the constituents of the concrete mixture, and the drum shall be revolving during loading.

Approximately 90% of the design water shall be added to the mix in a manner approved by the Director of Quality Assurance and Construction Safety, by either a batch plant water system or from the water supply carried on the truck.

Mixing shall begin not more than 5 minutes after cement has made contact with the aggregates. The load shall be mixed from 70 to 100 drum revolutions and then checked for consistency. If the truck is enroute to the project, the mixer speed shall be changed to agitating speed after 70 to 100 mixing revolutions. Under no circumstances shall the mixer drum be stopped.

Water may be added to the mixture in not more than two additions at the point of deposition before discharge to obtain initial slump. After each such addition the concrete shall be mixed at least 30 revolutions in the mixing speed range. The total number of revolutions in the mixing range shall not be less than 100 nor more than 160.

After completion of mixing, discharging may begin immediately, otherwise the mixer shall be revolved at agitating speed. Once discharge has commenced, the entire load shall be discharged in not more than 50 minutes.

Concrete shall be discharged through a completely opened discharge gate providing unrestricted flow. The discharge area or gate shall remain fully open throughout the discharge period and the rate of discharge shall be controlled by the speed of the drum.

The total time interval from the moment the cement makes contact with the aggregates to the completion of discharge shall not exceed 90 minutes for structural concrete placements and 60 minutes for pavement concrete placements. The Engineer may increase the allowable time for pavement placements to 90 minutes maximum for small or irregular sections where placing and finishing operations can be completed rapidly. The Assistant Commissioner, Construction or his representative may reduce the total time limit in hot weather or under unusual conditions, if unsatisfactory results are obtained.

(E) TRUCK MIXED CONCRETE

Truck mixed concrete is defined as concrete mixed completely in a truck mixer following the addition of mixing water at the point of deposition. The requirements of **Subsection 3.05.8.(D), Transit Mixed Concrete**, apply except as modified:

1. Each truck mixer shall have an approved revolution counter located in a position readily visible to the Engineer. The electrical revolution counting device will not be required but it may be used to count the number of revolutions of the drum in the direction of mixing.

2. The loading of the mixers shall be performed in the following manner:

a. Regular Truck Mix (cement in contact with moist aggregates). The drum many be rocked or revolved during the charging of coarse and/or fine aggregates with admixtures. Cement shall be charged last and the drum shall be stationary until mixing begins. Mixing shall begin no longer than 30 minutes after cement comes in contact with the aggregate.

b. Layered Truck Mix (cement in contact with saturated surface dry or drier coarse aggregate). Fine aggregate with admixtures, coarse aggregate and cement that have been separately batched shall be charged through a hatch in the side of the drum in the following sequence: fine aggregate with admixtures, coarse aggregate and then cement. The drum may be rocked after the addition of each aggregate size and shall remain stationary while charging the cement and until mixing begins. Mixing shall begin no longer than 90 minutes after cement comes in contact with the coarse aggregate.

3. Mixing shall begin at the point of deposition after the addition of water. The water shall be introduced into the drum either from the head section or by dual injection from both the head and discharge section. The mixing shall continue for a minimum of 100 revolutions or until uniform concrete of the required consistency is produced whichever is longer. The mixing period shall not exceed 15 minutes.

4. The entire load shall be discharged within 30 minutes after mixing has been completed.

TABLE 3.05-X
SUMMARY OF CONCRETE BATCHING, MIXING, HAULING AND DISCHARGING

Central Mixed Concrete	Transit Mixed Concrete	Truck Mixing Concrete	
	Requires electric revolution counting device	Regular Truck Mix	Layered Truck Mix
Begin Batching Charge mixer in an approved manner	Begin Batching Materials batch loaded or ribbon loaded thru back	Begin Batching Drum can be rocked or revolved for aggregates	Begin Batching Fine agg. and SSD coarse agg. is loaded thru hatch. Can rock after each fraction
	Add approximately 90% of design water	Drum cannot be moved while cement is added	Drum cannot be moved while cement is added
End of Batching & Begin Mixing 90 Seconds Minimum — After all material are in the mixer	Cement In Contact W/Aggs. 5 Minutes Maximum	Cement In Contact W/Aggs. 30 Minutes Maximum	Cement In Contact W/Aggs. 90 Minutes Maximum
	Beginning of Mixing At plant or in transit 100 revs Minimum — 160 revs Maximum Mix: 6-18 rpm	Beginning of Mixing At project, after the addition of water 100 revs Minimum — 15 Minutes Maximum Mix: 6-18 rpm	Beginning of Mixing At project, after the addition of water 100 revs Minimum — 15 Minutes Maximum Mix: 6-18 rpm
End of Mixing Open Haul Units — 30 Minutes Maximum Rotating Drum Agitators 2-6 rpm — 60 Mins. Max. (Pav't) — 90 Mins. Max. (Struct.)	End of Mixing Agitate 2-6 rpm	End of Mixing 30 Minutes Maximum — Agitate 2-6 rpm	End of Mixing 30 Minutes Maximum — Agitate 2-6 rpm
	Beginning of Discharge 50 Minutes Maximum		
Completion of Discharge When concrete is transported in units approved for mixing, the remainder of the design water may be added at the work site to attain initial slump.	Completion of Discharge The remainder of the design water may be added at the work site to attain initial slump.	Completion of Discharge	Completion of Discharge

(F) MOBILE CONCRETE MIXING UNITS

A mobile concrete mixing unit, as approved by the Engineer, may be used in miscellaneous work defined as curb, gutter, headwalls, catch basins, manholes, drop inlets, field inlets, sign foundations, lighting structure foundations, anchor units, pullboxes, leveling footings and similar placements.

Each mobile mixing unit shall be self contained and of the continuous mixing type, capable of carrying sufficient unmixed dry bulk cement, fine and coarse aggregate, water and admixtures to produce on site no less than six (6) cubic yards of concrete.

The mobile mixing unit shall be equipped with proportioning devices which shall deliver the materials within the following tolerances by weight:

Cement	0 to + 4%
Fine Aggregate	± 2%
Coarse Aggregate	± 2%
Water	± 1%
Admixtures	± 3%

The amount of cement being introduced into the mix shall be measured by a meter which is clearly visible and kept clean at all times. The quantity of cement shall be recorded by a ticket printer which shall, as a minimum, record the number of revolution counts of the cement feeder.

The mixers shall provide positive control of the flow of water into the mixing chamber. Water flow shall be indicated by a flow meter and be readily adjustable to provide for minor variations in aggregate moisture. The system shall be equipped with a bypass valve or hose suitable to determine batching accuracy.

The mixers shall be equipped with at least one admixture delivery system. Each system shall provide positive control of the flow of admixture into the unit's mix water system. Flowmeters shall be used to control the amount of admixture added to the mix. Admixtures shall be dispensed in a manner that shall ensure uniform distribution of the material throughout the concrete. The system shall be capable of adding admixture in the amounts necessary to achieve the required air content. The system shall be equipped with a bypass valve suitable for obtaining a calibrated sample of admixture to determine batching accuracy. The mixers shall be capable of combining aggregates, cement, water and admixture into a thoroughly mixed and uniform mass. Discharge of the mixture shall be accomplished without segregation.

When mobile mixing units are permitted, no specific mixing time will be required except that the concrete shall be properly and uniformly mixed as determined by the Engineer. All the constituents of concrete manufactured by a mobile mixing unit shall be stockpiled at the project site unless otherwise approved by the Engineer.

The Contractor shall calibrate the mobile mixing unit and shall provide a record of the calibration of the unit to the Engineer for the mix design to be used. The Engineer will furnish the mix design information and the written calibration procedure to the Contractor. The Department reserves the right to witness the calibration of the mixing unit.

Prior to actual use, the Contractor shall demonstrate, to the Engineer, that the concrete meets the specification requirements for slump, air content and proportioning. Proportioning may be verified in accordance with written Department procedures.

If, in the opinion of the Engineer, improper conditions exist, the conditions shall be corrected as approved by the Engineer. Improper conditions shall include, but not be limited to, hydrated cement deposits and mixing blades which are loose, broken, bent, scalloped, worn 20 percent in any dimension, or heavily caked with mortar.

If the Engineer determines that the mixer unit is not performing satisfactorily, he may discontinue use of the unit. The Contractor shall provide the necessary scales, containers and personnel approved by the Engineer to perform calibration of the unit.

(G) SMALL CONSTRUCTION MIXERS

In work involving small quantities of concrete, the Engineer may permit a small construction mixer. The mixer shall be capable of producing concrete having the specified slump and air content. Any concrete placed under such conditions shall be mixed no less than 90 seconds after all the materials are in the mixer drum.

3.05.9. TEMPERATURE OF CONCRETE. The concrete at the time of pouring shall be maintained at a temperature of not less than 50° nor more than 90° Fahrenheit.

When the air temperature exceeds 85° Fahrenheit, the concrete subsequent to initial set shall be protected for three (3) days after pouring so as to prevent it from going above 90° Fahrenheit.

When the air temperature is less than 38° F in the shade the Contractor may submit, to the Engineer for approval, proposed methods for placing and protecting concrete in the cold. At such temperatures concrete shall be poured only with the approval of the Engineer and shall be adequately protected.

If the air temperature falls below 50° F, an accelerator may be used. If the air temperature exceeds 85° F, a retarder may be used. Accelerators and retarders must be approved by the Engineer before use.

3.05.10. QUALITY CONTROL PROCEDURES. The quality control procedures used for on site inspection, sampling and testing of Portland cement concrete shall conform to those procedures described in the Department's Materials Method 9.2 - Field Inspection of Portland Cement Concrete.

SECTION 3.06 - Filler; Joint, Air-entrained Cement-grout

3.06.1. This section describes Air-entrained Cement-grout Joint Filler for use in the construction of block pavements.

3.06.2. (A) Cement-grout joint filler shall be of the following types:

Type 1 -- Air-entrained Portland Cement-grout
Type 2 -- Extra Strength Air-entrained Portland Cement-grout

(B) Type shall be as specified.

Type 1 shall be used unless Type 2 is specified.

3.06.3. (A) Type 1 Air-entrained Cement-grout Joint Filler shall consist of sand mixed with Portland cement and water in definite proportions so as to produce a mixture of cream-like consistency containing one (1) part of cement by volume and not more than two and one-half (2-1/2) parts of sand by volume, based on rodded volumetric measurement of dry material. Type 2 Extra Strength Air-entrained Cement-grout joint filler shall consist of sand mixed with Portland cement and water in definite proportions so as to produce a mixture of cream-like consistency containing one (1) part of cement by volume and not

more than two (2) parts of sand by volume, based on rodded volumetric measurement of dry material. When aggregates are measured in the damp-loose condition, they will occupy greater volume than when dry-rodded and the percentage bulking shall be determined by test. Approximate average bulking value for sand is twenty-five (25) percent.

(B) Portland cement for Type 1 and Type 2 cement grout shall comply with the requirements of **Section 2.10**, Type I or Type IA. If Type I is used an acceptable admixture shall be used.

(C) Sand shall comply with the requirements of **Section 2.21**, Type 2A.

(D) Water shall be potable and drawn from municipal water mains.

3.06.4. (A) PROPORTIONING INGREDIENTS.

The materials comprising the charge for each batch shall be measured accurately by weight or volume.

(B) MIXING INGREDIENTS.

Grout shall be mixed in a suitable box or on a tight platform, and never upon pavement or ground. Cement and Sand Grout shall be thoroughly mixed dry, until the mixture has a uniform color. Clean, fresh water shall then be added and the mass worked until a mixture, which is uniform and of the required consistency, is produced. Grout shall be mixed in no greater quantity than is required for the work in hand. Grout that has set sufficiently to require retempering shall not be used.

When required by the Engineer, ingredient materials, after measuring, shall be mixed in an approved rotating drum type batch mixer. Mixing shall be for a period of not less than one and one half (1-1/2) minutes at a rate of not less than fourteen (14) nor more than twenty-two (22) revolution per minute and shall be continued until a homogeneous mixture is produced. The grout shall be kept constantly agitated until used.

3.06.5. (A) NON-SHRINK GROUTS.

The grouting and/or mortar material shall be an approved ready-to-use mixture requiring only water for use at the job site. The compressive strength of 2 in. cubes shall be 3000 psi at 7 days. The grouting and/or mortar material shall meet the following performance requirements. When mixed to a flow table consistency of 130 +/- 5 percent (ASTM C 109 except that the reading shall be taken after 5 drops delivered in 3 seconds) the grout shall show complete vertical shrinkage correction in 3 to 7 days when placed in test cylinders 2 in. diameter by 4 in. high, covered immediately with a glass plate held firmly in place. Initial surface of the grout shall be determined by micrometer measurements to the top of the plate and the thickness of the plate gauged to determine the true initial level of the grout. The glass plate shall be removed at 24 hours and subsequent measurements at 3 and 7 days made to the free surface of the grout. The specimens shall be cured in laboratory air during the test period.

Non-shrink grouts containing additives such as iron or steel particles depending on oxidation to limit shrinkage shall not be used.

(B) DRY PACK.

Mortar for dry packing (to be packed or tamped in place) shall be made at no slump consistency. When mixing the batch, only enough water shall be added to the dry materials to produce a rather stiff mixture, then additions of water may be made in small increments until the desired consistency is secured. Settlement of the mortar can be reduced by delaying its placing.

The mortar shall be mixed; then allowed to stand in a mortar box or other container for about two (2) hours. The box or container shall be kept covered. When used, the mixture should be of such

consistency that when a sample is squeezed in the hand only enough water will come to the surface to moisten the hand.

3.06.6. The mixing and use of grout in freezing weather shall be subject to the same requirements as herein specified for mixing and placing concrete under similar conditions.

SECTION 3.07 - Mortar, Air-entrained Portland Cement

3.07.1. This section describes Air-entrained Portland Cement Mortar for use in the construction of pavements.

3.07.2. (A) Mortar shall be of the following types:

Type 1 -- Air-entrained Portland Cement Mortar

Type 2 -- Extra Strength Air-entrained Portland Cement Mortar

(B) Type shall be as specified.

Type 1 shall be used unless Type 2 is specified.

3.07.3. (A) Type 1 Air-entrained Mortar shall consist of sand mixed with Portland cement and water in definite proportions so as to produce a stiff mixture containing one (1) part of air-entrained cement by volume and not more than three (3) parts of sand by volume, based on rodded volumetric measurement of dry material.

Type 2 Extra Strength Air-entrained Portland Cement Mortar shall consist of sand mixed with Portland cement and water in definite proportions so as to produce a stiff mixture containing one (1) part of air-entrained cement by volume and not more than two and one-half (2-1/2) parts of sand by volume, based on rodded volumetric measurement of dry material. When aggregates are measured in the damp-loose condition they will occupy greater volume than when dry-rodded and the percentage bulking shall be determined by test. Approximate average bulking value for sand is twenty-five (25) percent.

(B) Air-entrained Portland cement for Type 1 and Type 2 mortar shall comply with the requirements of **Section 2.10**, Type I or Type IA. If Type I is used, an acceptable admixture shall be used.

(C) Sand shall comply with the requirements of **Section 2.21**, Type 2A.

(D) Water shall be potable and drawn from municipal water mains.

3.07.4. (A) PROPORTIONING INGREDIENTS.

The materials comprising the charge for each batch shall be measured accurately by weight or volume.

(B) MIXING INGREDIENTS

Mortar shall be mixed in a suitable box or on a tight platform, and never upon pavement or ground. Cement and sand shall be thoroughly mixed dry, until the mixture has a uniform color. Clean, fresh water shall then be added and the mass worked until a mortar, which is uniform and of the required consistency, is produced. Mortar shall be mixed in no greater quantity than is required for the work in hand. Mortar that has set sufficiently to require retempering shall not be used.

When required by the Engineer, ingredient materials, after measuring, shall be mixed in an approved rotating drum type batch mixer. Mixing shall be for a period of not less than one and one half (1-1/2) minutes at a rate of not less than fourteen (14) nor more than twenty two (22) revolutions per minute and shall be continued until a homogeneous mixture is produced. The mortar shall be kept constantly agitated until used.

3.07.5. FREEZING WEATHER. The mixing and use of mortar in freezing weather shall be subject to the same requirements as herein specified for mixing and placing concrete under similar conditions.

SECTION 3.08 - Separating Agent, Calcium Chloride

3.08.1. This section describes Calcium Chloride Separating Agent for use in preventing asphaltic joint fillers from adhering to the surfaces of block pavements.

3.08.2. Calcium chloride separating agent shall be of one kind.

3.08.3. Calcium chloride separating agent shall consist of a mixture of calcium chloride, laundry starch and water.

3.08.4. (A) Separating agent shall be composed of 34 to 35 percent calcium chloride, 1 to 2 percent laundry starch and 63 to 65 percent water, all by weight. (To fill a 50 gallon drum with separating agent, use 170 to 175 lbs. calcium chloride, 5 to 10 lbs. starch and approximately 38 gallons of water. This will yield approximately 48 gallons of separating agent.)

(B) Calcium chloride shall comply with the requirements of **Section 2.08**.

(C) Laundry starch shall be either a boiling corn starch or a blended boiling starch, suitable for the purpose intended.

(D) Water shall be potable and drawn from municipal water mains.

3.08.5. The materials comprising the charge for each batch shall be measured accurately by weight or volume. The required water shall be placed in the drum. The starch shall be mixed with a small quantity of hot water in a separate vessel to a smooth paste, poured into the water in the drum and thoroughly mixed. The calcium chloride shall then be poured into the drum and thoroughly mixed. If used in a spray, the mixture shall be strained before application.

DIVISION IV - CONSTRUCTION METHODS

(NO TEXT ON THIS PAGE)

DIVISION IV

CONSTRUCTION METHODS

SECTION 4.01 - Asphalt Macadam Pavement

4.01.1. INTENT. This section describes construction of Asphalt Macadam Pavement.

Recycled asphalt concrete pavement (consisting of reclaimed asphalt pavement blended with new materials) may be used to the percentages specified in **Subsection 4.01.3.(D)**, below.

4.01.2. DESCRIPTION.

(A) Asphalt Macadam Pavement shall consist of a base course after compaction of two (2”) inches less than the total specified thickness of the Asphalt Macadam Pavement and a wearing course two (2”) inches in thickness after compaction. The Contractor shall be responsible for continuous monitoring of the pavement density using nuclear density gauges and pavement coring as required by these specifications.

(B) Base course shall be of the following classes:

Class 1(a) -- Non-bituminous, composed of one and one-half (1-1/2”) inch aggregate with screenings or sand.

Class 1(b) -- Non-bituminous, composed of a dense graded stone base mix complying with the requirements of **Section 2.02** for such mix.

Class 2 -- Bituminous, composed of one and one-half (1-1/2”) inch and three-eighth (3/8”) inch aggregates combined with asphaltic cement.

Class 3 -- Plant Mix Binder, conforming to Marshall Design Type 3 RA binder course conforming to the requirements of **Section 3.01**.

Unless otherwise specified, shown on the Contract Drawings, or directed or ordered by the Engineer, Class 3 base course shall be used. The initial first lift shall not exceed four (4”) inches in thickness after compaction and any additional lifts, as may be required, shall not exceed two (2”) inches or be less than one and one-half (1-1/2”) inches in thickness after compaction.

(C) Surface course shall be of the following classes:

Class 1 -- Penetration Method, composed of one and one-half (1-1/2”) inch and three-eighth (3/8”) inch aggregates penetrated with asphaltic cement.

Class 2 -- Plant Mix shall be Marshall Design high friction Type 6F RA Asphaltic Concrete conforming to the requirements of **Section 3.01**.

Unless otherwise specified, Class 2 surface course shall be used.

(D) Class of base course and class of surface course shall be as specified.

4.01.3. MATERIALS.

(A) ASPHALTIC CEMENT

Asphaltic cement shall comply with the requirements of **Section 2.05, Asphaltic Cement**. The penetration at 77° Fahrenheit shall be 85 to 100 or 120 to 150 as specified. The 120 to 150 grade may be used for cool weather with written permission of the Engineer.

(B) AGGREGATE

Aggregate shall be broken stone Type 1, Grade A or B, as specified, complying with the requirements of **Section 2.02**. Broken stone of Grade B shall not be laminated or indicate any structural weakness in the nominal sizes one and one-half (1-1/2") inch and three-eighth (3/8") inch. Grade of broken stone shall be as specified. One and one-half (1-1/2") inch aggregate shall be size No. 357, broken stone. Three-eighth (3/8") inch aggregate shall be size No. 8 broken stone. Screenings shall be Grade B. Aggregate of each size shall be of uniform quality.

(C) SAND

Sand for Base Course, Class 1, shall comply with the requirements of **Section 2.21**, Type 1A or 2A Sand.

(D) PLANT MIX

Plant mix shall comply with the requirements of **Section 3.01, Asphalt Paving Mixtures**, for the type and asphalt penetration specified, except that the proportion of reclaimed asphalt pavement permitted within each mix shall be 10 percent for top and 25 percent for the base course.

4.01.4. METHODS, BASE COURSE.

(A) EARTH SUBGRADE

The earth subgrade, immediately before stone is placed upon it, shall be compacted with an approved roller weighing not less than two hundred and twenty-five (225) pounds per inch width of main roll. It shall be smooth, parallel to and at the required depth below the finished pavement surface and shall not be in a muddy or frozen condition. Unsuitable material shall be removed and replaced with acceptable material thoroughly compacted to a minimum of 95% of Standard Proctor Maximum Density.

(B) BASE COURSE, CLASS 1 AND CLASS 2

The one and one-half (1-1/2") inch aggregate shall be spread on the subgrade by shovels or by approved spreading vehicles, uniformly in such manner as to prevent segregation. Not more than four (4") inches shall be spread at one time. The surface of the aggregate when properly compressed shall be two (2") inches below and parallel to the finished pavement surface. Aggregate shall not be placed adjacent to railway tracks, manhole heads or other structures until they have been set to the proper lines and grades. Not more than an average day's work shall be spread in advance of the rolling.

Should objectionable material become mixed with the broken stone, it shall be dug out, removed, and replaced with clean broken stone compacted as required. Surface irregularities shall be corrected by loosening the surface, removing excesses or supplying deficiencies of coarse aggregate and by rolling the disturbed and surrounding areas until satisfactorily compacted to a true surface.

The aggregate when properly spread shall be rolled with one or more approved power-driven rollers weighing not less than ten (10) tons. Rolling shall proceed longitudinally, toward the center of the pavement, with successive trips overlapping each other by one-half (1/2) of the width of the roller, and continuously until a firm, true, uniform surface is obtained.

(C) BASE COURSE, CLASS 1 (A), NON-BITUMINOUS

The broken stone screenings or sand shall, after the one and one-half (1-1/2") inch aggregate has been rolled to a satisfactory surface, be spread in uniform thin layers, each layer being rolled until all voids in the broken stone are filled without an excess of screenings or sand above the surface of the broken stone. Rolling shall proceed continuously until the stone does not creep or wave ahead of the roller.

(D) BASE COURSE, CLASS 1(B), NON-BITUMINOUS, DENSE GRADED STONE

The total thickness of the course, after compaction, shall be six (6") inches, unless otherwise provided. Loose material shall be spread with approved spreader equipment to a depth sufficient to result in a compacted layer not exceeding four (4") inches in thickness.

Water shall be added in such amounts as will secure the maximum density in each layer and in the course after compaction. The entire surface of the layer shall be rolled with a smooth wheel roller having a minimum weight of ten (10) tons and each portion of the layer shall be covered by a minimum of eight (8) passes of the roller. The foregoing procedure shall be followed in spreading each subsequent layer in the base course.

The Contractor may substitute the following vibratory compaction method for the foregoing procedure. After the course is spread evenly so that it will have the required thickness, after compaction, it shall be compacted over the entire area by an approved vibratory compactor. Vibration shall continue until the stone is keyed sufficiently to permit rolling with an approved roller without displacement of the stone. The entire area of the base course shall then be thoroughly rolled with an approved roller weighing not less than ten (10) tons. Rolling shall begin at the sides and continue toward the center and shall be continued until there is no movement of the course ahead of the roller.

All pertinent provisions of **Subsections 4.01.4.(B)**, **4.01.4.(G)** and **4.01.4.(H)** shall be deemed applicable to this provision.

(E) BASE COURSE, CLASS 2, BITUMINOUS

The asphaltic cement shall be heated to a temperature between 300° and 350° Fahrenheit in suitable vessels properly equipped with approved thermometers. It shall be at a temperature of not less than 275° Fahrenheit at the time of application and be applied only when the course is dry and clean of all loose material and when the air temperature in the shade is not less than 45° Fahrenheit, unless otherwise permitted by the Engineer. After the one and one-half (1-1/2") inch stone has been rolled to a satisfactory surface, the asphaltic cement shall be distributed uniformly at the rate of one and one-half (1-1/2) gallons per square yard for each course with a tolerance of one-tenth (1/10) gallon, by means of a pressure distributor of approved type in such a manner as not to defile or discolor the curb and other structures.

The pressure distributor shall distribute the asphaltic cement in a uniform spray without atomization and be equipped with an approved thermometer, tachometer and pressure gauge which can be easily read during operation, and have tires of such width as to prevent rutting. If provided with heating attachments, the distributor shall be so equipped and operated that the asphaltic cement shall be circulated or agitated throughout the entire heating process.

The distributor shall be operated to secure uniformity in distribution and in depth of penetration by the regulation of the speed of the vehicle and the discharge of the asphaltic cement and by the prevention of overlapping at either the sides or ends of applications and the draining of pipes and nozzles onto the road.

An approved pouring pot or hose attachment to the distributor shall be used to touch up spots or cover narrow strips unavoidably missed by the distributor.

The three-eighth (3/8") inch aggregate shall be deposited in piles adjacent to the road before the application of the asphaltic cement is begun, and shall be kept clean. It shall be dry when used, be spread uniformly over the asphaltic cement while it is still warm and be distributed uniformly in quantity sufficient only to completely fill the surface voids. The surface shall be broomed, if necessary, to prevent excess deposits in spots, and be rolled continuously until the bonding is thorough and the surface is hard, smooth and apparently immovable under the roller. The three-eighth (3/8") inch aggregate shall be applied in additional amounts at points where asphaltic cement adheres to the wheels of the roller.

A second application of asphaltic cement shall be applied at the rate of four-tenths (4/10) gallon per square yard, with a plus tolerance of one-tenth (1/10) gallon, and be of the same material and under the same conditions as the first application. After the second application of asphaltic cement and while it is still warm, clean, dry three-eighth (3/8") inch aggregate shall be spread, rolled and broomed until the surface interstices between the one and one-half (1-1/2") inch aggregate fragments have been filled but without covering the one and one-half (1-1/2") inch aggregate itself. Upon completion of the base, no loose aggregate shall be allowed to remain on the surface. The finished surface shall be uniform, free from porous areas, ruts or irregularities in contour, and true to the established crown and grade.

(F) BASE COURSE, CLASS 3, PLANT MIX MARSHALL DESIGN TYPE 3 RA BINDER

Base Course, Class 3, Plant Mix Marshall Design Type 3 RA Binder shall be furnished and laid in layers the first of which shall not exceed four (4") inches in thickness after compaction and any additional lifts, as may be required, shall not exceed two (2") inches or be less than one and one-half (1-1/2") inches in thickness when compacted, to a total depth which after compaction shall be equal to the specified depth of pavement, less two (2") inches of wearing course. Installation methods including, but not limited to, the Contractor's Quality Control Plan, Certification of Laboratory and Technicians, Preparation of Surface, Test Strip Operations, and testing shall comply with the requirements of installing binder mixture under **Section 4.02, Asphaltic Concrete Wearing Course**, except as otherwise modified herein:

1. A subbase course of granular material shall be furnished, installed, and rolled, to the satisfaction of the Engineer, under other Contract items.

2. Before any asphaltic mixture is laid, unpaved surfaces and paved surfaces shall be free from standing water. All asphaltic mixtures used for temporary ramping shall be removed and a layer of tack coat shall be applied. No mixture shall be deposited unless the surface on which it is to be laid is in a condition acceptable to the Engineer.

3. Tack coat shall be uniformly distributed, without atomization, over the entire surface to be paved at the rate specified under **Section 6.58, Tack Coat**, by means of a pressure distributor of approved type in such manner as not to defile or discolor curbs or other structures.

4. Unless otherwise specified, shown on the Contract Drawings, or directed by the Engineer, no tack coat will be required between layers of asphalt mixture provided the subsequent layer of asphalt mixture has been placed within seventy-two (72) hours of the previous course. When a subsequent layer of asphalt mixture has not been placed within sevety-two (72) hours of the previous course, the Contractor shall be required to apply a tack coat, at one-half (1/2) the rate specified under **Section 6.58**, prior to paving.

5. Binder mixture shall be placed in layers, the first of which shall be not more than four (4") inches, after final compression, and each additional lift as may be required, after final compression, shall be not more than two (2") inches. Binder shall be thoroughly compacted by approved tamping irons adjacent to curbs, manholes, rails, etc., and with approved rollers, in layers, each of which shall not be more than two (2") inches, and to a surface which shall be parallel to and two (2") inches below the finished grade and crown of the street.

(G) BACK ROLLING

The finished base shall be back rolled for such period and at such time as the Engineer may direct.

(H) DENSITY

After final compaction, a plant mix binder base course shall have a density not less than ninety (90) percent nor more than ninety-seven (97) percent of the theoretical maximum density. However, where the density of compaction for any two or more core samples within a block length are shown to fall between 92% and 90% of the theoretical maximum density obtained in accordance with ASTM Designation D 2041, a credit will be taken for that area of pavement in accordance with **Section 5.04(F)**.

(I) WEATHER LIMITATIONS

The provisions of **Section 4.02.4.(C)** shall apply to the work to be done under this section.

4.01.5. METHODS, SURFACE COURSE.

(A) SURFACE COURSE, CLASS 1, PENETRATION METHOD

The one and one-half (1-1/2") inch aggregate shall be placed and spread in accordance with the procedure for base course, conform to the established crown and grade, and have a thickness of not less than two (2") inches when compacted.

Removal, replacement and rolling shall be in compliance with the procedure for base course.

The one and one-half (1-1/2") inch aggregate shall be treated with asphaltic cement under the same conditions and in the same manner as specified under Base Course, Class 2, Bituminous, except that the rate of application shall be one and one-half (1-1/2) gallons per square yard with a tolerance of one-tenth (1/10) gallon.

The pressure distributor shall be identical with that described under Base Course, Class 2, Bituminous.

Three-eighth (3/8") inch aggregate and seal coat shall be applied under the same conditions and in the same manner as specified under Base Course, Class 2, Bituminous.

After completion of the seal coat the finished pavement shall be back rolled, for such period and at such time as the Engineer may direct.

(B) SURFACE COURSE, CLASS 2, PLANT MIX MARSHALL DESIGN HIGH FRICTION TYPE 6F RA ASPHALTIC CONCRETE

Surface Course, Class 2, Plant Mix Marshall Design high friction, Type 6F RA, Asphaltic Concrete shall be placed in one(1) two (2") inch thick course, after compaction. Installation methods including, but not limited to, the Contractor's Quality Control Plan, Certification of Laboratory and Technicians, Preparation of Surface, Test Strip Operations, and testing shall comply with the requirements of installing surface mixture under **Section 4.02, Asphaltic Concrete Wearing Course**, except as otherwise modified herein.

Unless otherwise specified, shown on the Contract Drawings, or directed by the Engineer, no tack coat will be required between layers of asphalt mixture except where the subsequent layer of asphalt mixture has not been placed within seventy-two (72) hours. When a subsequent layer of asphalt mixture has not been placed within seventy-two (72) hours of the previous course, the Contractor shall be required to apply a tack coat, at one-half (1/2) the rate specified under **Section 6.58**, prior to paving.

(C) DENSITY

After final compaction, a plant mix Marshall Design high friction Type 6F RA Asphaltic Concrete shall have a density not less than ninety (90) percent nor more than ninety-seven (97) percent of the theoretical maximum density. However, where the density of compaction for any two or more core samples within a block length are shown to fall between ninety-two (92%) percent and ninety (90%) percent of the theoretical maximum density obtained in accordance with ASTM Designation D 2041, a credit will be taken for that area of pavement in accordance with **Section 5.04(F)**.

(D) WEATHER LIMITATIONS

The provisions of **Section 4.02.4.(C)** shall apply to the work to be done under this section.

4.01.6. TRAFFIC. During the period of construction, base and surface courses shall be protected from traffic other than that absolutely essential to its construction until permitted by the Engineer.

4.01.7. DEFECTIVE BASE AND WEARING COURSE. Such portions of the completed base or wearing course pavements that are defective in finish, compression, composition, density, or do not comply with the requirements of these specifications, shall be taken up, removed and replaced with suitable material properly laid in accordance with these specifications.

4.01.8. MEASUREMENT. In determining the area of pavement to be paid for, the areas occupied by rails, bases or columns, manhole heads, gate boxes, road boxes and similar structures will be deducted when they measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less.

All aggregates, screenings, sand and plant mixed materials shall be weighed separately in trucks on approved scales to be provided by the Contractor. The Contractor shall furnish delivery tickets on which shall be stamped the time weighed and the metered net weight of materials, contained in each vehicle, upon delivery to the site. The certification of a licensed Weighmaster will be accepted in lieu of such delivery ticket.

When a Class 1 (b) base course is specified, shown on the Contract Drawings, or directed or ordered by the Engineer, the delivery tickets to be furnished by the Contractor, in addition to the required weight data, shall also have the volume of base course material contained in each vehicle, upon delivery to the site, legibly inscribed or stamped thereon.

4.01.9. PRICES TO COVER. The contract price per square yard for the type and thickness of Macadam Pavement shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish and lay the pavement, complete, in full compliance with the requirements of the specifications, to furnish and lay test strips, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required and to maintain the courses or mixtures, as laid, in good condition as specified in **Section 5.05**.

No separate payment will be made for the cost of furnishing and applying of tack coat as directed under **Subsections 4.01.4.(F)** and **4.01.5.(B)**. **Where a tack coat is required to be placed, in accordance with these specifications and the directions of the Engineer, and the Contractor fails to apply the required tack coat, the City will take a credit of one dollar ($1.00) per square yard of pavement placed without the tack coat.**

No payment will be made under this Item where the Contractor fails to provide the Engineer with an approved Quality Control Plan and Marshall Design Mix. Also, no payment will be made for any asphalt work placed each work day in which a copy of all test results for gradation, asphalt cement content, and theoretical maximum density and the Marshall plug test results for stability, flow, and air voids were not submitted to the Engineer.

Payment will be made under:

Item No.	Item	Pay Unit
4.01 RAE	ASPHALT MACADAM PAVEMENT, 4” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on a 2” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.
4.01 RAF	ASPHALT MACADAM PAVEMENT, 5” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on a 3” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.
4.01 RAG	ASPHALT MACADAM PAVEMENT, 6” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on a 4” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.
4.01 RAH	ASPHALT MACADAM PAVEMENT, 7” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on a 5” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.
4.01 RAI	ASPHALT MACADAM PAVEMENT, 8” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on a 6” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.
4.01 RAJ	ASPHALT MACADAM PAVEMENT, 9” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on a 7” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.
4.01 RAK	ASPHALT MACADAM PAVEMENT, 10” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on an 8” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.
4.01 RAL	ASPHALT MACADAM PAVEMENT, 11” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on a 9” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.
4.01 RAM	ASPHALT MACADAM PAVEMENT, 12” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on a 10” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.
4.01 RAN	ASPHALT MACADAM PAVEMENT, 13” THICK (2” Class 2 – Plant Mixed, Marshall Design, Type 6F RA Asphaltic Concrete Surface Course on an 11” Class 3 – Plant Mixed, Marshall Design, Type 3 RA Binder Base Course)	S.Y.

SECTION 4.02 - Asphaltic Concrete Wearing Course

4.02.1. INTENT. This section describes construction of Asphaltic Concrete Wearing Course and placement of plant mixed asphaltic mixtures.

Recycled asphalt concrete pavement (consisting of reclaimed asphalt pavement blended with new materials) may be used up to the percentages specified in **Subsection 3.01.3.(C)1.(c)**.

For temporary pavement only, an open source Recycled Hot Asphalt material meeting the requirements of **Subsection 4.02.3.(B**) may be substituted by the Contractor at the unit price bid for Binder Mixture. However, all temporary material must be completely removed prior to the final paving operation.

4.02.2. DESCRIPTION.

(A) Asphaltic Concrete Wearing Course shall be one & one-half (1-1/2") inches, two (2") inches or three (3") inches in thickness when compressed.

One and one-half (1-1/2") inch and two (2") inch asphaltic concrete wearing courses shall consist of a plant mixed Marshall Design high friction asphaltic concrete surface course, Type 6F RA, only. Three (3") inch asphaltic concrete wearing course shall consist of a plant mixed Marshall Design binder mixture base course, Type 3 RA, and a plant mixed Marshall Design high friction asphaltic concrete surface mixture, Type 6F RA, each one and one-half (1-1/2") inches in thickness after compaction. Additional binder mixture shall be placed when specified.

(B) Binder Mixture for use in leveling courses, in areas to be built up, in areas of adjustment, for temporary pavements, for base for pavers, and where directed within designated limits shall consist of a plant mixed Marshall Design binder mixture base course, Type 3 RA.

Each lift of leveling course shall not exceed two (2") inches in thickness, unless otherwise provided or directed, in writing, by the Engineer.

The Contractor is advised that for temporary pavement only, an open source Recycled Hot Asphalt material meeting the requirements of **Subsection 4.02.3.(B**) may be substituted at the unit price bid for Binder Mixture. However, all temporary material must be completely removed prior to the final paving operation.

(C) Asphaltic Concrete Mixture for use in leveling courses, in areas to be built up, in areas of adjustment, for temporary pavements, and where directed within designated limits shall consist of a plant mixed Marshall Design high friction asphaltic concrete surface course, Type 6F RA. In areas required to be built up by more than two (2") inches in thickness, the Contractor will be permitted to substitute Binder Mixture for Asphaltic Concrete Mixture, at no additional cost to the City.

Each lift of leveling course shall not exceed two (2") inches in thickness, unless otherwise provided or directed, in writing, by the Engineer.

The Contractor is advised that for temporary pavement only, an open source Recycled Hot Asphalt material meeting the requirements of **Subsection 4.02.3.(B**) may be substituted at the unit price bid for Asphaltic Concrete Mixture. However, this temporary material must be completely removed prior to the final paving operation.

(D) On resurfacing contracts, when a leveling course is required, it may consist of the same material as is used for resurfacing.

4.02.3. MATERIALS.

(A) ASPHALT PAVING MIXTURES

All materials shall comply with the requirements of **Section 3.01, Asphalt Paving Mixtures**, for the type and asphalt penetration specified, except that for temporary pavement only the Contractor may substitute an open source Recycled Hot Mix Asphalt material as specified in **Subsection 4.02.3.(B)**, below.

(B) OPEN SOURCE RECYCLED HOT MIX ASPHALT

For temporary pavement only, the Contractor may substitute open source hot mix asphalt with recycled content that exceeds NYS Department of Transporation maximum limits in place of Binder Mixture or Asphalic Concrete Mixture. Up to 100% recycled content is desired and encouraged provided the resulting mix satisfies the following requirements:

All manufacturing equipment must be in compliance with land use and environmental requirements.

Mix must be suitable for the intended use and have a gradation within ± 10% on any sieve of a Superpave 1/2" (12.5 mm) design. Laboratory air voids should average 4% and be greater than 2% but less than 7% at all times. AC content should be greater than 4.5% at all times. Marshall samples should be prepared and tested every 1,000 tons of production regardless if used on DDC projects. Results of laboratory testing shall be made available to DDC inspectors or NYC DOT personnel upon request.

For recycled content greater than 30%, adjustment must be made to compensate for the age hardened recycled binder. Acceptable adjustments include use of lower Performance Grade (PG) binder or addition of a petroleum based rejuvenator with less than 30% saturates. Rejuvenators should be added at a rate no less than 1/2% or greater than 1% of Reclaimed Asphalt Pavement (RAP) feed rate.

Use of wood, tear-off shingles, concrete, topsoil, fly ash, bottom ash, slag, glass cullet, or rubber tires as recycled raw materials is not authorized by this specification. Care must be taken in stockpiling waste asphalt to minimize contamination. The crushing/screening process should be designed to remove deleterious materials and debris either manually or by screening. Ripped asphalt must be pre-screened to remove all subgrade aggregates prior to crushing for use as a recycled feed.

4.02.4. CONSTRUCTION METHODS.

(A) CONTRACTOR'S QUALITY CONTROL PLAN

A Quality Control Plan shall be furnished by the Contractor at least five (5) working days prior to paving for the Engineer's approval before commencing work. The plan shall indicate the number and type of rollers planned to do the work, methods of synchronizing the paver and rolling speeds, methods of compaction to be used around street hardware and along both longitudinal and transverse joints, and the back-up provision in case of roller breakdown. Approval of the Contractor's Quality Control Plan shall not relieve the Contractor of the responsibility for compliance with these specifications.

At the start of paving operations or as may be required to recertify the Contractors paving operations, the Contractor shall construct a test strip, as detailed in **Subsection 4.02.4.(G), Test Strip Operation**, on the project site at a location approved by the Engineer, using the same equipment and procedures to be used in the construction of the remainder of the course being laid. Where the entire paving operation can, in the judgment of the Engineer, be completed within one working day the Contractor may, subject to prior approval by the Engineer, construct the test strip as part of his paving operations.

(B) CERTIFICATION OF LABORATORY AND TECHNICIANS

The testing laboratory used by the Contractor for testing core samples must be independent of those used at the plant and job site during placement of asphalt. All proposed testing laboratories shall be duly licensed by the NYC Department of Buildings. Only laboratories approved by the Director of DDC QACS shall be used for all work performed and technicians qualified by the DDC QACS Bureau shall be used for field work. Laboratory technicians used for field work **who are not applying for renewal** of the QACS Qualification cards (new entrants) shall have current NICET Level 2 certification. Field technicians must present their current QACS Qualification Cards if so requested by authorized DDC staff. Staff used for laboratory testing or plant work must have current NICET Level 2 or NYS DOT QA/QC certification card as administered by SUNY Alfred State College. Exceptions granted to any of the above requirements must be in writing by the Director of QACS.

(C) WEATHER LIMITATIONS

Mixtures shall be spread and compacted during daylight hours, unless otherwise permitted by the Engineer and then only when satisfactory artificial light is provided.

Except by permission of the Engineer, bituminous plant mixtures shall not be placed on any wet surface or when the surface temperature is less than 45°F, or when weather conditions otherwise prevent the proper handling or finishing of the bituminous mixtures as determined by the Engineer. Therefore, the Contractor shall not schedule paving operations when the Precipitation Probability, obtained by the Contractor from the U.S. Weather Bureau within three (3) hours prior to the start of such operations, equals or exceeds fifty (50) percent. Prior to each day's delivery of any bituminous paving materials, the Contractor shall notify the Engineer of the exact time and source from which the above information was obtained.

NOTE: All surface temperatures shall be measured on the surface to be paved and the controlling temperature shall be the average of three temperature readings taken at locations 25$\pm$ feet apart as directed by the Engineer.

Generally, the laying of mixtures will not be permitted in wet weather. However, the Engineer may permit work of this character to continue when overtaken by sudden rain, up to the amount which may be in transit from the plant at the time. The plant shall, however, shut down on its orders under these conditions and no additional material will be permitted to be laid.

The Contractor shall schedule the paving operations such that all paving necessary to provide safe and adequate maintenance and protection of traffic or for protection of previously laid courses is completed within the above mentioned weather limitations. Such scheduling shall include expediting construction operations to permit paving before the seasonal change in weather or by limiting the length of work to that which can be completed before the seasonal shut-down of work occurs. The cost of scheduling and sequencing of work to conform with the seasonal limitations of paving work shall be reflected in the unit prices for the related contract items. If the Contractor fails to complete the necessary paving operations prior to weather and seasonal limitations, all temporary materials and work which become necessary as a result of such failure, such as the shimming of castings and protrusions, drainage of the roadway, providing acceptable ride ability, and other work needed for the adequate maintenance and protection of traffic until paving operations can be completed the following paving season, shall not by reimbursable by the City. In addition, any binder course, placed by the Contractor, which will be permanently incorporated into the work and left open to traffic over the winter shall be cleaned in accordance with **Subsection 4.02.4.(H)** and tack coated in accordance with **Section 6.58 - Tack Coat** immediately prior to paving.

Any pavement damage which occurs as a result of the Contractor either not protecting previously laid courses or constructing any pavement course outside the specified weather requirements, whether or not a waiver was granted, shall be repaired by the Contractor at no expense to the City. All repairs shall be performed to the satisfaction of the Engineer.

Bituminous mixtures used for temporary pavement, which is not and will not become a part of the permanent pavement, will not be subject to the above temperature requirement but must be placed as approved by the Engineer.

(D) HAULING EQUIPMENT

The hot bituminous mixtures shall be transported to the work site in vehicles having clean, smooth and tight metal beds. During transporting, the mixture shall be completely covered. The cover shall be of canvas or other suitable material and shall overlap the vehicle's sideboards and be securely fastened. When necessary to deliver the mixture at the specified temperature, the truck bodies shall be properly insulated or heated. Haul units shall be subject to the approval of the Engineer.

The inside surface of the truck body may be lightly coated with an approved asphalt release agent.

(E) MECHANICAL SPREADERS

Bituminous pavers shall be self-powered units, provided with an activated screed or strike-off assembly. The machine shall be capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical section and thicknesses shown on the Contract Drawings. When screed extensions are permitted by the Engineer for placement of mainline pavement, such extensions shall be of the same design as the main screed. The pavers shall have a receiving hopper with sufficient capacity for uniform spreading operation and with automatic flow controls to place the mixture uniformly in front of the screed. The screed or strike-off assembly shall be heated as necessary to produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture. When laying mixtures, the paver shall be capable of operating at forward speeds consistent with satisfactory placement of the mixtures.

All bituminous pavers, used to place base, binder, and surface courses shall be equipped with approved automatic transverse slope and longitudinal grade screed controls. The controls shall automatically adjust the screed and increase or decrease the mat thickness to compensate for irregularities that are in the surface being paved. The controls shall be capable of maintaining the proper transverse slope and be readily adjustable so transitions and super-elevation curves can be satisfactorily paved. The controls shall operate from suitable fixed or moving references. Widths in excess of seventeen (17') feet shall have approved automatic transverse slope and longitudinal grade screed controls that operate from references of both sides of the paver.

The transverse slope and longitudinal grade screed controls of the bituminous paver may be manually adjusted, where permitted by the Engineer.

The bituminous pavers shall be at the job site sufficiently ahead of the start of paving operations to be examined and approved by the Engineer. Any paver found worn or defective either before or during its use shall be immediately repaired to the satisfaction of the Engineer or replaced.

(F) ROLLERS

Rollers shall consist of steel wheel rollers, pneumatic rubber-tired rollers, or vibratory rollers as described herein.

There shall be technical literature available giving the weight and dimensions of the rollers to be used. Rollers shall be in first class mechanical condition and adjustment so that they run smoothly without jerking or pounding. They shall be capable of reversing without backlash and shall be capable of operating at speed slow enough to avoid displacement of the mixture. The number and weight of rollers shall be sufficient to satisfactorily compact the mixture while it is still in a workable condition. The use of equipment which results in excessive crushing of aggregate will not be permitted.

Rollers shall have smooth, true rolls without flat spots, openings, projections or other imperfections which may mar the pavement surface. Rollers shall be kept clean at all times and moist to prevent bituminous concrete from sticking to the wheels; however, the amount of water used to prevent adhesion of asphaltic materials shall be kept to a minimum.

Tandem type power driven steel rollers used in the breakdown mode shall have an operating weight of between 10 and 14 tons. Tandem type power driven steel rollers used in the intermediate and finished modes shall have an operating weight of between 8 and 10 tons.

Where the Contractor elects to use pneumatic rubber-tired rollers in the intermediate rolling stage, they shall have a minimum rim diameter of 20 inches, be self-propelled, and shall have wheels so mounted, grouped and spaced as to provide essentially uniform coverage with each pass. Rear group wheels shall not follow in the tracks of forward group wheels. Maximum wheel load shall be 5,600 pounds; tire shall be inflated to a minimum of 90 psi inflation pressure, and at 90 psi inflation pressure, the tire compression on pavement, where the area of contact is measured on a hard, unyielding surface, shall exert not less than 80 psi contact pressure with suitable roller ballast for each wheel; and the total maximum load per axle, whether single axle or a group of axles in the same alignment, shall be 22,400 pounds. Axles shall be mounted in a rigid frame provided with a platform or body suitable for ballast loading. Wheels shall be mounted to oscillate individually or in pairs. Tires shall be smooth, show no tread pattern, of equal size and diameter, and inflated so the air pressure in the several tires shall not vary more than 5 psi. Wheel loads and tire pressures shall be controlled to produce the required degree of compaction without rutting of the surface to be rolled. Tire roll surfaces shall be kept clean at all times and the amount of water used to prevent adhesion of asphaltic materials shall be kept to a minimum.

In addition, the Contractor may substitute vibratory rollers in lieu of the conventional steel-wheel and rubber-tired roller equipment specified above. However, under this option, the pavement course shall be finish rolled with a steel-wheel tandem roller. This finish roller shall add a minimum of two (2) passes closely following the vibratory roller or as directed by the Engineer.

Vibratory rollers shall be of a type that are specifically designed for the compaction of bituminous concrete. Only vibratory roller models appearing on the New York State Department of Transportation's Approved List - Bituminous Concrete Vibratory Compaction Equipment shall be used.

Vibratory rollers shall meet the following requirements:

Vibration Frequency - 2,300 vpm minimum

Drum Width - 54 inch, minimum, dual vibrating drums

Acceptable dual vibrating drum rollers operating in the static mode may be used as the finish roller. However, this single vibratory roller shall not be used as both the initial roller and the finish roller.

Vibratory roller with an operating weight between 6.0 and 8.5 tons shall be operated at a nominal amplitude no greater than 0.4 mm or with a dynamic force no greater than 160 pli, whichever yields the lower dynamic force.

Vibratory roller with an operating weight greater than 8.5 tons shall be operated at a nominal amplitude no greater than 0.4 mm or with a dynamic force no greater than 210 pounds per linear inch (pli) width of roller, whichever yields the lower dynamic force.

No vibratory roller with a gross operating weight of more than 23,000 lbs. will be permitted to operate in the vibratory mode.

The minimum operating frequency for any vibratory roller used must exceed 2,300 vibrations per minute (vpm).

Each vibratory roller shall be equipped with the following:

A speed indicator in feet per minute or tenths of a mile per hour shall be provided to permit the operator to closely control the rolling speed.

A vibrating reed tachometer for the exclusive use of the Engineer to provide a mechanical check on the rollers' vibration control system. The vibrating reed tachometer shall have a frequency range of 1,000 vpm to 4,000 vpm with a minimum reed interval of 50 vpm between 1,000 vpm and 2,000 vpm and a minimum reed interval of 100 vpm between 2,000 vpm and 4,000 vpm.

Rollers shall be equipped with an automatic vibration disconnect system which automatically shuts off the vibration when the roller is in a stationary position. A mechanical override system shall be provided in the event of temporary failure of the automatic system which shuts off the vibration when the roller is in a stationary position.

Instruction plates indicating operational instructions, recommended amplitude, vibrations per minute and speed settings shall be provided.

Vibratory rollers shall operate on all pavement courses at a uniform speed not exceeding 2-1/2 miles per hour (220 feet per minute) and frequency combination that will deliver a minimum of 10 impacts per linear foot. All turning of the compaction equipment shall be completed on material which has had a minimum of one roller pass.

If the Engineer determines that damage to street components and/or adjacent property is occurring or that there is excessive aggregate fracture or crushing, lateral displacement or compaction waves using vibratory compaction equipment, the Contractor shall immediately cease using this equipment and proceed with the work in accordance with approved conventional compaction procedures, at no additional cost.

The Contractor shall note that if he elects to use vibratory compaction equipment, he assumes full responsibility for the cost of repairing all damages which may occur, as a result, to street components and adjacent property.

Furthermore, the New York City Transit Authority may order the Contractor to stop using vibratory compaction equipment over their facilities and the Contractor shall be required to immediately cease using vibratory compaction equipment and proceed with the work in accordance with approved conventional compaction procedures, at no additional cost.

The application of material to pneumatic drive wheels for the prevention of tire pickup shall be controlled by a momentary contact switch. Controls which provide a continuous flow of material will not be permitted.

All vibratory rollers shall be equipped with a speedometer that accurately indicates roller speed in either 1/2 mph or 50 fpm increments (maximum) throughout the specified operating range. Vibratory rollers shall also be equipped with a speed control device which shall be set by the Contractor to prevent the roller from traveling in excess of 2-1/2 mph or 220 fpm when the roller is in vibratory mode. The type of speed control device will be subject to the approval of the Engineer.

Static steel wheel rollers shall be self propelled and be either 10 to 12 ton tandem three axle type or 8 to 10 ton tandem two axle type.

Alternate types of rollers may be approved by the Chief Engineer of Construction, if field tests or other data demonstrates that satisfactory results can be achieved.

The Contractor will control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers.

(G) TEST STRIP OPERATIONS

Demonstration of the Contractor's paving operations shall be done by placing a test strip for each lift of asphaltic concrete placed. The intent of the test strip is for the Contractor to demonstrate that the rolling train will meet the N.Y.C.D.O.T.'s density requirements and the Contractor's productivity goals. Therefore, the test strip MUST simulate, in so far as possible, the way in which rollers and pavers will actually be used during construction, in accordance with the Contractor's approved Quality Control Plan.

Size of each test strip shall be no greater than: a length of one city block, 250 feet, an area of 1,000 square yards, and 125 tons of each course of asphaltic concrete. Test strip areas shall become part of the completed pavement if, in fact, they meet the requirements of these specifications. The Contractor shall be required to furnish and use a properly calibrated nuclear asphalt testing device operated by a NICET Level 2, or equivalent, certified technician in the field to monitor the effectiveness of compaction by rolling during construction for each lift of asphaltic concrete placed. The amount of compaction shall be determined as a percentage of the theoretical maximum density of bituminous pavement mixture at the plant obtained in accordance with the requirements of ASTM Designation D 2041. Acceptable in place compaction shall range between 92% and 97% of the theoretical maximum density of bituminous pavement mixture. Field testing for compacted asphaltic concrete with the nuclear asphalt testing device shall be done by the Contractor in accordance with ASTM Designation D 2950, throughout his rolling operations. Number and locations of nuclear asphalt tests to be performed within each test strip area shall be of a sufficient number to obtain acceptable results, with a minimum of 12 randomly selected locations using statistically random number charts, except that none are to be within 18 inches of a longitudinal joints or edge of street hardware or within ten (10') feet of transverse joints; however, it is the Contractor's responsibility to take as many density readings as required to insure that the in place density after compaction falls within the specified range of 92% to 97% of the theoretical maximum density, obtained in accordance with ASTM Designation D 2041, of the asphaltic concrete placed. A copy of all density monitoring results, including date, time, station, offset, and theoretical maximum density of pavement mixture obtained in the plant in accordance with ASTM Designation D 2041, shall be given to the Engineer at the end of that day's operations.

Acceptance of all test strips will be determined by core sample results. A minimum of four (4) core samples shall be taken by the Contractor in each test strip and their test results must be delivered to the Engineer within 48 hours, without which no additional paving will be allowed. Core samples shall be taken at random locations selected by the Engineer using statistically random number charts, and tested by the Contractor in accordance with **Section 5.04**, except that: at least one of the core samples shall be within 18 inches of the edge of a randomly selected street hardware; the acceptable compaction shall range, under **Section 5.04(F)**, between 92% and 97% of the theoretical maximum density obtained in the plant, in accordance with ASTM Designation D 2041; and, under **Subsection 5.04(N)**, the minimum and maximum design percentage of bitumen in any asphaltic mixture shall be the bitumen percentage contained in the approved Contractor's formula with a tolerance of $\pm$ 7% of that bitumen percentage.

Where any two or more consecutive core samples taken within a test strip are shown to have a compaction density either in excess of 97% or below 90% of the theoretical maximum density in accordance with ASTM Designation D 2041, then the entire test strip shall be considered unacceptable. The Contractor shall then be required to remove and dispose of the test strip area and perform a second test within the same area at his own cost. Failure of the second test strip area shall result in a shutdown of his paving operations until remedial action is taken which will bring production within the permitted tolerances. A new test strip area shall be required for any change in the source of materials or in the materials from the same source, a change in the job mix formula, a change in compaction equipment, methods of operation, or failure of an asphaltic concrete course to meet the requirements of these specifications.

Where all laboratory test results performed on core samples taken in the test strip area meet the specifications, the Contractor will be permitted to resume his paving operations as indicated by the test strip.

NOTE: Except for the following option, routine paving shall only begin after successful test results have been established by the Contractor's independent testing laboratory. Also, construction of a test strip shall not begin unless both a nuclear density gauge and an operator are present.

OPTION: Paving may continue after completion of the test strip; however, payment adjustments in accordance with the requirements of **Subsection 5.04**, for density, asphalt content and mix tolerance will be applied to all material placed and each block length containing unsatisfactory material, as determined by the average of core samples taken within that block, shall be removed and replaced at the Contractor's own expense.

(H) PREPARATION OF SURFACE

Before any asphaltic mixture is laid, the surface shall be thoroughly swept and cleaned of all dirt, loose and foreign matter, and be free from standing water. All asphaltic mixtures used for temporary ramping shall be removed at no additional cost. No mixture shall be deposited unless the surface on which it is to be laid is in a condition acceptable to the Engineer.

Unless otherwise specified, shown on the plans or directed by the Engineer, surfaces on which asphaltic mixtures are to be laid shall be given a tack coat of Liquid Asphalt (RC-70), Asphalt Cement (AC-20), or Emulsified Asphalt (RS-1) complying respectively with the requirements of **Section 2.03**, **2.05**, and **Section 2.04**. Tack coat shall be uniformly distributed, without atomization, over the entire surface of the base for pavement at the rate specified under **Section 6.58, Tack Coat**, by means of a pressure distributor of approved type in such manner as not to defile or discolor curbs or other structures.

(I) CONDITIONING OF EXISTING PAVEMENT FOR RESURFACING

The surface of the existing pavement shall be cleaned, joints and cracks filled, and the surface leveled to a uniform grade and cross slope in areas designated by the Engineer prior to the application of a new bituminous concrete course. The surface shall be cleaned by the use of mechanical sweepers, hand brooms, or other effective means until the surfaces are free of all material which might interfere with the bond between the overlay material and the existing surfaces. All cleaning equipment shall be approved by the Engineer prior to use. Cleaning shall continue until adequate cleaning results, as determined by the Engineer. All debris shall be removed from the pavement surface and disposed of in a manner directed by the Engineer. The pavement shall be kept clean until the overlay operations are completed.

All unsealed and inadequately sealed joints and cracks, as determined by the Engineer, shall be subjected to a compressed air stream of at least 80 p.s.i.g. measured at the source. Joints and cracks in the pavement as designated by the Engineer shall be cleaned of all dirt and loose material holding the cleaning jet 1 inch above the pavement surface. Old joint and crack sealer remaining after such cleaning operation need not be removed. The cracks shall be kept clean until the sealing, filling and paving operations are completed.

Joints and cracks in the existing pavement from 1/4 inch to 1 inch wide shall be sealed with a bituminous material meeting the requirements of **Section 2.16 - Asphaltic Filler**. To insure that space will be available for expansion of the asphalt when the hot bituminous mixture is paved over the joint or crack, the joint or crack shall not be filled completely to the surface. Blotting with fine aggregate may be required by the Engineer to prevent tracking the bituminous material over the pavement surface.

Joints and cracks greater than 1 inch wide shall be filled with asphalt concrete meeting the requirements of **Section 3.01**. Alternate materials may be used subject to the approval of the Engineer. Joints and cracks less than 1/4 inch will not be required to be cleaned or sealed.

Work on joints and cracks shall not begin until all stress relieving pavement repairs have been completed.

The expense for cleaning foreign material from the pavement as a result of the Contractor's construction operations shall be borne by the Contractor. Leveling of the surface shall be in conformance with the requirements stated below.

Where a Pre-Identified Binder Mixture course is specified on the Contract Drawings or in the itemized proposal, the work shall consist of placing a Marshall Design binder base mixture, Type 3 RA, of variable thickness necessary to contour the existing pavement in preparation for placement of the finished pavement surface. The work shall consist of removing irregularities in the old pavement, filling and patching holes, correcting variations in banked pavement, establishing pavement crowns, etc. as a separate leveling operation prior to the placing of the wearing course. All depression and wheel path ruts shall be filled prior to the paving of the binder mixture course, as directed by the Engineer. Where compacted thicknesses greater than two (2") inches are required, the Engineer may approve the use of the binder base course mixture in layers not to exceed 2 inches in thickness after compaction. The surface of this course shall be tested in the same manner prescribed in **Subsection 4.02.4.(P)**, except that the allowable variation from the true surface after compaction shall not exceed 3/8 inch.

(J) LAYING LEVELING COURSE MIXTURE FOR RESURFACING

Leveling course mixture, on reaching the street, shall be dumped on approved dumping boards or steel plates and shall be immediately deposited by means of hot shovels over the area to be leveled, built-up or adjusted. It shall be uniformly spread by means of hot iron rakes to a thickness that will provide a surface, after final compaction, which shall be a constant depth, equal to the specified thickness of wearing course, below the proposed final surface of the wearing course. Where practical, a mechanical spreader of approved design may be used. The no walking and luting requirements under **Section 4.02.4.(N)**, below, shall apply to the work under this section.

(K) LAYING BINDER MIXTURE

Prior to paving, all asphaltic mixtures used as temporary pavements shall be removed at no additional cost.

Binder mixture shall be furnished and laid by means of a mechanical spreader of approved design to a depth which after final compaction shall be equal to the specified depth. In areas where the use of a mechanical spreader is impractical, as determined by the Engineer, other approved means of spreading and compaction may be permitted.

The maximum length of bituminous mixture which can be placed by an approved mechanical spreader in a continuous strip shall not exceed one block or six hundred (600') feet, whichever is less, unless otherwise permitted, in writing, by the Engineer. Adjacent strips shall be laid, subject to the above limitations, immediately after each previous strip is placed until the full width of roadway surface has been covered in the said maximum or permitted length.

The compaction equipment shall conform to the requirements of **Subsection 4.02.4.(F), Rollers**, above. The Contractor shall control the operation of the rollers during the placement of these items including the speed, the amplitude settings, the vibration frequency, and the weight of the rollers.

Where permitted by the Engineer, hand laying of the mixture shall comply with the following requirements:

> Binder mixture, on reaching the street, shall be dumped outside the area on which it is to be spread, be deposited over the area to be covered by means of hot shovels. It shall be uniformly spread by means of hot iron rakes with tines not less than one-half (1/2") inch longer than loose depth mixture, or by means of a mechanical spreader of approved design, to a depth which, after final compression, shall be one and one-half (1-1/2") inches. Binder shall be thoroughly compacted by approved tamping irons adjacent to curbs, manholes, rails, etc., and with approved rollers to a thickness of one and one-half (1-1/2") inches, and to a surface which shall be parallel to and one and one-half (1-1/2") inches below the finished grade and crown of the street. If the

binder mixture breaks up, shows lack of bond or other defects before the surface mixture is laid, it shall be taken up, removed and replaced with suitable material, properly laid in accordance with these specifications.

Immediately after the binder mix has been spread, struck off and surface irregularities adjusted, the Contractor shall compact the mix by rolling thoroughly and uniformly in accordance with the requirements of the following **Subsection 4.02.4.(O) Compaction**.

(L) BINDER SURFACE

The surface of the binder course shall be kept as free from traffic as is possible under working conditions, be clean, free from water, and after 48 hours, if necessary as determined by the Engineer, it shall be swept clean and tack coated at 1/2 the rate specified under **Section 6.58**, at no additional cost to the City, immediately before the surface mixture is laid. Binder shall be covered with surface mixture as soon as practicable and in all cases not later than seven (7) calendar days, unless otherwise approved in writing by the Engineer.

(M) PAINTING CONTACT SURFACES, ETC.

All contact surfaces of curbs, gutters, headers, manholes, etc., shall, before the surface mixture is laid, be well painted with a thin uniform coating of approved hot asphaltic cement or liquid asphalt or emulsified asphalt.

(N) LAYING SURFACE MIXTURE

Prior to paving, all asphaltic mixtures used as temporary pavements shall be removed at no additional cost.

Surface mixture shall be furnished and laid by means of a mechanical spreader of approved design to a depth which after final compaction shall be equal to the specified depth. In areas where the use of a mechanical spreader is impractical, as determined by the Engineer, other approved means of spreading and compaction may be permitted.

Where permitted by the Engineer, hand laying of the mixture shall comply with the following requirements:

The surface mixture, on reaching the street, shall be dumped on approved dumping boards or steel plates, be deposited immediately by means of hot shovels over the area to be covered. It shall be uniformly spread by means of hot iron rakes with tines not less than one-half (1/2") inch longer than the loose depth of mixture, or be deposited and spread by means of a mechanical spreader of approved design, to a depth which, after final compression, shall be of the thickness required. No walking will be permitted on the surface mixture during the laying operations. If laid by hand, the surface mixture, after spreading and raking, shall be carefully luted from the sides before compaction. The width of the lute shall be approximately six (6') feet and the handle shall be sufficiently long to reach from edge to midway of the width under construction.

Immediately after the asphaltic mixture has been spread, struck off and surface irregularities adjusted, the Contractor shall compact the mix by rolling thoroughly and uniformly in accordance with the requirements of the following **Subsection 4.02.4.(O) Compaction**.

(O) COMPACTION

In accordance with the Test Strip operation and the Contractor's Quality Control Plan, the number and types of rollers and their method of use shall be sufficient to obtain an acceptable pavement density in accordance with these specifications.

Immediately after the asphaltic mixture has been spread, struck off and surface irregularities adjusted, compact the mix by rolling thoroughly and uniformly. The Contractor shall roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking or shoving. The initial roll of the pavement shall be with the roller traveling parallel to the centerline of the pavement beginning at the low edge and working toward the super-elevated edge. The rolling methods and patterns used shall be monitored by the certified technician operating the nuclear asphalt testing device to verify compliance with the compaction requirements.

In accordance with the Contractor's Quality Control Plan and results of the test strip operations, rolling shall proceed continuously within the time limit requirements specified in **Subsection 3.01.5.(D)** and until all roller marks are eliminated and the air voids conform to the specified requirement.

Field density shall be monitored by the Contractor in accordance with the requirements of **Subsection 4.02.4.(Q)**.

Placement and compaction on shoulders, ramps, maintenance widening, crossovers, and bridges will be deemed satisfactory by the Engineer when the procedures used in these areas are the same as those used on the mainline pavement sections.

When the rolling operation is complete there should be no visible shallow ruts, ridges, other roller marks, or irregularities in the pavement. If these imperfections are present, the Contractor shall correct the imperfections or relay the pavement to the satisfaction of the Engineer. All corrective work shall be performed by the Contractor at no additional cost to the City.

The Contractor shall correct at once any displacement occurring as a result of reversing the direction of the roller, or from other causes, by the use of rakes and addition of fresh mixture as required. Exercise care in rolling not to displace the line and grade of the edges of the bituminous mixture. To prevent adhesion of the mixture to the drum(s) of the roller, they shall be kept properly moisten with water, or water mixed with small quantities of detergent or other Department approved asphalt release compounds, but in no case shall petrolium products or solvents having effect upon the bituminous pavement be used. In all instances, the Contractor shall protect the surface of the pavement from drippings of fuel oil or any other solvents used in paving, compaction or cleaning operations.

Unless otherwise directed by the Engineer, the Contractor shall compact the longitudinal joint by using one of the pneumatic drive wheels to overlap the joint in two (2) passes with the drum operating static when vibratory rollers having pneumatic drive wheels are used. If dual vibrating drum rollers are used, the joint shall be compacted by overlapping the joints in two (2) passes with both drums operating static.

Along forms, curbs, headers, walls and other areas not accessible to the rollers, compact the mix thoroughly with mechanical tampers as approved or directed by the Engineer. On depressed areas, a trench roller or small vibratory roller approved by the Engineer may be used. Cleated compression strips also may be used under the roller to transmit compression to the depressed area. Hand tampers will not be permitted.

When compaction procedure used by the Contractor fails to produce results in compliance with these specifications, the procedure shall be immediately adjusted to obtain desired results or the paving operation shall be stopped as directed by the Engineer. All unacceptable asphaltic concrete will not be measured for payment and shall be removed from the site by the Contractor at no cost to the City. No additional areas may be paved until a new test strip is performed in accordance with **Section 4.02.4.(G)** and all bituminous pavement within each block containing unacceptable material is replaced by the Contractor to the satisfaction of the Engineer.

Suitable means shall be provided to keep pavers and other equipment and tools free from bituminous accumulations. The surface of the pavement shall be protected from drippings of oil, kerosene, or other materials used in paving and cleaning operations.

Any mixture that becomes loose and broken, mixed with dirt, or is in any way defective shall be removed and replaced with fresh hot mixture which shall be compacted to conform with the surrounding area. Any area showing an excess or deficiency of bituminous material shall be corrected to the satisfaction of the Engineer. Care shall be exercised in rolling not to displace the line and grade of the edges of the bituminous mixture.

If vibratory compaction equipment is used, the Contractor assumes full responsibility for the cost repairing all damage which may occur to highway components and adjacent property including buried utility and service facilities.

When multiple paving operations are utilized with material production from a single plant each paving operation will be evaluated separately.

Routine paving operations shall not begin unless both a project calibrated nuclear density gauge and an operator are present.

The Contractor shall backfill all core holes, with a similar hot mix asphalt material as was cored, as soon as possible after coring, using a procedure approved by the Engineer.

(P) SURFACE TOLERANCE

Pavement shall be constructed to a 1/4 inch surface tolerance. If, in the opinion of the Engineer, the pavement surface is not being constructed or has not been constructed to this tolerance based upon visual observation or upon riding quality, he may test the surface with a 16 foot straight edge or string line placed parallel to the centerline of the pavement and with a 10 foot straight edge or string line placed transversely to the centerline of the pavement on any portion of the pavement. Variations exceeding 1/4 inch shall be satisfactorily corrected or the pavement relaid at no additional cost to the City as ordered by the Engineer.

(Q) MONITORING FIELD DENSITY

Monitoring field density of compacted asphalt concrete shall be determined by the following methods:

1) The Contractor shall be required to furnish and use a properly calibrated nuclear density gauge in the field to monitor the effectiveness of compaction by rolling during construction for each lift of asphaltic concrete placed. The nuclear density gauge should consist of a radioactive source, scaler and other basic components housed in a single backscatter unit. The gauge must be operated by a NICET Level 2, or equivalent, certified technician trained in the principles of nuclear testing and safety practices. Only gauge(s) calibrated during the construction of the test strip will be used during normal paving operation. If another nuclear gauge is to be used, a new test strip must be constructed to calibrate that gauge.

   The amount of compaction shall be determined as a percentage of the theoretical maximum density of bituminous pavement mixture at the plant obtained in accordance with the requirements of ASTM Designation D 2041. Acceptable in place compaction shall range between 92% and 97% of the theoretical maximum density of bituminous pavement mixture. Field testing of compacted asphaltic concrete with the nuclear asphalt testing device shall be done by the Contractor in accordance with ASTM Designation D 2950, throughout his/her rolling operations. A nuclear density gauge measurement shall be taken at least every 200 feet along the length of the pavement for each pass of the paver, but not less than three (3) tests per day will be required. Each measurement shall consist of taking four readings at the same location, rotating the device 90 degree between each reading. However, it is the Contractor's responsibility to take as many density readings as required to insure that the in place density after compaction falls within the specified range of 92% to 97% of the theoretical maximum density of the asphaltic concrete placed each day. A copy of all nuclear density measurements, including date, time, station, offset, and theoretical maximum density of pavement mixture obtained in the plant, in accordance

with the requirements of ASTM Designation D 2041, shall be given to the Engineer at the end of each day's work.

If the average of two nuclear density gauge measurements taken over two consecutive locations falls below 90% or above 97% of the Theoretical Maximum Density (TMD), or if the moving average of the last 10 nuclear gauge measurements within each block falls below 92% or above 97% of the TMD, the Contractor shall stop routine paving operations, remove the pavement represented by those measurement results, and construct a new test strip. Normal production will only be allowed to resume after satisfactory completion of the new test strip.

2) For Contractor's quality control, core samples shall be taken by the Contractor at random locations and tested by the Contractor's approved independent testing laboratory in accordance with **Section 5.04** for pavement thickness, density, asphalt content, and compliance with the Marshall mix properties. Core samples shall include, but not be limited to, locations within 18 inches of a longitudinal joints or edge of street hardware, or within ten (10') feet of transverse joints.

In addition, the Contractor shall be required to take full depth core samples at random locations selected by the Engineer using statistically random number charts (to be used as the Commissioner's cores) for determining payment. These cores shall be taken by the Contractor's independent laboratory within seven (7) days of completion of the Contractor's paving operations or after the 28 day curing period for the concrete base, whichever is later. One (1) full depth core sample shall be taken approximately every 200 feet along the length of pavement for each pass of the paver (with each pass of the paver being not more than 17 feet in width). A minimum of four (4) full depth core samples per block will be required, one of which shall be taken within 18" of a randomly selected street hardware. These cores along with a nuclear density gauge test results taken at the same locations and two loose mix samples taken for each batch of pavement placed each day shall be properly recorded, tagged and delivered by the Contractor, under the direct supervision of the Engineer, to the City's testing laboratory for testing to determine payment.

However, these cores shall not relieve the Contractor of his responsibility for performing tests and inspection (i.e. cores), as may be required or directed, to maintain quality control of his work.

Unacceptable asphaltic concrete will not be measured for payment and shall be removed from the site by the Contractor at no cost to the City. No additional areas may be paved until the block length of unacceptable material is replaced by the Contractor to the satisfaction of the Engineer and a new test strip is performed in accordance with requirements of **Subsection 4.02.4.(R)**.

Where the density of compaction for any two or more core samples within a block length are shown to fall between 92% and 90% of the theoretical maximum density obtained in accordance with ASTM Designation D 2041, a credit will be taken for that area of pavement in accordance with **Section 5.04(F)**.

The Contractor will not be allowed to re-roll cold in-place asphalt concrete to attempt to increase density after putting the finish roller on it.

(R) JOINTS

The surface mixture shall be laid in as nearly a continuous operation as possible and the roller shall pass over the unprotected end of the freshly laid mixture only when the laying of the course is to be discontinued for such length of time as to permit the mixture to become chilled. In all such cases, including the formation of joints, as herein required, provision shall be made for proper bond with new mixture by cutting or trimming back the joint so as to expose an unsealed or granular surface for the full specified depth of the course. At the end of each day's work, joints shall be formed by laying and rolling against boards of the thickness of the compacted mixture, placed across the entire width of the pavement or by such other method as may be approved by the Engineer. When the laying of the mixture is

resumed, the exposed edge of the joint shall be painted with a thin coat of approved hot asphaltic cement or liquid asphalt and fresh mixture shall be raked against the joint and thoroughly tamped with hot tampers and rolled. Hot smoothing irons may be used for sealing joints.

(S) VERIFICATION TESTING OF PLANT MIX

The independent testing laboratory retained by the Contractor shall make two (2) sets of Marshall plugs for every 800 tons, or portion thereof, of material placed each day to determine production tolerances: one set shall be delivered to the City's Quality Assurance and Construction Safety laboratory and the other set shall be used by the independent testing laboratory to certify test results for payment and acceptance, but the City reserves the right to perform verification testing. If the Contractor's results deviate from the results of the verification tests by the City and this deviation falls within the tolerances listed below, then the Contractor's results will apply. If the deviation exceeds the tolerance, the City's results will apply.

Deviation shall be calculated with the following formula:

Deviation = (Contractor's Results) - (City's test results)

Tolerances

Test Item	Tolerance for Deviation vs. Verification Tests
Gradation	±5(%) (any sieve)
A/C Content	±7(%) of the Asphaltic Cement Content Percentage from the approved Contractor's formula.
Stability	±300# (average of three plugs)
Flow	±2(%)
Air Voids	±1(%) (Note: The City's calculations for air voids may be based on City's determination of theoretical maximum density.)

4.02.5. TRAFFIC. No traffic of any kind will be allowed on the pavement until permitted by the Engineer.

4.02.6. DEFECTIVE WEARING COURSE. Such portions of the completed wearing course as are defective in finish, compaction, composition, density, or do not comply with the requirements of these specifications, shall be taken up, removed and replaced with suitable material properly laid in accordance with these specifications.

4.02.7. MEASUREMENT.

(A) In determining the area of wearing course to be paid for, the areas of the spaces occupied by rails, bases of columns, manhole heads, gate boxes, roadway boxes and similar structures will be deducted when they measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less.

(B) The measured quantity of wearing courses, laid to a specified thickness on an area basis, will be adjusted for deficiencies in thickness and density. The measured quantity of a binder or asphaltic mixture, laid to an unspecified thickness on a tonnage basis, will be adjusted for deficiencies in density. Adjustment shall be made in accordance with **Section 5.04**.

(C) The Contractor shall furnish a delivery ticket to the Engineer for all binder and asphaltic concrete delivered to the site on which shall be stamped the type, the time weighted and metered net weight of material contained in each vehicle. The certification of a licensed Weighmaster will be accepted in lieu of such delivery ticket. The Engineer will estimate the quantity of material from a given delivery which is wasted or not used in the work and deduct such quantity from the metered or certified weight in determining the quantity to be measured for payment.

(D) No payment for binder or asphaltic concrete mixture per ton will be made in areas where a specified thickness of wearing course is placed on a new base for pavement.

Where a wearing course of any specified thickness is placed on an existing base, in built-up areas, in areas of adjustment or on a leveling course and there is a separate price bid per ton for binder, asphaltic concrete mixture, the quantity of mixture per ton, placed in excess of the specified thickness of wearing course or placed in the leveling course, will be determined as follows:

1. When a three (3") inch wearing course consisting of a base course of binder, compacted to a thickness of one and one-half (1-1/2") inches, and a surface course of asphaltic concrete, compacted to a thickness of one and one-half (1-1/2") inches, is specified; a deduction of 340 pounds for each square yard of completed wearing course shall be made from the total weight of binder and asphaltic concrete incorporated in the work. The remainder, after such deduction, will be paid for as binder mixture at the price bid per ton.

2. When a wearing course of specified thickness consists solely of asphaltic concrete, a deduction of 113-1/3 pounds per inch of specified thickness for each square yard of completed wearing course shall be made from the total weight of asphaltic concrete incorporated in the work. The remainder, after such deduction, will be paid for as asphaltic concrete mixture at the price bid per ton.

4.02.8. PRICES TO COVER.

(A) ASPHALTIC CONCRETE WEARING COURSE. The unit price shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish and lay the wearing course of the thickness specified, complete, in full compliance with the requirements of the specifications, to furnish and lay test strips, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required and to maintain the courses or mixtures, as laid, in good condition as specified in **Section 5.05**.

No payment will be made under this Item where the Contractor fails to provide the Engineer with an approved Quality Control Plan and Marshall Design Mix. Also, no payment will be made for any asphalt work placed each work day in which a copy of all test results for gradation, asphalt cement content, and theoretical maximum density and the Marshall plug test results for stability, flow, and air voids were not submitted to the Engineer.

(B) BINDER MIXTURE. The unit price shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish, lay and remove when directed the binder mixture, complete, in full compliance with the requirements of the specifications, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required and to maintain the courses or mixtures, as laid, in good condition as specified in **Section 5.05**.

(C) ASPHALTIC CONCRETE MIXTURE. The unit price shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish, lay and remove when directed the asphaltic concrete mixture, complete, in full compliance with the requirements of the specifications, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required and to maintain the courses or mixtures, as laid, in good condition as specified **Section 5.05**.

(D) No separate payment will be made for the cost of furnishing and applying of tack coat as directed under **Subsection 4.02.4.(H)**. Where a tack coat is required to be placed, in accordance with these specifications and the directions of the Engineer, and the Contractor fails to apply the required tack coat as specified, the City will take a credit of one ($1.00) dollar per square yard of pavement placed without the tack coat.

(E) Where an item for Pre-Identified Binder Mixture is provided in the project for areas to be resurfaced, payment for resurfacing thereon in excess of the specified thickness of asphaltic concrete wearing course under Item No. 4.02 AB-R or 4.02 AF-R, as applicable, will be made as follows:

1. First one-quarter inch in excess of the specified thickness of resurfacing pavement will be paid under the price bid for Pre-Identified Binder Mixture, Item 4.02 BA-R.

2. All material in excess of both the specified resurfacing pavement plus the first one-quarter inch paid for under Item 4.02 BA-R, will be paid for at a cost of Twenty-Eight ($28) dollars per ton or the price bid for PRE-IDENTIFIED BINDER MIXTURE, Item 4.02 BA-R, whichever is the lesser.

Payment will be made under:

Item No.	Item	Pay Unit
4.02 AB-R	ASPHALTIC CONCRETE WEARING COURSE, 1-1/2" THICK	S.Y.
4.02 AF-R	ASPHALTIC CONCRETE WEARING COURSE, 2" THICK	S.Y.
4.02 AG	ASPHALTIC CONCRETE WEARING COURSE, 3" THICK	S.Y.
4.02 BA-R	PRE-IDENTIFIED BINDER MIXTURE	TON
4.02 CA	BINDER MIXTURE	TON
4.02 CB	ASPHALTIC CONCRETE MIXTURE	TON
4.02 CP	BINDER MIXTURE FOR BASE PAVERS	TON

SECTION 4.03 - Temporary Surfacing For Roadways

4.03.1. INTENT. This section describes construction of Temporary Surfacing for Roadways.

4.03.2. DESCRIPTION. Temporary Surfacing shall consist of a layer of screenings, with a bituminous and stone treatment or a single layer of plant-mixed binder mixture. Surfacing shall be four (4") inches in thickness after compression.

4.03.3. MATERIALS.

(A) Bituminous material shall comply with the requirements of **Section 2.03, Liquid Asphalt**, MC-250.

(B) (No Text)

(C) Stone shall comply with the requirements of **Section 2.02**, Type 1, Grade B, Size No. 8.

(D) Screenings shall comply with the requirements of **Section 2.02**, Type 1, Grade B, and the gradation given for screenings in TABLE 2.02-II.

(E) Plant-mixed binder mixture shall comply with the requirements of **Section 3.01, Asphalt Paving Mixtures**.

4.03.4. METHODS--PENETRATION METHOD.

(A) EARTH SUBGRADE

The earth subgrade, immediately before the surfacing is laid, shall be thoroughly compacted with an approved roller weighing not less than two hundred and twenty-five (225) pounds per inch width of main roll. It shall be smooth, parallel to and at the required depth below the finished surface, and shall not be in a muddy or frozen condition. Unsuitable material shall be removed and replaced with acceptable material thoroughly compacted.

(B) DEPOSITING SCREENINGS

The screenings shall be deposited and spread on the prepared subgrade in a uniform layer. They shall then be compacted in a satisfactory manner with an approved roller, weighing not less than eight (8) tons. Rolling shall proceed continuously until they do not creep or wave ahead of the roller.

(C) BITUMINOUS TREATMENT

When the surface is moderately dry, bituminous material shall be applied uniformly at the rate of from seven-tenths (0.7) gallon to nine-tenths (0.9) gallon per square yard of surface.

(D) PRESSURE DISTRIBUTOR

The pressure distributor shall distribute the bituminous material in a uniform spray without atomization and be equipped with an approved thermometer, tachometer and pressure gauge which can be easily read during operation, and have tires of such width as to prevent rutting. If provided with heating attachments, the distributor shall be so equipped and operated that the bituminous material shall be circulated or agitated throughout the entire heating process.

The distributor shall be operated to secure uniformity in distribution and in depth of penetration by the regulation of the speed of the vehicle and the discharge of the bituminous material, and by the prevention of overlapping at either the sides or ends of applications and the draining of pipes and nozzles onto the road.

An approved pouring pot or hose attachment to the distributor shall be used to touch up spots or cover narrow strips unavoidably missed by the distributor.

(E) STONE TREATMENT

The stone shall be deposited in piles adjacent to the road before the application of the bituminous material is begun, and shall be kept clean. It shall be moderately dry when used. It shall be spread immediately after the application of the bituminous material uniformly at the rate of 25 to 30 pounds per square yard. The surface shall be broomed, if necessary, to prevent excess deposits in spots, and be rolled continuously until the bonding is thorough and the surface is hard, smooth and apparently immovable under the roller. The stone shall be applied in additional amounts at points where bituminous material adheres to the wheels of the roller.

4.03.5. METHODS--PLANT-MIX BINDER. All provisions of **Subsection 4.01.4.**, applicable to a Class 3, Plant Mixed Binder Base Course, shall apply when Plant Mixed Binder is used as a temporary surfacing for roadways.

4.03.6. DEFECTIVE WORK. Such portions of the completed surfacing as are defective in finish, compression, composition or that do not comply with the requirements of these specifications, shall be taken up, removed and replaced with suitable materials, properly laid in accordance with these specifications.

4.03.7. MEASUREMENT. In determining the area of temporary surfacing to be paid for, the areas occupied by rails, bases of columns, manhole heads, gate boxes, roadway boxes and similar structures will be deducted when they measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less.

All screenings, sand, stone and plant-mixed binder shall be weighed separately in trucks on approved scales to be provided by the Contractor. The Contractor shall furnish a delivery ticket to the Engineer on which shall be stamped the time weighed and the metered net weight and type of material contained in each vehicle when delivered to the site. The certification of a licensed Weighmaster will be accepted in lieu of such delivery ticket.

4.03.8. PRICE TO COVER. The contract price for Temporary Surfacing for Roadways per square yard shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish and lay the temporary surfacing, complete in place, in full compliance with the requirements of the specifications, and to furnish such samples for testing and provide such test equipment, laboratory space and facilities as may be required.

Payment will be made under:

Item No.	Item	Pay Unit
4.03	TEMPORARY SURFACING FOR ROADWAYS	S.Y.

SECTION 4.04 - Concrete Base for Pavement

4.04.1. INTENT. This section describes construction of Concrete Base for Pavement and Pavers.

4.04.2. DESCRIPTION.

(A) CONCRETE BASE FOR PAVEMENT. Concrete base for pavement shall consist of a course of concrete of a specified thickness and type except for a space eighteen (18”) inches wide around manhole heads and similar structures where it shall be two (2”) inches thicker than the surrounding concrete.

(B) CONCRETE BASE FOR PAVERS. Concrete base for pavers shall consist of a course of concrete of a specified thickness and type, which shall be keyed into the adjacent base for pavement when used in roadway areas or keyed into the adjacent concrete sidewalk when used in sidewalk areas.

4.04.3. MATERIALS. Concrete shall comply with the requirements of **Section 3.05**, Class B-32, Type IA, unless otherwise specified. Classes A-40, C-25, or D-18, Type IA, or High Early Strength Concrete, shall be used when specified or directed.

For the High Early Strength Concrete, the Contractor shall be required to produce a concrete having a minimum compressive strength of 3,000 p.s.i. at 3 days as determined by one set (3 cylinders) of concrete cylinders for each day’s work to be tested by the Contractor, at no cost to the City. For the High Early Strength Concrete, the Contractor shall be required to substitute 20% of the weight of Portland cement with fly ash, Class F, on a pound for pound basis.

The Contractor will be allowed to use an admixture for an additional two and one-half (2-1/2") inches of slump, for a maximum slump of five and one-half (5-1/2") inches, and an admixture to enhance workability to help in the surface finishing of the concrete, all at no additional cost to the City. All admixtures used shall be compatible with each other and shall conform to the requirements of Article 711.08 - ADMIXTURES, of the State of New York, Department of Transportation, Standard Specifications. The Contractor shall submit his mix design for approval by the Engineer; however, such approval by the Engineer shall not relieve the Contractor of his responsibility for meeting the minimum 3 day strength requirements specified herein.

Concrete cylinders shall be taken at each location of work, as directed by the Engineer, to be tested for 3-day and 28-day strengths.

Fine aggregate shall comply with the requirements of **Section 2.21**, Type 1A.

Coarse aggregate shall comply with the requirements of **Section 2.02**; Size No. 57; Type 1, Grade B, or Type 2.

Curing compound shall be a Type 4, Bituminous, complying with the requirements of **Section 2.14**.

Preformed expansion joint filler, Type IV, 1/4" thick, shall comply with the requirements of **Section 2.15**.

Asphaltic joint filler, blown type shall comply with the requirements of **Section 2.16**.

Concrete reinforcement shall comply with the requirements of the following sections:

Steel Bars--**Section 2.23**
Welded Steel Wire Fabric--**Section 2.25**

Kind of reinforcement, size and placement shall be as specified or as shown on the Contract Drawings.

4.04.4. METHODS.

(A) EARTH SUBGRADE

The earth subgrade, immediately before the concrete base is laid, shall be compacted with an approved roller weighing not less than two hundred and twenty-five (225) pounds per inch width of main roll. It shall be smooth, parallel to and at the required depth below the finished pavement surface, and be dampened with water sufficient only to be absorbed by the subgrade. The subgrade shall not be in a muddy or frozen condition, and unsuitable material shall be removed and replaced with acceptable material thoroughly compacted to obtain a minimum of 95% standard Proctor maximum density.

(B) DEPOSITING, COMPACTING, AND FINISHING CONCRETE

Concrete shall be placed, spread, internally vibrated, consolidated and struck off using methods and equipment approved by the Engineer. Spreading by shovels will be permitted.

Concrete shall be deposited before the initial set has taken place, crosswise of the street, in as nearly a continuous operation as practicable, and with approved tools which will prevent segregation. It shall not be deposited in standing water and shall be thoroughly compacted to the required depth and against rails and structures. Concrete shall have its top surface parallel to and at the required depth below the finished pavement surface.

The Contractor shall be required to furnish a minimum of three (3) hand operated immersion type vibrators to the job site, one of which shall be used as a backup for the other two. Immediately after concrete has been placed, the Contractor shall use the hand operated immersion type vibrators to thoroughly consolidate the concrete in areas against and along the face of forms, when used, and along

curbs, street hardware, and other structures. Vibrators shall not come in contact with forms, shall not be used for moving concrete in the work, and in no case shall any vibrator be operated longer than 4 seconds in any one location.

Where a block pavement is to be laid on the concrete base it shall be finished to a surface that is not rough and where an asphalt pavement is to be laid the surface of the concrete shall be left roughened by transverse brooming, except within one (1') foot of joints which shall be finished smooth for the application of a reflective cracking membrane.

Concrete base in roadways shall be finished three (3") inches below the surface of the new asphaltic concrete wearing course and shall conform to the profile and cross section of finished asphaltic concrete wearing course within a tolerance of ±1/4 inch throughout. Hand screeding and finishing of the concrete base will be permitted. The finished surface shall be struck uniformly and be free of ruts, depressions, bumps and unevenness, suitable for temporary use as a vehicular riding surface. For the application of reflective cracking membrane under Item 6.91, the surface of the concrete base within one (1') foot of joints shall be finished smooth. No other hand finishing of the pavement will be required except to correct surface irregularities.

(C) CONCRETE BASE FOR PAVERS

When installing concrete base for pavers particular care shall be taken by the Contractor to insure that the concrete base for pavers be placed to its proper elevation and actual width required to minimize the need for sawcutting pavers during their installation. The Contractor shall layout a sample section of the actual pavers to be installed in the work, to determine the actual width of base for pavers required, prior to installation of the concrete base. Should the Contractor fail to meet the concrete base elevation required to maintain the bituminous setting bed thickness specified under the paver item, it shall be required to remove and replace the concrete base or portion thereof, as required, to maintain the specified bed thickness, at no additional cost to the City. Minimum concrete replacement thickness shall be two (2") inches.

In addition, the Contractor shall be required to install weep holes in the concrete base as directed.

Concrete base for pavers in sidewalk areas shall also include a six (6") inch foundation material, which shall comply with the requirements of **Subsection 4.13.3.(A)** and be placed in accordance with the requirements of **Subsections 4.13.4.(A)** and **4.13.4.(B)**; preformed expansion joint filler, Type IV, one-quarter (1/4") inch thick, which shall comply with the requirements of **Section 2.15**; and, asphaltic blown joint filler which shall comply with the requirements of **Section 2.16**. Installation of these materials shall be as shown on the Contract Drawings or directed by the Engineer.

(D) TESTING THE SURFACE

Any surface irregularity of the concrete found when testing the concrete surface prior to initial set, exceeding three-eighth (3/8") inches in ten (10') feet, shall be immediately corrected.

(E) CURING

Curing the Portland Cement Concrete foundation for pavement by the impervious membrane method will not be permitted. Curing shall be done by spraying bituminous curing material at the rate of one hundred (100) square foot per gallon. Type RS-1, Emulsified Asphalt, shall be used when the ambient temperature is 40° Fahrenheit or over. Type RC-70, Liquid Asphalt shall be used when the ambient temperature is below 40° Fahrenheit.

The concrete shall be cured in accordance with the provisions of the specifications, Curing Materials, **Section 2.14**, Type 4, Bituminous.

The sum of one (1) dollar will be deducted from any moneys due under the contract for each square foot of pavement base which the Contractor fails to cure as specified. Furthermore, the Contractor, pursuant to **Section 5.04**, shall take core borings at his own expense to determine the compressive strength of the concrete at any location in which he fails to cure as specified.

(F) JOINTS

Transverse and construction joints shall be constructed as per the New York City Department of Transportation's Standard Details of Construction Standard Drawing Nos. H-1040 and H-1034. Construction joints will be required at paving stops and at other locations as directed by the Engineer.

(G) RAIN AND COLD WEATHER

Concrete placement operations may be started when the air temperature is 40° Fahrenheit and rising, or warmer, and when the surface temperature of the area to be paved is 40° F or higher. All temperatures shall be measured in the shade within an accuracy of ±2° Fahrenheit. Paving shall be discontinued when the air temperature falls below 40° Fahrenheit unless otherwise permitted in writing by the Engineer. Concrete paving will not be permitted when it is raining, except when permitted in writing by the Engineer.

When the air temperature is expected to fall below 35° Fahrenheit anytime during the curing period of the concrete placement, a sufficient supply of straw, hay or other blanketing material approved by the Engineer shall be provided at the work site. At any time during the curing period of the concrete when the air temperature may be expected to reach 32° Fahrenheit and colder, the blanketing material so provided shall be spread over the pavement and maintained to prevent freezing of the concrete. Concrete damaged by cold weather as determined by the Engineer shall be removed and replaced at the Contractor's own expense.

During rainfall, concrete may be placed, if permitted by the Engineer, only under conditions where the required water-cement ratio can be maintained.

The placing of concrete during wet or cold weather will not relieve the Contractor of any responsibilities under this contract.

4.04.5. TRAFFIC. No traffic of any kind will be allowed on the concrete base until permitted by the Engineer. Normally that shall be at least seven (7) days or at least seventy-two (72) hours for High Early Strength Concrete.

4.04.6. MEASUREMENT. The volume of concrete in cubic yards and the amount to be paid shall be determined from cores taken by the Contractor after twenty-eight (28) days of curing in accordance with **Section 5.04**. Where concrete is laid upon an existing concrete base, the volume of concrete in cubic yards shall be determined from cross sections.

In determining the volume of concrete to be paid for, the spaces occupied by rails, bases of columns, manhole heads, gate boxes, road boxes and similar structures will be deducted when their superficial areas measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less.

4.04.7. PRICES TO COVER.

(A) CONCRETE BASE FOR PAVEMENT. The contract price for Concrete Base for Pavement per cubic yard shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish, lay and cure the concrete, of the Class, Type and thickness specified, complete in full compliance with the requirements of the specifications, to furnish such samples and cores for testing and to provide such testing equipment, laboratory space and facilities as may be required, and to maintain the concrete base in good condition as specified in **Section 5.05**.

(B) CONCRETE BASE FOR PAVEMENT, WITH REINFORCEMENT. The contract price for Concrete Base for Pavement per cubic yard shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish, lay and cure the concrete, of the Class, Type and thickness specified, with steel reinforcement complete in full compliance with the requirements of the specifications, to furnish such samples and cores for testing and to provide such testing equipment, laboratory space and facilities as may be required, and to maintain the concrete base in good condition as specified in **Section 5.05**.

(C) CONCRETE BASE FOR PAVERS. The contract price for Concrete Base for Pavers per cubic yard shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish, lay and cure the concrete, of the Class, Type and thickness specified, complete in full compliance with the requirements of the specifications, including, but not limited to, furnishing and placing foundation material, to furnish such samples and cores for testing and to provide such testing equipment, laboratory space and facilities as may be required, and to maintain the concrete base in good condition as specified in **Section 5.05**.

Payment will be made under:

Item No.	Item	Pay Unit
4.04 B	CONCRETE BASE FOR PAVEMENT, VARIABLE THICKNESS FOR TRENCH RESTORATION, CLASS B-32	C.Y.
4.04 H	CONCRETE BASE FOR PAVEMENT, VARIABLE THICKNESS FOR TRENCH RESTORATION, (HIGH EARLY STRENGTH)	C.Y.
4.04 AC	CONCRETE BASE FOR PAVEMENT, 6” THICK, CLASS B-32	C.Y.
4.04 BC	CONCRETE BASE FOR PAVEMENT, 7” THICK, CLASS B-32	C.Y.
4.04 BCR	CONCRETE BASE FOR PAVEMENT, WITH REINFORCEMENT, 7” THICK, CLASS B-32	C.Y.
4.04 CC	CONCRETE BASE FOR PAVEMENT, 8” THICK, CLASS B-32	C.Y.
4.04 CD	CONCRETE BASE FOR PAVEMENT, 8” THICK, CLASS A-40	C.Y.
4.04 DC	CONCRETE BASE FOR PAVEMENT, 9” THICK, CLASS B-32	C.Y.
4.04 DD	CONCRETE BASE FOR PAVEMENT, 9” THICK, CLASS A-40	C.Y.
4.04 EC	CONCRETE BASE FOR PAVEMENT, 10” THICK, CLASS B-32	C.Y.
4.04 ED	CONCRETE BASE FOR PAVEMENT, 10” THICK, CLASS A-40	C.Y.
4.04 FD	CONCRETE BASE FOR PAVEMENT, 11” THICK, CLASS A-40	C.Y.
4.04 GD	CONCRETE BASE FOR PAVEMENT, 12” THICK, CLASS A-40	C.Y.
4.04 AP	CONCRETE BASE FOR PAVERS, 4” TO 7” THICK, CLASS A-40	C.Y.
4.04 BP	CONCRETE BASE FOR PAVERS, 4” TO 7” THICK, CLASS B-32	C.Y.
4.04 HA	CONCRETE BASE FOR PAVEMENT, 6” THICK (HIGH EARLY STRENGTH)	C.Y.
4.04 HB	CONCRETE BASE FOR PAVEMENT, 7” THICK (HIGH EARLY STRENGTH)	C.Y.
4.04 HC	CONCRETE BASE FOR PAVEMENT, 8” THICK (HIGH EARLY STRENGTH)	C.Y.
4.04 HD	CONCRETE BASE FOR PAVEMENT, 9” THICK (HIGH EARLY STRENGTH)	C.Y.
4.04 HE	CONCRETE BASE FOR PAVEMENT, 10” THICK (HIGH EARLY STRENGTH)	C.Y.
4.04 HF	CONCRETE BASE FOR PAVEMENT, 11” THICK (HIGH EARLY STRENGTH)	C.Y.
4.04 HG	CONCRETE BASE FOR PAVEMENT, 12” THICK (HIGH EARLY STRENGTH)	C.Y.

SECTION 4.05 - Concrete Pavement

4.05.1. INTENT.
This section describes construction of Concrete Pavement.

4.05.2 DESCRIPTION.

(A) Concrete Pavement shall be of the following types:

Type 1--Non-reinforced
Type 2--Reinforced (Unpigmented or pigmented when specified)
Type 3--High Early Strength Reinforced (Unpigmented or pigmented when specified)

Type 2 and Type 3 pavements shall consist of a concrete surface course which shall be unpigmented or pigmented when specified, laid on a concrete base course, which may or may not be pigmented at the Contractor's option, while the base course is still plastic, of the thickness shown on the Contract Drawings, with reinforcement placed between the surface and base courses.

(B) Concrete Pavement shall be of the type, thickness and finish specified, and shall be colored when specified.

4.05.3 MATERIALS.

(A) CONCRETE

Concrete shall comply with the requirements of **Section 3.05**, Class A-40, Type IIA, or High Early Strength, Type IIIA. Concrete shall be Class A-40, Type IIA, unless otherwise specified.

Coarse aggregate shall comply with the requirements of **Section 2.02**, broken stone, Type 1, Grade B or Type 2. Type 2 aggregate shall be crushed. Coarse aggregate shall have the following gradation requirements:

Sieve Size	Percent Passing by Weight	
	Minimum	Maximum
1-1/2 inch	100	
1 inch	93	100
1/2 inch	27	58
1/4 inch	0	8

Fine aggregate shall comply with the requirements of **Section 2.21**, Type 1A, with the following gradation requirements when dry:

Sieve Size	Percent Passing by Weight	
Minimum	Minimum	Maximum
3/8 inch	100	
No. 4	90	100
No. 8	75	100
No. 16	50	85
No. 30	25	60
No. 50	10	30
No. 100	1	10
No. 200 (Wet)	0	3

(B) PIGMENTING

Where pigmenting is specified, the concrete bus pads shall be pigmented with an admixture complying with the requirements of Section 2.19 of the Standard Highway Specifications.

Where the color of the concrete is required to simulate the red color of the Red Bus Lane Pavement Overlay (Item 6.44 POR in Section 6.44 PO), the surface course concrete shall be integrally pigmented to produce a red color equivalent to Scofield's quarry red (to match the Quest's StreetBondCL Terracotta color overlay to be used along the designated adjacent asphalt pavement).

Except for the use of an air-entraining agent complying with ASTM Designation C 260 and water reducing admixtures complying with ASTM Designation C 494 used in combination with the Pigment Admixture as per the pigment manufacturer's instruction, no other admixtures (including, but not limited to, calcium chloride) shall be used unless stated in writing by the manufacturer of the Pigment Admixture to be of no consequence to the colorfastness of the concrete mixture and is approved by the Engineer.

All pigmented concrete at different locations shall be identical, unless otherwise directed. Variations in color/tint/hue will not be acceptable. Therefore, the same brand and type of cement and the same source and type of aggregate shall be used throughout the project.

Prior to the mix design being made, the cement intended for use shall be checked to determine that its lightness/darkness is similar to the cement used in the original approved sample. The Pigmented Admixture shall be added in the standard proportion specified by the manufacturer.

(C) CURING COMPOUND

Curing Compound for unpigmented concrete shall be Type 1-D as per **Section 2.14**. The compound shall contain a fugitive dye that will fade uniformly.

Curing Compound for pigmented concrete shall be a liquid membrane-forming compound color-matched to the pigmented concrete, as specified under **Section 2.19**. Additionally, the curing membrane shall be of a type recommended by the Pigmented Admixture manufacturer and shall conform to both ASTM C 309 and all local, State, and Federal regulations concerning volatile organic compounds (VOC). Plastic sheeting, burlap, paper, or other unspecified material shall not be used as a curing membrane.

(D) CONCRETE REINFORCEMENT

Concrete reinforcement shall comply with the requirements of the following sections:

Steel Bars--**Section 2.23**
Welded Steel Wire Fabric--**Section 2.25**

Kind of reinforcement, size and placement shall be as specified or as shown on the Contract Drawings.

(E) JOINT TIE BARS AND DOWEL BARS

Joint Tie Bars and Dowels shall be of the types, sizes and placement shown on the Contract Drawings. Epoxy coating of bars shall be furnished, applied, sampled, tested, repaired, handled and stored in accordance with the requirements of **Section 709-04, EPOXY-COATED BAR REINFORCEMENT**, of the State of New York, Department of Transportation, Standard Specifications. Acceptance of epoxy coated joint tie bars and dowels shall be based on: the names and locations of the reinforcing bar manufacturer, the epoxy reinforcing bar applicator, and the epoxy coating material appearing on the NYS Department of Transportation's Material and Equipment Approved List; and, certifications from the steel manufacturer, the coating manufacturer, and the coating applicator as to their compliance with these specifications. These certifications shall accompany the material delivered to the job site.

(F) JOINT SEALER

(1) Field Molded, Elastic Type, Concrete Expansion Joint Sealer. The Field Molded, Elastic Type, Concrete Expansion Joint Sealer shall comply with the requirements of **Section 2.22**, Type 2 - Cold Applied Sealer.

(2) Preformed Joint Sealer. The Preformed Joint Sealer shall meet the requirements of AASHTO M220 and/or ASTM D 2628.

Lubricant for preformed elastic joint sealer shall be a one-component polychloroprene compound containing only soluble phenolic resins blended together with anti-oxidants and acid acceptors in an aromatic hydrocarbon solvent mixture.

The lubricant shall meet the following physical requirements:

Average net weight per gallon: 7.84 lbs. + 5%.

Solid content: 22-28% by weight.

Film strength (ASTM D 412): 2,300 psi minimum tensile strength, 750% minimum elongation before breaking.

The viscosity shall be such that the lubricant will perform suitably with the installation equipment.

Each lot of the lubricant shall be delivered in containers plainly marked with the manufacturer's name or trademark, lot numbers and date of manufacture.

The basis of acceptance for the lubricant shall be the manufacturer's certification as to compliance with this specification which shall accompany the material delivered to the job site. Any lubricant not used within 270 days of its manufacture shall be unacceptable.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.

(G) EXPANSION JOINT FILLER

Preformed Expansion Joint Filler shall comply with the requirements of **Section 2.15**, Type IV shall be used unless otherwise specified.

(H) SNOW PICKET FENCE

Snow Picket Fence shall be manufactured from one (1") inch wide, one-quarter (1/4") inch thick and three (3') feet long wood laths dyed or painted red, spaced approximately one-quarter (1/4") inch apart and bound together at the top and bottom of each stake with No. 16 wire. Snow picket fence shall be as described herein or an equivalent as approved by the Engineer.

4.05.4 EQUIPMENT.

(A) GENERAL

All equipment for placing and finishing concrete pavement shall be at the job site sufficiently ahead of the start of the paving operations to be examined thoroughly and approved by the Engineer. Any equipment found worn or defective either before or during its use shall be immediately repaired to the satisfaction of the Engineer or replaced. Paving operations shall be discontinued at any time equipment is not working properly and producing unsatisfactory results. The concrete for pavement shall be mixed and transported in conformance with the requirements of **Section 3.05**, unless otherwise stated herein.

(B) SPREADING AND FINISHING MACHINES

Spreading and Finishing Machines shall have the following characteristics:

1) Travel speed, direction, and elevation shall be controlled hydraulically.

2) Effective paving width capability shall be fifteen (15') feet to twenty-five (25') feet.

3) A minimum of two independent function augers for controlled directional spreading of concrete.

4) A minimum of two oscillating screeds with variable stroke for working concrete slab.

5) Hydraulic or electric internal vibration.

6) Hydraulic crown control for contouring slab.

The spreading and finishing machines shall be self-powered and shall be capable of spreading, consolidating and finishing the freshly placed concrete to the required pavement elevation and cross-section within the specified tolerances. When the spreading or finishing machines are operated on adjacent pavement, the equipment shall be provided with either: approved rubber tires, flangeless wheels, sleeved steel wheels with quick removable flanges for travel and operation on the existing slab, so as to avoid damage to the adjacent lane slab. Approved pads may be used to protect the adjacent lane when tracked equipment is used for paving.

The finishing machine shall be equipped with a pan float attached to the finishing equipment behind the last screed.

(C) VIBRATORS

Vibrators for full width vibration of concrete paving may be either the surface pan type or internal type with either immersed tube or multiple spuds. The vibrators shall be capable of thoroughly consolidating the concrete, leaving the concrete free from honeycomb. Vibrators may be attached to the spreader or the finishing machine, or may be mounted on a separate carriage for either the slipform or fixed form paving methods. The vibrators shall be mounted so as to transmit a minimum of vibration to the spreader or finishing machine or forms and shall not be in contact with the forms. The vibrating equipment shall be designed to permit the vibrators to be raised or lowered during the progress of the paving operations and they shall be capable of being shut off. The frequencies of the vibrating elements for the various types of vibrators shall meet the following requirements for Vibrator Element Frequencies.

TABLE 4.05-A
VIBRATOR ELEMENT FREQUENCIES

Type	Frequency, Minimum Cycles/Minute
Surface, Pan or Screed	3500
Immersion Tube, Paving Machine Attachment	5000
Immersion Spud, Hand Operated	7000
Immersion Spud, Gang Mounted	7000

(D) SLIPFORMS

The slipform paving equipment shall be self-propelled and shall be capable of placing, spreading, consolidating, screeding and finishing the freshly placed concrete to the proper pavement elevation and cross-section within the specified tolerances. The equipment may consist of a placing machine followed by a separate paver unit. Sliding forms on the paver unit shall be rigidly held together laterally to prevent spreading of the forms. Mechanical floats designed to eliminate small surface irregularities may be utilized as a separate machine in the final finishing operation. The paving equipment shall finish the concrete pavement surface in a manner such that any hand finishing will be kept to a minimum. The slipform paving equipment shall be guided by an approved reference system for placing the concrete pavement at an established line and grade.

(E) FIXED FORMS

Straight fixed forms shall be made of metal having a thickness of not less than seven thirty-seconds of an (7/32") inch and shall be furnished in sections not less than ten (10') feet in length. They shall have a joint connection to insure unbroken lines across the joint and contain holes for bars as required. Forms shall have a depth equal to the prescribed edge thickness of the concrete, without horizontal joints, and shall have a minimum base width equal to the depth of the forms. Flexible, curved or wooden forms of a design acceptable to the Engineer may be used, but only for curved sections having a radius of less than two hundred (200') feet. All forms shall have an approved section with the vertical face rounded on the upper corner to not more than three-quarters (3/4) of an inch radius and with a horizontal top face at least two inches wide. Flange braces shall extend outward on the base not less than two-thirds (2/3) the height of the form. The forms shall be designed for locking the ends of abutting form sections together tightly. The top of the form shall not vary from a true plane more than one-eighth (1/8") inch in ten (10') feet, and the vertical face shall not vary more than one-fourth (1/4") inch. Forms with battered top surfaces, or bent, twisted or broken forms shall not be used. Repaired forms shall not be used until inspected and approved by the Engineer.

(F) OTHER EQUIPMENT

Other Equipment for placing pavement concrete may be used subject to the approval of the Assistant Commissioner, Infrastructure Construction.

4.05.5. METHODS.

(A) GENERAL

Immediately following but not later than eight weeks after the date of the Contractor's Notice to Proceed, the Contractor shall file with the Engineer, Age-Strength data of the job mix he proposes to use for various ambient temperatures anticipated during the period. This data will be used in determining the curing periods of concrete prior to opening pavement to traffic. This data may be in tabular or graphical form for various ambient temperatures with a maximum curing period of seventy-two (72) hours.

In addition, the Contractor shall within eight weeks of the notice to proceed, prepare and submit for approval to the Director of Construction, Infrastructure Division, detailed shop drawings for the entire pavement showing: all proposed transverse and longitudinal construction, expansion and contraction joints; proposed curb joints; the proposed method of joint forming; the proposed method of dowel support; and the proposed sealant method.

For pigmented concrete, the Contractor shall within eight weeks of the notice to proceed, submit the name of its proposed roadway installer upon which its bid is based, along with their respective work history experience in placing pigmented concrete. The installer shall have documented experience in working with pigmented concrete.

Prior to making any field samples and the placing of any pigmented concrete, the Contractor, its concrete supplier, installer, cement producer, laboratory, the pigmented admixture's representative, and the Engineer shall meet and agree on the specifications and methods of handling the pigmented concrete.

(B) WEATHER LIMITATIONS

Concrete placement operations may be started when the air temperature is forty (40) degrees Fahrenheit and rising, or warmer, and when the surface temperature of the area to be paved is forty (40) degrees Fahrenheit or higher. All temperatures shall be measured in the shade within an accuracy of plus two (+2) degrees Fahrenheit. Paving shall be discontinued when the air temperature falls below forty (40) degrees Fahrenheit unless otherwise permitted by the Engineer. Concrete pavement shall not be placed when it is raining. When the air temperature is expected to fall below thirty-five (35) degrees Fahrenheit anytime during the curing period of the concrete placement, a sufficient supply of straw, hay or blanketing material approved by the Engineer shall be provided at the work site. At any time during the curing period of the concrete when the air temperature may be expected to reach thirty-two (32) degrees Fahrenheit and colder, the material so provided shall be spread over the pavement and maintained to prevent freezing of the concrete. Concrete damaged by cold weather as determined by the Engineer shall be removed and replaced at the Contractor's expense.

(C) PREPARATION OF SUBBASE

Before any concrete may be placed, the subbase course shall be fine graded to a tolerance of plus one-quarter (+1/4") inch of true grade for the subbase. High areas shall be trimmed to proper elevation. Low areas may be filled with approved granular material mixed with two (2%) percent Portland cement by weight. The subbase course shall be fine graded at least twelve (12") inches beyond the outside edge of either: 1) the slipform paving equipment, trackline or wheelpath; or, 2) the fixed forms.

Wherever possible as determined by the Engineer, concrete paving operations shall not begin until the subbase course has been fine graded ahead as follows:

500 Linear Feet, Minimum, for Slipform Paving; and,
200 Linear Feet, Minimum, for Fixed Form Paving.

The subbase course shall be uniformly moist when the concrete is placed. If it subsequently becomes too dry, the subbase course shall be sprinkled, but the method of sprinkling shall not be such as to form mud or pools of water.

During concrete paving operations, a roller weighting not less than five (5) tons shall be maintained in readiness to recompact the subbase course if the surface, for any reason, has become uneven or defective. Soft spots in the subbase shall be corrected to the satisfaction of the Engineer. Traffic will not be allowed on the finished subbase unless permitted by the Engineer. It shall be protected, where required, against freezing by a layer of straw spread to a depth of six (6") inches and be unfrozen when concrete is laid.

(D) SETTING FIXED FORMS

The Contractor shall submit details of the forms he proposes to use to the Engineer for approval before he starts their construction.

1) Base Support. The subbase under the forms shall be compacted and true to grade so that the form, when set will be firmly in contact for its whole length and at the specified grade. Any part of the subbase course at the form line found below the established grade shall be filled with approved granular material for a distance at least six (6") inches on each side of the form base, and thoroughly compacted. Imperfections or variations above grade shall be corrected by cutting as necessary.

2) Form Setting. Forms shall be set wherever possible as determined by the Engineer, at least two hundred (200') feet ahead of the point where concrete is being placed. Forms shall be staked into place with not less than three (3) pins or stakes for each ten (10') foot section. A pin shall be placed at each side of every joint. Form sections shall be tightly locked, free from play or movement in any direction. The forms shall not deviate from true line by more than one-quarter (1/4") inch at any point. The forms shall resist the pressure of the concrete and the impact of the operating equipment without springing, and shall be left in place until the day following the laying of the concrete unless otherwise permitted, and be carefully removed without damaging the concrete. Forms shall be cleaned and oiled each time prior to using the forms for placing concrete.

3) Grade and Alignment. On curves, the forms shall be shaped to the required radius. The alignment and grade elevations of the forms shall be checked and corrections made by the Contractor immediately before placing the concrete. When any form has been disturbed or any subbase has become unstable, the forms shall be reset and rechecked.

(E) STEEL REINFORCEMENT

Steel Reinforcement for reinforced concrete pavement shall be installed in accordance with the requirements of **Section 4.14**, unless otherwise specified herein.

Reinforcing steel mats shall be free from dirt, oil, grease, paint, loose mill scale, or thick rust which could impair bond of the steel with the concrete. Before being placed, all reinforcement shall be in a condition that is approved by the Engineer. All steel reinforcement shall be placed as shown on the Contract Drawings.

(F) CONCRETE MIXING, TRANSPORTING AND DISCHARGING

Concrete Mixing, Transporting and Discharging shall meet the requirements of **Section 3.05**. Concrete shall be mixed, transported, placed and spread by approved mechanical equipment only, except mechanical spreading equipment will not be required for bus stops and for concrete pavement limited to not more than five hundred (500') linear feet.

Concrete shall be deposited rapidly in successive batches by means of batcher trucks or other approved methods. It shall be thoroughly spaded and be handled with special care to prevent segregation. Along all joints, around all protrusions into the concrete such as manholes, drainage structures, etc., and along the inside of the forms, hand operated immersion type vibrators shall be used to thoroughly consolidate the concrete. Vibrators shall not come in contact with forms, shall not be used for moving concrete in the work, and in no case shall any vibrator be operated longer than four (4) seconds in any one location. The Contractor shall be required to furnish a minimum of three (3) hand operated immersion type vibrators to the job site, one of which shall be used as a backup for the other two.

Maintain uniform concrete quality and head in front of the paving machine and without running over the screeds. Delivery of concrete shall be coordinate to maintain continuous forward movement of the paver and avoid excessive delivery truck queues. The top of forms shall be kept clean before and during paving operations. Consolidate the entire concrete placement using internal vibrators attached to the paver. Combine paver forward speed, vibrator frequency, and vibrator depth to consolidate the concrete without segregation, vibrator trails, or contacting the joint assemblies. Discontinue vibration and tamping if the paver stops.

(G) CONCRETE PLACEMENT

Concrete shall be placed in one half the width of the roadway pavement at a time unless otherwise shown on the Contract Drawings or directed by the Engineer. Longitudinal lane joints shall be constructed in the new pavement by sawcutting the concrete within twenty-four (24) hours of its placing but not within four (4) hours after it has been placed.

Immediately before placing concrete, the entire subbase surface shall be wet without forming puddles or mud.

Concrete shall be unloaded into an approved spreading device and mechanically spread as near to final position on the subbase, unless otherwise permitted by the Engineer, and in such a manner as to prevent segregation of the material. If a spreader is not used, uniformly distribute the concrete in front of the paver by maneuvering the delivery truck chute. When concrete is placed adjoining bridges or existing intersecting pavements with slipform paving equipment, the start-off or ending procedures shall be subject to the approval of the Engineer. The concrete shall be placed to the depth and width of the paving operation continuously between the transverse joints without the use of intermediate bulkheads except when a disruption in the paving operation occurs. A transverse construction joint, meeting the requirements herein shall be formed whenever concrete paving operations are stopped longer than thirty (30) minutes. If, due to any disruption, concreting must be stopped within ten (10') feet after forming a transverse joint, the Contractor shall remove the concrete to the joint previously formed and no payment will be made for placing or removing this concrete.

The concrete shall be placed in such a manner to provide a dense and homogeneous pavement with a minimum of hand finishing. The equipment shall have as nearly a continuous forward movement as possible and all operations of delivery and spreading the concrete shall be so coordinated as to provide uniform progress with stopping and starting of the placing equipment held to a minimum. If, for any reason, it is necessary to stop the forward movement of the equipment, the vibratory and tamping elements shall be stopped immediately.

Where concrete will be placed adjacent to a previously constructed lane of pavement and hauling or finishing equipment will be operated upon the existing lane of pavement, that lane shall have cured for the minimum period of seventy-two (72) hours. Whenever concrete is mixed in a paver mixer, the paver will be allowed to operate on an adjacent paved lane provided that a mat at least six (6") inches wider than the treads, at least two (2") inches in thickness and of a length not less than the length of treads shall be maintained at all time while the equipment is on the pavement.

Pavement widening six (6') feet or less may be placed with pavement widening equipment as approved by the Engineer. Longitudinal forms will not be required when pavement widening equipment is used.

Necessary hand spreading shall be done with shovels. Workmen shall not be allowed to walk in the freshly mixed concrete with boots or shoes coated with earth or other foreign substances.

Immersion type vibrators, either hand operated or attached to the paving equipment, shall be used to thoroughly consolidate the concrete against and along the faces of forms, when used, and along the full length and on both sides of all joint support assemblies. The vibrators shall not come in contact with a joint support assembly, the subbase or forms. In no case shall any vibrator be operated longer than ten (10) seconds in any one (1) location.

The use of a mechanical spreader may be dispensed with on small or irregular areas if a substitute method satisfactory to the Engineer is provided. When paving small or irregular areas, the concrete shall be uniformly spread. If concrete is spread by hand, comealongs or shovels shall be use. Rakes or hand-held vibrators shall not be used to spread the concrete. Use hand-held vibrators ahead of the paving equipment to consolidate all concrete not vibrated by equipment mounted internal vibrators. Keep hand-held vibrators perpendicular to the pavement surface. Vibrate between two (2) and four (4) seconds in each location, overlapping adjacent locations. Do not drag handheld vibrators through the concrete. Do not walk through consolidated concrete.

Following the placing and spreading of the concrete, it shall be struck-off to conform to the cross-section shown on the Contract Drawings and to an elevation such that when the concrete is properly consolidated and finished, the surface of the pavement will be at the elevation shown on the Contract Drawings.

Mark the midpoint (□1/2") of each transverse contraction joint with a shim placed into the plastic concrete immediately adjacent to each form. Use shims equal in width and depth to the contraction joint first-stage saw cuts depicted in the Contract Drawings. Set the shims perpendicular to the forms and the pavement surface. Make first-stage saw cuts from shim to shim as discussed in **Subsection 4.05.5(L)(3), Sawcutting Joints**. Use shims of sufficient lengths to allow complete first-stage saw cutting to each shim without striking the form.

Reinforced concrete pavement shall be placed in two layers. The entire width of the bottom layer shall be struck-off to a depth such that the reinforcement mat may be laid on the concrete in its final position without further manipulation. The reinforcement shall then be placed directly upon the concrete, after which the top layer of the concrete shall be placed, struck-off and screeded. Any portion of the bottom layer of concrete which has been placed more than thirty (30) minutes without being covered with the top layer shall be removed and replaced with freshly mixed concrete at the Contractor's expense.

Reinforcing steel mats shall be free from dirt, oil, grease, paint, loose mill scale, or thick rust which could impair bond of the steel with the concrete. Before being placed, all reinforcement shall be in a condition that is approved by the Engineer. All steel reinforcement shall be placed as shown on the Contract Drawings.

(H) SLIPFORM PAVING

When slipform paving machines are used, the Contractor shall establish a reference system to achieve the specified smoothness level.

A uniform concrete quality and head shall be maintained in front of the paving machine. Concrete delivery shall be coordinated to maintain continuous forward movement of the paver and avoid excessive delivery truck queues. Paver tracks shall be kept clear of concrete and debris before and during paving.

If concrete is placed directly on subbase, wet the entire subbase surface without forming puddles or mud immediately before placing concrete. Whenever possible, unload concrete into a mechanical spreader that deposits it near the final position before paving. If a spreader is not used, uniformly distribute the concrete in front of the paver by maneuvering the delivery truck chute.

Consolidate the entire concrete placement using internal vibrators attached to the slip form machine. Combine paver forward speed, vibrator frequency, and vibrator depth to consolidate the concrete without segregation, vibrator trails, or contacting the joint assemblies. Discontinue vibration and tamping if the paver stops.

(I) SCREEDING AND FINISHING CONCRETE

The strike-off and screeding of roadway slabs shall be done by machinery except where otherwise permitted by the Engineer. The machine shall be of a type approved by the Engineer. Flat finishing and brooming shall be done where directed by hand finishers.

Screeding shall be completed with as few passes of the machine as are necessary to produce a surface which is uniform in appearance, density and composition. The concrete shall be worked only sufficiently to embed the coarse aggregate, to close surface voids and to eliminate porous spots. This working shall not be carried to the point where excess mortar or water are drawn to the surface.

If hand screeding is permitted, the pavement surface shall be struck off in two (2) operations by means of approved steel channel or angle screeds which shall be not less than ten (10") inches in width and weigh not less than fifteen (15) pounds per linear foot. Screeds shall be at least two (2') feet longer than the width of the section, be moved forward with a longitudinal and cross-wise motion pushing an excess quantity of concrete ahead as required and with care to prevent tilting or riding up above the forms. The second screeding operation shall follow the first as late as possible in order that there may be a minimum of slumping down of the concrete surface.

Upon completion of the screeding, the concrete shall be finished by use of a flexible belt made of wood, canvas or rubber which shall be not less than ten (10”) inches nor more than twelve (12”) inches in width, and be not less than two (2’) feet longer than the width of the pavement. The belt shall be worked in a longitudinal and cross-wise motion with care to prevent the edges from digging into the surface of the concrete. Upon completion, the finished surface shall be in satisfactory conformity with the established grade and crown of the street. If excess water should appear on the surface after belting, it shall be removed by the use of a wide strip of wet burlap used as a belt or sweep over the surface.

Where mortar is not properly brought to the surface by screeding, hand floating shall be done as required.

The finishing operation shall be such that the surface will be uniform, even and without dips, hollows or projections, in accordance with the following requirements:

(1) Mechanical Finishing.

Pavement finishing equipment shall maintain a uniform height of concrete ahead of the main transverse screed and along its entire length. The number of transverse screeds shall be the number required to produce the specified smoothness, but not less than two. No backing up of any transverse screeding equipment will be permitted. The finishing equipment shall have as nearly a continuous forward movement as possible to provide uniform progress with stopping and starting of the finishing equipment held to a minimum.

When paving equipment utilizing tracks for mobility are used, the area on the prepared subbase course in the trackline shall be kept free from concrete or other debris that would affect the finished pavement surface. When fixed form paving is used, the tops of the forms shall be kept clean by a device attached to the machines and the travel of the machines on the forms shall be maintained true without lift, wobble, or other variations tending to affect the screeding operations.

Any edge slump of the pavement, resulting from slipform paving operations, exclusive of edge rounding, in excess of one-quarter (1/4”) inch shall be corrected before the concrete has hardened.

In general, the addition of superficial water to the surface of the concrete to assist in finishing operations will not be permitted. Where application of water to the surface is permitted by the Engineer, it shall be applied as a fog spray by means of approved spray equipment.

(2) Hand Finishing.

After the mechanical finishing operations have been completed, hand-operated smoothing lutes approved by the Engineer shall, if needed, be used to smooth out irregularities in the surface. The cutting edge of the lute shall be kept parallel to the centerline of the pavement at all times as it is moved transversely over the surface of the concrete. Excess thin mortar accumulated ahead of the lutes shall be removed from the surface of the pavement and shall not be used in filling the depressions.

As part of the edging operation on the fixed form pavements, a trowel shall be inserted between the form and the concrete for a depth of approximately three (3”) inches along the entire length of the slab before the edging tool is used. Finishing of the pavement slab edges for fixed form paving operations shall be performed in a manner approved by the Engineer using an approved edging tool.

All hand finishing of joint and surface irregularities, when necessary, shall be performed from a bridge which shall not rest on any part of the unhardened concrete.

Except on irregular or small areas or in the case of breakdown of the finishing machine, hand screeding and finishing of the pavement will not be permitted. When hand finishing is used, the surface shall be struck-off by means of two manually operated transverse screeds. The screed shall be moved forward with a longitudinal and crosswise movement. After the above screeding has been completed, approved hand operated smoothing lutes shall be used.

(J) INITIAL SURFACE TEST

The pavement surface shall be tested after the mechanical screeding is completed but before the initial set of the concrete occurs. The surface shall be tested with a standard ten (10') foot straight edge laid in contact with the pavement surface in successive positions parallel to and transverse to the center line of the pavement. Before the pavement hardens, any irregularities greater than one-eighth (1/8") inch in ten (10') feet should be promptly corrected in a manner approved by the Engineer.

(K) TEXTURING

(1) Full Width Pavement.

For full width concrete pavements, immediately after smoothing operations have been completed in roadways and prior to application of the curing compound, the surface of the concrete shall be grooved with a set of spring steel tines in a direction parallel to the transverse joint lines. The individual tines shall be rectangular in shape, three-sixteeth (3/16") inch wide, a thirty-second (1/32") inch thick, and approximately six (6") inches long. The center to center spacing of the tines shall be approximately three-quarters (3/4") inch. They shall be capable of producing striations generally not less than three-sixteeth (3/16") inch deep in the plastic concrete in one pass. More than one pass over the same area will not be permitted unless the surface has first been refinished. The capability of the tines to provide an acceptable texture shall be demonstrated to the Engineer prior to approval for use.

The tine head shall be operated mechanically. Concrete grooving shall take place with the longitudinal axis of the tines as nearly at an angle of forty-five (45) degrees to the concrete surface as is practicable to eliminate the dragging of mortar by the tines. The tines shall be kept free of hardened concrete particles. A smooth border three (3") inches in width on each side of the longitudinal joints, including joints along curb lines, and two (2") inches in width on each side of the transverse joints, shall be made with an approved tool.

(2) Bus Stop Pavements.

For bus stop pavements, the final finish shall be made by brooming after the water sheen has disappeared. Brooming shall proceed at right angles to the center line of the pavement for the full width of the slab in one operation, and with not more than one (1) stroke per width of broom. A smooth border three (3") inches in width on each side of the longitudinal joints, including joints along curb lines, and two (2") inches in width on each side of the transverse joints, shall be made with an approved tool.

(L) CONSTRUCTION JOINTS

Pavement surfaces shall be divided into strips by means of longitudinal joints, as required, and into slabs by means of transverse joints. Longitudinal and transverse joints shall be placed as specified and as shown on the Contract Drawings. In case of unforeseen delays, an approved transverse joint in a strip under construction may be placed not less than fifteen (15') feet or the length of one (1) reinforcement mat from the nearest joint in the completed adjacent strip.

Longitudinal and transverse joints shall be constructed as indicated in the typical layout for a section of the reinforced concrete pavement shown on the Contract Drawings and as specified herein, except that

the arrangement of longitudinal and transverse joints at intersections, tapers, and other irregular pavement areas shall be subject to the approval of the Engineer prior to construction.

The limits of the proposed concrete pavement in intersecting streets shall be at or near the building lines as indicated in the Contract Drawings.

All joints shall be properly constructed in accordance with these specifications, the Contract Drawings and approved shop drawings. Alternate methods for constructing joints, that are different from those specified, shall require preapproval by the Assistant Commissioner, Infrastructure Construction. Any method may be discontinued by the Engineer if unsatisfactory joints are obtained. The Contractor shall have the option in choosing the particular devices for the various joints, but only one type of each shall be used on the project unless otherwise permitted by the Engineer.

(1) Longitudinal Joints. Longitudinal joints shall be constructed between adjacent slabs and halfway between the outside edges of pavement placed in two lanes wide, unless otherwise shown on the Contract Drawings. When adjacent lanes of pavement are placed separately, a keyway constructed to the dimensions shown on the Contract Drawings shall be formed along the longitudinal joint.

Tie bars shall be placed perpendicular to the longitudinal joints at the spacing shown on the Contract Drawings, unless otherwise directed by the Engineer. No ties shall be placed within twelve (12") inches of the end of the pavement slab. Longitudinal joint tie bars shall be of the type specified and shall meet the dimensions shown on the Contract Drawings. Tie bars shall be placed by approved equipment or rigidly secured by chairs or other approved supports to prevent displacement.

Longitudinal joints shall consist of either a sawed or formed groove extending downward from and normal to the surface of the pavement. The groove dimensions and the construction method shall be as shown on the Contract Drawings and as specified herein.

When adjacent lanes of pavement are placed separately, the longitudinal joint between the adjacent slabs shall be sawed. When the grooves are cut by means of an approved concrete saw, suitable guidelines or devices shall be used to assure cutting the longitudinal joint on the true line. The longitudinal joint shall be sawn before the end of the curing period and before any equipment or vehicles are allowed on the pavement.

Tie bars shall not be coated with materials deleterious to bond, such as asphalt. When permitted by the Engineer, tie bars may be constructed of two-piece connectors when adjacent lanes of pavement are placed separately.

2) Transverse Joints. Transverse joints shall include contraction, expansion and construction joints. These joints shall be skewed to the center line with a maximum spacing of twenty (20') feet and a minimum spacing of fifteen (15') feet as shown on the Contract Drawings. Transverse joints shall be aligned to coincide with the joints in the adjacent curb. Expansion joints shall be provided in the pavement at or near the building lines along intersecting streets.

All transverse joints shall include dowel bars. Dowel bars shall be longitudinally spaced as shown on the Contract Drawings and indicated in these specifications. Transverse joint dowel bars shall be positioned by using basket assemblies installed and securely set in place on the prepared subbase in a manner approved by the Engineer, before placing concrete.

Transverse joint support assemblies shall space dowel bars as required herein and as indicated on the Contract Drawings, and shall hold the dowel bars at mid-depth of the pavement slab. Assemblies shall be capable of maintaining dowel bars in proper position and alignment within the limits of tolerance required herein both before and during concrete placement.

At transverse expansion joints, the joint supports assemblies shall provide support for and maintain the joint filler in the required position both before and during concrete placement.

At construction joints, the joint support assembly shall include a bulkhead device extending from the bottom of the pavement to the surface of the pavement.

Unless otherwise indicated by the Contract Drawings or herein, dowel bars shall be spaced at twelve (12") inch plus or minus one-half (± 1/2") inch centers transversely, with the first and last bar positioned six (6") inches from the edge of pavement. The dowel bars shall be placed at mid-depth of the pavement slab plus or minus one-quarter (± 1/4") inch with their longitudinal axes aligned and parallel to the centerline horizontally and vertically. The maximum allowable vertical and horizontal displacement of any individual dowel bar shall be no more than one-eighth (1/8") inch per foot. The maximum allowable longitudinal displacement of the midpoint of any one bar relative to the center of the joint shall be one (1") inch. When basket assemblies are used, the maximum longitudinal misalignment of one end of a basket with respect to the other end in achieving the required skew alignment to the centerline shall be no more than one (1") inch.

The Contractor shall place and maintain the dowel bars in their proper position and alignment during paving operations.

a) Transverse Contraction Joints shall be constructed by sawing grooves in the concrete pavement as soon as the concrete has hardened sufficiently to permit sawing without raveling and before uncontrolled shrinkage cracking takes place.

b) Transverse Expansion Joints shall be constructed in a straight line across the pavement as shown on the Contract Drawings. A one piece premoulded bitiuminous joint filler, three-quarter (3/4") inch thick, shall be installed continuously across the pavement width. It shall be installed not less than three-quarters (3/4") inches or more than one and one-quarter (1-1/4") inches below the top of the pavement surface and shall extend to the bottom of the pavement slab. The bituminous joint filler shall be protected on top by a cap and supported at the center of the joint by an approved support assembly.

   Transverse expansion joints shall be spanned by plain round dowels placed parallel to the center line and the finished grade. The projecting ends of the dowels shall be thoroughly greased or coated with bituminous paint for the entire one-half length and the extreme end of each bar for three (3") or four (4") inches shall be encased in an approved, snugly fitting, water-proofed tube which shall have one end closed. Provision shall be made for about one (1") inch expansion in the closed end of the tube. Other devices that are approved by the Engineer for transferring loads may be used.

   Where expansion joint fillers are assembled in sections, such as full width paving operations, there shall be no offsets between adjacent units. No plugs of concrete shall be permitted anywhere within the expansion space.

   The transverse expansion joint shall be constructed with beveled edges to the dimensions shown on the Contract Drawings. They shall be sawed using the procedures specified herein.

   Expansion joints shall be made with a preformed filler or expansion joint form which, during construction, shall not extend above the finished pavement surface or in any way interfere with the proper operation of the finishing equipment. Before expansion joint material is placed, the joints shall be thoroughly cleaned out for the full depth of the pavement.

Joints shall have their planes at right angles with the pavement surface and have their edges rounded to a radius of one-half (1/2") inch. They shall extend the full depth of the pavement.

c) Transverse Construction Joints shall be constructed at paving stops and when there is an interruption of more than thirty (30) minutes in the concreting operations. No construction joint shall be constructed within ten (10') feet of an expansion joint or contraction joint, unless otherwise permitted by the Engineer.

Whenever concrete paving operations are stopped, a bulkhead shall be installed and concrete must immediately be removed from the subbase in front of the bulkhead device and from all of the exposed parts of the joint support assembly and bulkhead plate. Paving operations may not be started if there is any concrete ahead of or on any exposed parts of the joint support assembly or on the exposed side of the bulkhead plate.

The construction joint shall be sawed to the dimensions and requirements for transverse contraction joints.

d) Special Joints shall be constructed as described in these specifications, as shown on the Contract Drawings or as ordered by the Engineer. Special joints shall be used around drainage, utility and other rigid structures located within the concrete pavement boundaries. Joints shall be constructed to meet the requirements of the transverse expansion joints except no joint support assemblies are required. Temporary forms used in constructing the joints shall be held securely in place by means of form pins.

3) Sawcutting Joints. Sawcutting Joints to the required widths, depths and shapes may be performed in one or two stage operations. The Contractor shall ensure that the cutting edges in each saw assembly will produce pavement grooves, having the dimensions and to the dimensional tolerances shown on the Contract Drawings. The Contractor shall check the dimensions of each groove immediately after it has been cut and shall adjust and or replace worn cutting edges as necessary before proceeding to the next joint.

Sawing operation shall be done in succession down the pavement. Sawing alternate joints initially and returning later to saw intermediate joints will not be allowed with the exception of second stage sawing only. The first stage sawing shall be within one (1") inch of the center of the dowels or bars. The second stage shall consist of sawing the joint to its final dimension. The second stage sawing shall be performed no sooner than thirty-six (36) hours after the concrete has been placed at the joint. The edges shall be beveled by either a cutting or grinding device attached to the sawing blade or a cutting or grinding device following the sawing operation. When unsatisfactory results are being obtained, the Contractor shall, at the direction of the Engineer, modify or change his method of producing bevels. The second stage sawing operation may be delayed at the Contractor's convenience except that if this second stage sawing is done after October 15 and the joint to be sawed has opened more than one-eighth (1/8") inch, as determined by measuring cracking on the slab side, the Contractor shall saw an additional one-sixteeth (1/16") inch in width for each one-sixteeth (1/16") inch of opening exceeding the one-eighth (1/8") inch.

(M) CURING

Immediately after the finishing operations have been completed and the surface water has evaporated from the concrete, the entire surface including slipformed edges shall be sprayed uniformly with curing compound. All joints shall be protected by an approved method to prevent curing compound entering any joint. The curing compound shall not be applied during rainfall.

Self-propelled mechanical sprayers shall be used to apply the curing compound under pressure at the minimum rate of one (1) gallon per one hundred and fifty (150) square feet. The spraying equipment shall

be of the fully atomizing type equipped with a tank agitator. At the time of use, the pigment shall be uniformly dispersed throughout the vehicle. During application, the compound shall be stirred continuously by effective mechanical means. Hand spraying of odd widths or shapes and concrete surfaces exposed by the removal of forms may be permitted by the Engineer. Curing compound shall not be applied to the inside faces of joints ready for sealing.

The curing compound may be applied as one or two coats in accordance with the manufacturer's instructions. If two coats are used, the second coat shall be applied not later than thirty (30) minutes after the first. Should the film become damaged from any cause, within the required curing period, the damaged portions shall be repaired immediately with additional compound.

The Contractor shall provide on the project a sufficient quantity of approved covering for protection of the pavement in case of rain, or when there is breakdown of the spray equipment and no other mechanical sprayers are available. In the event rain damages the curing compound film before it hardens, the Contractor shall apply, after the surface water leaves the pavement, a new coat to the affected areas at the coverage rate of one hundred and fifty (150) square feet per gallon, minimum.

Upon removal of the forms, the exposed sides of the slabs shall be protected immediately to provide a curing treatment equal to that provided for the top surface. When final saw cuts at joints are made prior to the expiration of the mandatory curing period, the concrete at the joints shall be cured for the remainder of the curing period in accordance with one of the following methods:

1) A tape, at least four (4") inches wide, made from waterproof paper, polyethylene curing covers or other suitable moisture retention material and provided near each edge with adhesive material which will seal the tape to the pavement, shall be centered over the joint and pressed into place. The adhesive material shall be a type which can be readily removed from the pavement upon completion of curing.

2) A strip of waterproof paper, polyethylene curing covers or other suitable moisture retention materials at least twelve (12") inches wide, shall be centered over the joint and weighted down for its full length with soil, sand or other material to hold it in place.

3) Alternate methods approved by the Engineer. Such methods shall satisfactorily prevent the escape of moisture from the concrete joint and leave no detrimental residue adhering to the pavement or joint surface.

The strips of curing materials shall extend down the slab edge for at least two (2") inches below the bottom of the saw cut. Other means to prevent the escape or moisture at the pavement edge may be approved by the Engineer.

The joint curing materials shall be applied immediately following the sawing of the joint and removal of resulting dust or slurry. However, when the curing medium is sealed to the concrete by an adhesive material, the water on the pavement surface, resulting from sawing and removal of slurry, shall be allowed to dry sufficiently to provide proper adhesion of the material.

Where the Contractor fails to cure the concrete pavement in accordance with the requirements of this Subsection, the Contractor shall be required, at no addition cost to the City, to replace, in its entirety, any concrete pavement which did not receive, in part or in whole, the specified cure.

(N) REMOVING FORMS

Unless otherwise provided, forms shall not be removed from freshly placed concrete until it has cured for at least twelve (12) hours. Forms shall be removed carefully so as to avoid damage to the pavement. After the forms have been removed, the sides of the slab shall be cured as specified above. Major honeycombed areas along the edge of a slab, as determined by the Engineer, will be considered

defective concrete and shall be removed and replaced; minor honecombed areas shall be patched smoothly with approved material.

(O) PROTECTION OF PAVEMENT

The work shall be protected from traffic by such devices as temporary curbs, barricades, warning lights and signs; and by the use of crossing guards as required in the stipulations for the maintenance of traffic shown on the Contract Drawings, and as specified and directed by the Engineer.

Additionally the Contractor shall provide, install, and remove snow picket fencing along the curb and sidewalk adjacent to the concrete pavement for the protection of the wet concrete from pedestrian traffic. The fencing shall be installed before the concrete finishing operation is completed at each location and shall be maintained in place for a minimum of four (4) hours or as directed by the Engineer.

(P) SURFACE TEST

After the concrete has hardened sufficiently, the Engineer shall test the pavement surface using a ten (10') foot straight-edge. Areas that contain high spots of more than one-eighth (1/8") inch but not exceeding three-eighth (3/8") inch in ten (10') feet shall be marked and ground down with an approved grinding tool. The surface deviations shall not exceed one-eighth (1/8") inch in ten (10') feet. The Contractor shall restore the ground area to a texture satisfactory to the Engineer.

Where the surface deviations exceed three-eighth (3/8") inch in ten (10') feet, the pavement shall be removed as specified herein and replaced by and at the Contractor's expense or the condition shall be remedied to the satisfaction of the Assistant Commissioner, Infrastructure Construction.

(Q) DEFECTIVE OR DAMAGED CONCRETE

All defective or damaged concrete which occurs prior to the final acceptance of the work shall be repaired or replaced at the Contractor's expense. The defects shall include but not be limited to spalling and irregular cracking at joints, edge spalls, honeycombing and damage or other imperfections caused by traffic and/or construction operations. Any concrete requiring complete replacement, as determined by the Engineer, shall be replaced in kind as concrete originally called for in the Contract Drawings or herein. The type of repair shall be subject to the approval of the Engineer. When a repair is made, the defective or damaged concrete shall be removed by chipping the unsuitable material to sound concrete with pneumatic tools. The type and size of tools and the depth at which sound concrete is reached shall be approved by the Engineer. All surfaces to be repaired shall be thoroughly blast cleaned with sandblast sand and repaired in accordance with the requirements under **Section 502-3.15** of the State of New York, Department of Transportation, Standard Specifications.

(R) PREFORMED JOINT FILLER

Preformed joint filler shall be held in place during the placing and finishing of concrete by a steel plate bulkhead, shall extend to the bottom of the pavement and have the top edge set three-quarters (3/4") to one and one-quarter (1-1/4") inch below the finished pavement surface and be adequately protected. Where a temporary strip is used over the preformed joint filler, it shall be securely anchored in place.

(S) JOINT FILLER FORMS

The steel plate bulkhead shall be three-eighths (3/8") inch in thickness, of a width not less than the pavement depth, and one-half (1/2") inch less in length than the width of the pavement. It shall be shaped to the exact cross-section of the pavement, and be kept straight, free from mortar or rust, and well oiled. Slots shall be cut into it corresponding with the spacing of the dowels. The steel plate bulkhead shall support the filler and a suitable form to provide space for the poured joint sealer. The bulkhead shall be set in the required position and be firmly staked into place by iron pins twelve (12") inches in length and two (2') feet apart driven into the subgrade alongside of the filler and the bulkhead. It shall have the

top edge set to the finished pavement surface and be removed after the concrete has been placed on both sides of the bulkhead and been struck to a true surface conforming to the finished surface grade on both sides of the joint. It shall be removed by carefully lifting it slowly from one end and shall be replaced with concrete.

(T) SEALING JOINTS

All longitudinal and transverse joints, formed or sawed as required herein shall be sealed with joint sealing materials of the type and size shown on the Contract Drawings before the pavement is opened to traffic. Joints shall be sealed on all pavements before discontinuing paving operations when the work is suspended during the winter. Immediately before sealing, the joints shall be cleaned thoroughly using equipment approved by the Engineer. Any joints having concrete spalls or defective concrete shall be repaired according to the requirements under “Defective or Damaged Concrete”, above. Preformed sealers shall be installed by mechanical tools approved by the Engineer. A lubricant shall be applied to either the concrete or sealer or both during the sealing operations such that the lubricant thoroughly covers the sealer in contact with the concrete, but in no case shall the lubricant be allowed on top of the sealer.

Special joints shall be sealed according to the requirements for transverse expansion joints. The sealer material may be cut to fit around corners in these special joints.

In lieu of using preformed elastic joint sealer, a liquid sealer and a sealer applicator approved by the Engineer may be used on an approved bond breaker.

Preformed joint sealer shall be installed in the following manner:

1) Beveled Joints. The sealer shall be installed in a compressed condition at a depth of not less than one-sixteenth (1/16”) inch nor more than three-sixteenth (3/16”) inches below the bottom of the beveled edge.

2) Vertical Side Joints. The joint sealer shall be installed in a compressed condition at a depth of one-quarter (1/4”) inch plus one-sixteeth (+ 1/16”) inch below the level of the pavement surface.

Transverse joints shall be sealed across the full width of the entire pavement and down the full depth of the exposed pavement edges with one piece of sealer material. The longitudinal joint sealer shall be cut where it crosses a transverse joint. No splices will be permitted in the longitudinal joint sealer between transverse joints. All intersections between longitudinal and transverse sealer material shall be sealed with a lubricant.

The method of installation shall be such that the joint sealer material shall not be stretched more than five (5) percent nor compressed more than two (2) percent of the minimum theoretical length. The method of installation shall be checked for stretching and compression by installing sealer in five transverse joints and removing the sealer immediately after installation and checking the length. An alternate method for checking stretch and compression, where applicable, may be performed by pre-marking or pre-cutting the sealer to length prior to installation. If the measurement of any of these five sealers demonstrates that stretching in excess of five (5) percent or compression in excess of two (2) percent is occurring, the installation method shall be modified to meet the requirements or discontinued.

Once sealing operations begin, at least one (1) joint per one hundred (100) with a minimum of two (2) shall be removed by the Contractor in the presence of the Engineer to check for stretch in excess of five (5) percent and compression in excess of two (2) percent. If the sealer is found to be stretched in excess of five (5) percent or compressed in excess of two (2) percent at this joint, the sealer material shall be removed in successive joints in both directions until sealers are found that meet the stretch and compression requirements. All joints found to be sealed with material having excess stretch or compression shall be replaced at the expense of the Contractor. Any joint sealer material that is removed

and found to meet the stretch and compression requirements may be replaced in a manner approved by the Engineer.

The Contractor may choose to place a temporary filler, of such material approved by the Engineer, in the joints and delay the placing of the preformed sealer until the fall season. Thorough cleaning of the joint and joint faces must precede the installation of the permanent sealer.

(U) POURED JOINT SEALER

The space above the preformed joint sealer and in dummy joint grooves shall be sealed with a poured joint sealer as per **Section 2.22**, Type 2 – Cold Applied Sealer, on an approved bond breaker.

(V) PROTECTION

The Contractor shall be required to install snow fencing around the new pavement as directed by the Engineer, unless otherwise directed or shown on the Contract Drawings.

During unfavorable weather, or when otherwise required, pavement surfaces shall be protected with canvas supported by suitable frames to prevent it from resting on the concrete, or by other approved methods. The protective materials shall remain in place until the concrete has hardened sufficiently, in the judgment of the Engineer, to warrant their removal. Sufficient canvas or other approved materials necessary for full protection of the pavement shall be provided and be available for immediate use at all times.

The placing of concrete during wet or cold weather will not relieve the Contractor of any responsibilities under this contract.

4.05.6. TRAFFIC. No traffic of any kind will be allowed on the new concrete pavement until the concrete has been cured as specified, and until permitted by the Engineer.

4.05.7. DEFECTIVE PAVEMENTS. Such portions of the completed pavement as are defective in finish, compression, composition, or that does not comply with the requirements of these specifications, shall be taken up, removed and replaced with suitable materials, properly laid in accordance with these specifications.

4.05.8. MEASUREMENT. The quantity to be measured for payment shall be the number of cubic yards of each type of Concrete Pavement constructed, measured in place, adjusted for thickness and strength deficiencies in accordance with **Section 5.04**.

In determining the quantity of pavement to be paid for, the areas occupied by bases of columns, manhole heads, gate boxes, road boxes, and similar structures will be deducted when they measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less.

4.05.9. PRICES TO COVER. The contract prices bid per cubic yard for each type of concrete pavement shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish and lay the pavement complete in place in full compliance with the requirements of the specifications, including, but not limited to: pigment when specified, furnishing and installing steel reinforcement, dowel bars and all other steel bars required; preparation and submission of shop drawings and concrete mix design criteria; supports, forms, joint filler and joint sealer; curing; repairs to and replacement of damaged and defective pavement; saw cutting joints; damping of the subgrade; snow fencing; etc.; to furnish such samples and cores for testing and to maintain the pavement in good condition as specified in **Section 5.05**; and completing the work in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

Payment will be made under:

Item No.	Item	Pay Unit
4.05 A	NON-REINFORCED CONCRETE PAVEMENT	C.Y.
4.05 AC	REINFORCED CONCRETE PAVEMENT (BUS STOPS)	C.Y.
4.05 ACP	REINFORCED CONCRETE PAVEMENT (BUS STOPS)(PIGMENTED)	C.Y.
4.05 AX	HIGH-EARLY STRENGTH REINFORCED CONCRETE PAVEMENT (BUS STOPS)	C.Y.
4.05 AXP	HIGH-EARLY STRENGTH REINFORCED CONCRETE PAVEMENT (BUS STOPS)(PIGMENTED)	C.Y.
4.05 B	REINFORCED CONCRETE PAVEMENT (FULL WIDTH PAVEMENT)	C.Y.
4.05 BX	HIGH-EARLY STRENGTH REINFORCED CONCRETE PAVEMENT (FULL WIDTH PAVEMENT)	C.Y.

SECTION 4.06 - Concrete in Structures

4.06.1. INTENT. This section describes Concrete in Structures.

4.06.2. DESCRIPTION. Concrete in Structures under this section shall refer to all concrete in structures other than concrete curb, concrete sidewalk, concrete base for pavement, and concrete pavement. Finish, color and design shall be as specified.

4.06.3. MATERIALS.

(A) Concrete for deposit as a concrete structure shall comply with the requirements of **Section 3.05, Concrete**, and be of the class, type and method of mixing specified. Coarse aggregate shall be of the type, grade, size number and nominal size specified. Rubble aggregate shall be used when specified or shown on the Contract Drawings.

Where concrete is specified to be lightweight, the aggregate shall be in conformance with the requirements of ASTM designation C 330, Lightweight Aggregates for Structural Concrete, and the Contractor shall design the mix for a unit weight of one hundred and twenty (120) pounds per cubic foot.

(B) Concrete reinforcement shall comply with the requirements of the following sections:

Steel Bars--**Section 2.23**

Welded Steel Wire Fabric--**Section 2.25**

Kind of reinforcement, size and placement shall be as specified and as shown on Contract Drawings. Reinforcement shall be installed in accordance with the requirements of **Section 4.14**.

(C) Elastic Type Concrete Expansion Joint Sealer shall comply with the requirements of **Section 2.22**, type as specified.

(D) Preformed Expansion Joint Filler shall comply with the requirements of **Section 2.15**, type as specified.

4.06.4. DESIGN AND CONSTRUCTION OF FORMS.

(A) Forms shall accurately conform to the shape, lines and dimensions of the structure for which they are required, be substantial and sufficiently tight to prevent leakage of mortar, and have, unless otherwise specified by the Engineer, moldings or chamfer strips at angles. They shall be of adequate strength and be braced or tied together with approved ties and spacers, so as to maintain position and shape, and to insure the safety of workmen and passersby, be clean and free from sawdust, chips, dirt, ice and other objectionable materials. Forms shall present smooth, true surfaces to the concrete placed against them, having temporary openings where necessary, to facilitate cleaning and inspection immediately before concrete is deposited. Forms shall be coated with non-staining oil before the reinforcement is placed, or be wetted except in freezing weather.

(B) Except in cases of curved, special, and exposed surfaces, the lumber for concrete forms, after being planed, shall be not less than one and one-sixteenth (1-1/16") inches in actual thickness, shall be dressed on both surfaces, shall be tongued and grooved and shall be constructed so as to produce mortar tight joints. Plywood or other approved material shall be used on all exposed concrete surfaces, and lumber used in conjunction with it may be less than one and one-sixteenth (1-1/16") inches, if approved by the Engineer.

(C) The metal used for forms shall be of such thickness that the forms shall remain true to shape. All bolt and rivet heads shall be countersunk. Clamps, pins, or other connecting devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Metal forms which do not present a smooth surface or line up properly shall not be used. Special care shall be exercised to keep metal forms free from rust, grease, or foreign matter, such as will tend to discolor the concrete.

(D) If required, the Contractor shall submit details of the forms he proposes to use to the Engineer for approval before he starts their construction.

(E) Any metal ties or anchorages which are required within the forms to hold them to correct alignment and location shall be so constructed that the metal work can be removed to a depth of at least one (1") inch from the face surface of the concrete without injury to such surface by spalling or otherwise. Wire ties shall not be used unless permitted by the Engineer. All cavities produced by the removal of metal ties shall be filled carefully with a mortar of fine aggregate and cement in the proportion that has been employed for the particular class of concrete treated and the surface left smooth and even and uniform in color.

4.06.5. EXPANSION JOINTS. Expansion and construction joints shall be provided of the shape, in the manner, and at the intervals required.

4.06.6. CONVEYING.

(A) LOSS OF INGREDIENTS

Concrete shall be conveyed rapidly from the job-mixer or transporting vehicles to the place of final deposit by approved methods which will prevent loss of ingredients.

(B) CONVEYORS

Concrete shall be conveyed by chutes, pipes, buckets, tremies, buggies, wheelbarrows, or other approved conveyors.

(C) CLEANING

When required, all conveyors shall be thoroughly cleaned and flushed with water which shall not fall on concrete in place.

(D) CHUTES

Chutes shall be of metal or metal-lined. They shall have a slope not flatter than one vertical to two horizontal and shall deliver concrete in a practically continuous flow. Concrete shall be discharged into hoppers when the depositing is intermittent.

(E) LONG CHUTES

The use of long chutes is prohibited (a) generally, unless permitted under circumstances and in accordance with conditions prescribed by the Engineer, and (b) specifically, when the concrete is incorporated in structures which will be subject to salt water action.

(F) PIPES

When concrete is conveyed through pipes, the pipes shall be kept full of concrete and have discharge ends kept buried in the fresh concrete, unless otherwise permitted.

(G) BOTTOM DUMP BUCKETS

When concrete is placed by means of a bottom dump bucket, the buckets shall have a capacity of not less than one-half (1/2) cubic yard. In depositing concrete from such a bucket, the bucket shall be lowered gradually and carefully until it rests upon the concrete already placed. It shall then be raised very slowly during the discharge travel.

(H) BUGGIES OR WHEELBARROWS

Buggies or wheelbarrows shall travel on runways which have smooth surfaces.

4.06.7. DEPOSITING.

(A) DEPOSITING ON SURFACES

Concrete shall be deposited on surfaces free from standing water, dirt, shavings, sawdust, ice or other undesirable matter. Where necessary to deposit on set concrete, the set concrete shall be roughened, cleaned, washed and freshly coated with neat cement grout. Concrete shall be deposited at points and by methods which will minimize rehandling, prevent flowing, and obviate the necessity of working along forms. In sections confined by temporary vertical bulkheads, the concrete shall be deposited in a continuous operation until the section is completed. No drop shall exceed five (5') feet. It shall be deposited by methods which will release entrapped air and produce a dense, compact mass. Concrete shall not be deposited on ground which is in a muddy or frozen condition.

(B) DEPOSITING UNDER WATER

For concrete to be deposited under water, the cement content shall be increased by ten (10) percent over that indicated for the class and type of concrete specified.

Concrete shall not be deposited in water if it is practicable to deposit in air. No concrete shall be deposited in water having a temperature below thirty-five (35°) degrees Fahrenheit, unless permitted by the Engineer.

Concrete for deposit under water shall be conveyed by means of tremies, drop-bottom buckets or other approved methods.

When deposited by tremie method, the tremie shall be water-tight and sufficiently large to permit free flow of concrete. The discharge end shall be kept continuously submerged in the concrete and the shaft kept full of concrete.

When the bottom dump bucket method is used, the bucket shall be not dumped until after it has come to rest on the surface upon which the concrete is to be deposited. The bucket shall be provided with a suitable cover, and the bottom doors when tripped shall open freely. The bucket shall be filled completely and lowered slowly to avoid backwash, and, when tripped, it shall be withdrawn slowly until entirely free of the concrete.

(C) DEPOSITING IN FORMS

Unless specifically authorized to place concrete under water, there shall be no water in the forms at any time any concrete is deposited therein, and the work of depositing shall be kept well above the level of any rising water so that there will be no danger of entrance of water into the forms until the concrete is in place.

Concrete shall be deposited in continuous horizontal layers, each of which shall be placed before the one below has set and from which laitance and excess water shall be removed in such a manner that successive layers will be thoroughly bonded together to eliminate planes of separation between layers and prevent seepage of water.

Special care shall be taken to fill each part of the forms by depositing concrete directly as near final position as possible, to work the coarser aggregates back from the face and to force the concrete under and around the reinforcement bars without displacing them. After the concrete has taken its initial set, care shall be exercised to avoid jarring the forms or placing any strain on the ends of projecting reinforcement.

(D) COMPACTING CONCRETE

Unless otherwise permitted by the Engineer, all concrete, during and immediately after depositing, shall be compacted thoroughly by means of internal vibrators, supplemented by spades, slicing rods, forks or treading. The concrete shall be worked thoroughly around the reinforcement and around embedded fixtures and in the corners of the forms. The operation of compacting the concrete shall be conducted so as to form a compact, dense, impervious, artificial stone which shall show a smooth face on exposed surfaces. Porous, plastered or defective concrete, shall be removed and replaced as directed by the Engineer, entirely at the Contractor's expense.

Vibrators shall be of sturdy construction, adequately powered and capable of transmitting to the concrete not less than 3,000 nor more than 5,000 vibrations per minute when operating under load. The vibration shall be sufficiently intense to cause the concrete to flow or settle rapidly into place and visibly affect the concrete over a radius of at least eighteen (18") inches when used in a concrete having a one (1") inch slump.

Either electric or mechanical internal vibrators approved by the Engineer may be used.

When vibrators are used, at least one vibrator for every ten (10) cubic yards of concrete placed per hour shall be in use at all times. In addition to these, at least one extra vibrator shall be at hand for emergency use.

The vibration shall be of sufficient duration to accomplish thorough compaction, but shall not be prolonged to a point where segregation occurs. Internal vibrators shall be applied close enough to the forms to vibrate the surface concrete effectively, but care shall be taken to avoid hitting the forms sufficiently to damage them. In the use of the vibrators care shall be taken not to cause vibration of concrete in which initial set has taken place.

4.06.8. CONCRETING DURING RAINFALL. During periods when rainfall, concrete may be placed only if permitted by the Engineer, and under conditions where the required water-cement ratio can be maintained.

The placing of concrete during wet weather will not relieve the Contractor of any responsibilities under this contract.

4.06.9. CARE OF CONCRETE DURING COLD WEATHER. During air temperatures are below 38° F. in the shade, concrete in structures shall, where required, be maintained in an atmosphere of not less than 50° F., for at least five (5) days after placing or until the concrete has thoroughly hardened, and sufficient protective coverings, fuel and heating equipment shall be furnished, installed, operated and maintained to secure the required temperature conditions without injury to the concrete.

4.06.10. SURFACE CURING AND PROTECTION. All surfaces of concrete shall be protected from injury and horizontal surfaces shall be cured in compliance with the requirements of **Section 2.14, Curing Materials**, Type 1-D, Clear.

From the moneys due the Contractor, under this item, the sum of one (1) dollar will be deducted for each square foot of horizontal surface which the Contractor does not cure, as herein required.

4.06.11. REMOVAL OF FORMS. Forms shall not be removed until the concrete has hardened sufficiently, and the removal shall be carried out in such a manner as to insure the complete safety of the structure. In no event however shall forms be removed in less than three (3) days after completion of pouring, which time may be extended at the discretion of the Engineer. The Contractor shall be responsible for all damage or injury resulting from the removal of forms.

4.06.12. RUBBLE AGGREGATE. Rubble aggregate shall be of approved dimensions and quality. The total volume of the stone shall not be greater than one-third (1/3) of the total volume of the portion of the work in which it is placed. Each stone shall be surrounded by at least twelve (12”) inches of concrete. No stone shall be closer than twenty-four (24”) inches from the front face, the bottom or the top of the structure. The stones shall be cleaned and wetted before being placed and be joggled to settle well into the concrete. Stones shall not be set on concrete which has acquired its initial set.

4.06.13. SURFACE FINISH.

(A) SAMPLE SLABS

The Contractor shall, where required, submit for approval sample concrete slabs of desired sizes, exhibiting the surface finishes required that he proposes to furnish. Exposed surfaces of structures shall be finished, as required, to present appearances equal to those of samples on file in the office of the Engineer.

(B) VOIDS

The work of finishing shall not be started until all voids are filled with mortar of the same ingredients and proportions as used in the concrete.

(C) FLOAT, RUBBED AND SCRUBBED FINISHES

Forms shall be removed as early as possible to expose concrete while it is green (set but not hardened).

Float finish surfaces shall be finished smooth and true by means of wooden or steel floats and have edges, including those of joints, rounded or chamfered.

Rubbed finished surfaces shall be thoroughly wetted, be finished smooth and true by means of carborundum or other abrasive blocks, and have lather working up on the surface removed by brushing and washing. Only water shall be used in finishing. Scrubbed finished surfaces shall have the coarse aggregate uniformly exposed by scrubbing with wire brushes and water. Muriatic acid shall, where required, be added to the water in proportion of one to five (1:5), and be entirely removed with clean water when the desired finish is obtained.

(D) POINTED AND BUSH-HAMMERED FINISHES

Thoroughly cured concrete surfaces shall be dressed with tools to a uniform texture of an even face. The tools ordinarily used are electric, air, or hand tools, giving various textured surfaces such as hand-tooled, rough or fine pointed, crandalled or bush-hammered as specified.

4.06.14. MEASUREMENT. In determining the volume of concrete to be paid for, deductions will be made for the spaces occupied by pile heads, timbers and drains. Deductions will not be made for the spaces occupied by steel reinforcement, structural steel or water-proofing. Other deductions will or will not be made, as specified.

The measured volume of concrete will be adjusted for payment in accordance with the strength requirements under **Section 5.04**.

4.06.15. PRICES TO COVER. The contract price per cubic yard for Concrete in Structures, measured in place, except such concrete as otherwise paid for, shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish and construct the concrete structure complete in full compliance with the requirements of the specifications, exclusive of steel reinforcement, and to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required.

The contract price per cubic yard for concrete placed under water shall include the cost of the additional ten (10) percent of cement used for such concrete.

Payment will be made under:

Item No.	Item	Pay Unit
4.06	CONCRETE IN STRUCTURES, Class A-40	C.Y.
4.06 LA	LIGHTWEIGHT CONCRETE IN STRUCTURES, Class A-40	C.Y.

SECTION 4.07 - Curb, Bluestone and Granite

4.07.1. INTENT. This section describes construction of Bluestone and Granite Curb.

4.07.2. DESCRIPTION. Curb shall be bluestone or granite, as specified, and with concrete cradle, unless otherwise specified or shown on the Contract Drawings. Curb shall be new or recut and redressed, as specified.

4.07.3. MATERIALS.

(A) CURB

Curb shall comply with the requirements of **Section 2.12, Curbs and Headers, Granite and Bluestone**, for the type and corresponding class specified or shown on the Contract Drawings. Unless otherwise specified or shown on the Contract Drawings, Granite Curb shall be Type 1, Class A, cut and dressed as shown on the approved shop drawings to be submitted by the Contractor. The required shop drawings shall show his proposed straight and corner curb, including depressed and transitional curb details for use at pedestrian ramps and driveway locations, and all special non-standard shaped curb cuts, for the approval of the Engineer. Corner curb, measured from PC to PT, shall include the cost of all depressed and transitional curb required for pedestrian ramps at corner quadrants. Straight curb at mid-block crosswalks shall include the cost of all depressed and transitional curb required for pedestrian ramps.

Unless otherwise specified, granite curbs shall be medium gray in color equal to “Deer Isle” or “Oconee” as supplied by New England Stone Industries Inc., 15 Branch Pike, Esmond, Rhode Island 02917; Fletcher Granite Co., Chelmsford, Mass., Telephone No. (800) 253-8168; North Carolina Granite Co., Mt. Eire, North Carolina, Telephone No. (800) 227-6242; or, an approved equivalent.

(B) CONCRETE CRADLE

Concrete cradle for curb shall comply only with proportion and strength requirements of **Section 3.05**, Class B-32, Type IA. The requirements for air entrainment shall not apply.

Coarse aggregate shall comply with the requirements of **Section 2.02**, Size No. 57; Type 1, Grade B, or Type 2.

Fine aggregate shall comply with the requirements of **Section 2.21**, Type 1A.

4.07.4. METHODS (GENERAL). The Contractor shall complete all curb construction before commencing any roadway grading operation; stripping, removing or placing any pavement; or commencing sidewalk work unless otherwise permitted by the Engineer, in writing. The Contractor will be permitted to encroach upon the area immediately adjacent to the curb only to the extent essential for curb construction.

Excavation for curb shall be safeguarded and protected in accordance with the requirements of **Sections 1.06.44** and **6.70, “Maintenance and Protection of Traffic**”.

Existing concrete sidewalks, adjacent to or abutting new curb or curbs to be reset and interfering with the setting or resetting of said curbs shall be cut off to a line two (2’) feet back of the curb line and parallel thereto, unless otherwise provided or directed by the Engineer. Cutting shall be done by means of an approved power driven cutting machine with a carborundum cutting wheel. Full depth cuts shall be made through the existing sidewalk pavement. The space between the curb and sidewalk shall be filled with concrete sidewalk pigmented to match that of the adjacent walk.

No concrete sidewalk shall be cut off or otherwise disturbed until the same has been examined by the Engineer.

4.07.5. NEW CURB WITH CONCRETE CRADLE.

(A) EXCAVATION

Excavation shall be made to dimensions sufficient to permit the construction of cradle and setting of curbstones. It shall be made to a depth of six (6”) inches below the specified depth of curb and to a width of not less than eighteen (18”) inches or width of curb plus twelve (12”) inches, whichever is greater. The

trench shall be open to its full width and depth for a distance of not less than twenty (20') feet in advance of the setting of the curb.

(B) UNDERLYING MATERIAL

The material underlying the curb cradle shall be satisfactorily and thoroughly compacted. If unsatisfactory, it shall be removed and replaced with acceptable material, thoroughly compacted.

(C) CONCRETE CRADLE

The cradle shall be composed of stiff concrete, thoroughly tamped in place. The cradle shall be not less than eighteen (18") inches wide or width of curb plus twelve (12") inches, whichever is greater, and extend six (6") inches below the specified depth of curb. The concrete shall be brought up six (6") inches in front of the curb to the bottom of pavement base and in back of the curb concrete shall be brought up to either: the bottom of proposed sidewalk foundation material; to within six (6") inches of the top of the curb where sidewalk adjacent to curb is not required; or, as otherwise shown on the Contract Drawings. The concrete shall be laid not more than twenty (20') feet in advance of setting the curb. The portions of the concrete cradle in front and at back of curb shall be placed and thoroughly compacted as soon as the curb is brought to line and grade and before the concrete under the curb has set.

(D) SETTING

Curbstones shall be set centrally on the concrete cradle, with tops at grade outside of driveways, and below grade in driveways, as directed. Front faces shall be set in a true smooth surface having a batter of one (1) in eight (8), unless otherwise specified, with joints not less than one-eighth (1/8") inch and not more than one-quarter (1/4") inch for ten (10") inches below grade.

(E) BACKFILLING

Backfilling shall be of clean earth or other approved material, satisfactorily compacted.

4.07.6. NEW CURB WITHOUT CRADLE. Excavation for new curb without concrete cradle shall be made to dimensions sufficient to permit the setting of curbstones. Setting of curb and backfilling shall be as provided in **Subsection 4.07.5**.

4.07.7. OLD CURB, RECUT AND REDRESSED. Old curbstones which have been removed for re-use shall be reset as nearly as may be practicable in front of the premises from which they have been removed.

Old curbstones shall be recut and redressed and shall, when reset, in all respects conform with the specifications for new curb of the type and corresponding class specified for the contract, except that the top width shall not vary more than one-half (1/2") inch from the original specified width and the depth shall not vary more than two (2") inches from the original specified depth. Concrete cradle, when required, shall comply with **Subsection 4.07.5**.

4.07.8. RECURBING. On contracts where resetting of curb is required and there is no scheduled item for wearing course and/or concrete base for pavement, in excavating for curb trench, the removal of a width of not more than one (1') feet of roadway pavement along the curb will be permitted. At the completion of curb setting, the roadway strip shall be backfilled to the subgrade of the pavement base, the backfill thoroughly compacted to the satisfaction of the Engineer and the pavement restored in accordance with applicable sections of these Standard Highway Specifications.

4.07.9. MEASUREMENT. The quantity to be measured for payment shall be the number of linear feet of the several classes of curb constructed, complete, as required, measured in place along the top of the exposed face of curb, and adjusted in accordance with **Section 5.04**.

Curved granite curb will be measured as straight curb when the radius is greater than 100 feet and as corner curb when the radius is 100 feet or less. Corner curb will be measured only from PC to PT. Depressed and transitional granite curb will be measured for payment in driveways only.

4.07.10. PRICES TO COVER.

(A) NEW CURB

The contract price per linear foot of new curb with concrete cradle shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to construct the curb complete in place, including excavation (other than rock excavation) and backfilling, in full compliance with the requirements of the specifications, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required, and to maintain the curb in good condition as required in **Section 5.05**.

(B) OLD CURB, RECUT, REDRESSED AND/OR RESET

The contract price per linear foot of old curb, recut, redressed and/or reset, with concrete cradle shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to construct the curb complete in place, including excavation (other than rock excavation) and backfilling, in full compliance with the requirements of the specifications, and to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required, and to maintain the curb in good condition as required in **Section 5.05**.

(C) RECURBING

The contract price, in addition to the coverage listed under (A) and (B), above, shall also include the removal of not more than one (1') feet width of roadway pavement along the curb line and the restoration of all removed pavement in full compliance with the applicable sections of these Standard Highway Specifications. Restoration of pavement, removed beyond the above defined limits, shall be done by the Contractor at no additional cost to the City.

Payment will be made under:

Item No.	Item	Pay Unit
4.07 AB	RESET BLUESTONE CURB	L.F.
4.07 BA	RESET GRANITE CURB	L.F.
4.07 CB	NEW GRANITE CURB, STRAIGHT	L.F.
4.07 CC	NEW GRANITE CURB, CORNER	L.F.
4.07 CD	NEW STRAIGHT GRANITE CURB, DEPRESSED AND TRANSITION	L.F.
4.07 NYHA	NEW NY HISTORICAL GRANITE CURB, STRAIGHT	L.F.
4.07 NYHC	NEW NY HISTORICAL GRANITE CURB, CORNER	L.F.
4.07 NYHD	NEW NY HISTORICAL STRAIGHT GRANITE CURB, DEPRESSED AND TRANSITION	L.F.

SECTION 4.08 - Curb, Concrete

4.08.1. **INTENT**. This section describes construction of Concrete Curb and Integral Concrete Curb and Gutter.

4.08.2. **DESCRIPTION**. Concrete Curb shall be made of concrete six (6") inches wide on top, eight (8") inches wide on the bottom, eighteen (18") inches deep or as otherwise specified, measured on the back.

Integral Concrete Curb and Gutter shall be made of concrete and be constructed to the dimensions shown on the Contract Drawings.

4.08.3. **MATERIALS**. Concrete for curb shall comply with the requirements of **Section 3.05**, Class B-32, Type IIA. Cement shall be Type II Portland. Coarse aggregate shall be broken stone or gravel and comply with the requirements of **Section 2.02**, Type 1, Grade B, or Type 2, Size No. 57. An approved air-entraining agent shall be added at the time concrete ingredients are mixed with water.

Where proposed adjacent sidewalk is designated to be pigmented, curb shall also be pigmented to match in color. Pigmenting material shall comply with the requirements of **Section 2.19**. No additional payment will be made for the cost of pigmenting the concrete curb.

4.08.4. **METHODS.**

(A) GENERAL

The Contractor shall complete all curb construction before commencing any roadway grading operation; stripping, removing or placing any pavement; or commencing sidewalk work unless otherwise permitted by the Engineer, in writing. The Contractor will be permitted to encroach upon the area immediately adjacent to the curb only to the extent essential for curb construction.

All other provisions of **Subsection 4.07.4**. shall apply to the work to be done hereunder.

Excavation for curb shall be safeguarded and protected as provided in **Sections 1.06.44** and **6.70, "Maintenance and Protection of Traffic."**

(B) EXCAVATION

Excavation shall be made to dimensions sufficient to permit the setting of forms. Where recurbing is required and there is no scheduled item for wearing course and/or concrete base, in excavating for curb trench, the removal of a width of not more than one (1') feet of roadway pavement along the curb will be permitted. At the completion of curb setting, the roadway strip shall be backfilled to the subgrade of the pavement base, the backfill thoroughly compacted to the satisfaction of the Engineer and the pavement restored in accordance with the applicable sections of these Standard Highway Specifications.

(C) UNDERLYING MATERIAL

The material underlying concrete curbs shall be satisfactory and thoroughly compacted. If unsatisfactory, the unsuitable material shall be removed and replaced with acceptable material and be thoroughly compacted.

(D) FORMS

Forms shall be either of metal of sufficient thickness, but not less than one-eighth (1/8") inch, to satisfactorily resist distortion when fastened together and secured in place, or be of acceptable planed and matched lumber of sufficient thickness to resist distortion, rigidly held in position and of such construction that a smooth surface will be provided. Forms shall have suitable metal dividing plates

approximately three-sixteenths (3/16”) inch thick; be of a depth including dividing plates not less than that of the curb, be properly located with tops at grade and be left in place until the concrete has hardened.

On curves, forms shall be of such construction as to provide true arcs with radial joints.

(E) WORKMANSHIP

Concrete curb shall be built in independent sections ten (10’) feet long, except as otherwise specified, and shall have smooth plane ends separated by one-quarter (1/4”) inch joints. Concrete shall be placed and compacted in accordance with the requirements of **Subsections 4.06.7.(C)** and **4.06.7.(D)**. In depositing, the concrete shall be tamped and the aggregate shall be carefully spaded away from the front forms. Curb shall be set across driveways with the top below grade, as required, and the ends of the sections adjacent to the depressed curb shall be rounded or splayed as required, in accordance with the New York City Department of Transportation’s Standard Details of Construction Standard Drawings.

(F) SHAPE

The top shall pitch one-quarter (1/4”) inch downward toward the front. The back shall be perpendicular to the base. The top front edge of plain concrete curb shall be rounded to a one (1”) inch radius.

(G) SURFACE FINISH

The top shall be finished by trowelling and finally by using wooden floats. Upon the removal of the forms, the exposed faces shall be rubbed to a smooth and uniform surface. The color of the finished curb shall be uniform.

(H) BACKFILLING

Backfilling shall follow the removal of the forms as soon as practicable and shall be of clean earth or other approved material satisfactorily compacted.

(I) SURFACE CURING AND PROTECTION

Concrete curb shall be carefully protected against injury from rain, frost, the drying effects of the sun and wind, traffic or other causes, by means of suitable guards and covering. The concrete shall be cured in compliance with the requirements of **Section 2.14**, Type 1-D, Clear.

From the moneys due the Contractor there will be deducted the sum of one (1) dollar for each linear foot of curb which he fails to cure as specified.

(J) SIDEWALKS TO BE CUT OFF

Existing concrete sidewalks, adjacent to or abutting new curbs and interfering with the setting of said curbs shall be cut off to a line two (2’) feet back of the curb concrete and parallel thereto, unless otherwise provided or directed by the Engineer. Cutting shall be done by means of an approved power driven cutting machine with a carborundum cutting wheel. Cuts shall be a minimum depth of one and one-half (1-1/2”) inches. The space between the curb and sidewalk shall be filled with concrete sidewalk colored to correspond to the adjacent walk.

No concrete sidewalk shall be cut off or otherwise disturbed until the same has been examined by the Engineer.

(K) CURB JOINTS

In constructing concrete curb in areas where existing concrete sidewalk abuts the curb or new concrete sidewalk will be laid immediately behind the curb, curb joints shall be made to coincide with sidewalk

expansion joints. Also, all joints between sections of curb shall be filled with preformed expansion joint material in accordance with the requirements specified for filling sidewalk expansion joints.

(L) INTEGRAL CONCRETE CURB AND GUTTER

Integral concrete curb and gutter shall be formed to the size and shape shown on the Contract Drawings. Expansion joints one-quarter (1/4") inch or one-half (1/2") inch in width shall be filled with an approved preformed joint filler, at intervals specified by the Engineer. Filler shall completely fill the joint and shall be cut flush with all curb and gutter surfaces.

All materials and construction methods used are to conform to the requirements of **Subsections 4.08.3.** and **4.08.4.(A)** through **(K)**, above, unless otherwise specified herein.

The Contractor may use either conventional or machine formed integral curb and gutter.

Where the Contractor proposes to machine form integral curb and gutter, he shall also comply with the following additional requirements:

1) The Contractor's concrete mix design formula, to be submitted to the Engineer for approval, shall include the design air content and design slump.

2) Machine forming of curb and gutter shall be done to the proper line and grade. The Engineer may require the Contractor to demonstrate that the specific equipment he proposes to use is capable of satisfactorily placing the concrete mix.

   Any curb and gutter placed outside of tolerance of 1/2 inch of the established line or 1/4 inch of the established grade shall be removed and replaced at the Contractor's expense.

   Maximum placement slump shall be 2-1/2 inches. Air content shall be ±2% of design.

3) Contraction joints shall be formed or sawcut to depths slightly below the surface of the adjacent pavement every 20 feet or as ordered by the Engineer. The sawcut or formed joints shall be left unfilled.

4.08.5. MEASUREMENT. The quantity to be measured for payment shall be the length of concrete curb or integral concrete curb and gutter, constructed, complete, in place, as required, measured along the top of the exposed face of curb, and adjusted in accordance with **Section 5.04**.

4.08.6. PRICES TO COVER. When the proposed adjacent sidewalk is designated to be pigmented, no additional payment will be made for the cost of pigmenting the concrete curb to match the proposed adjacent pigmented sidewalk in color.

(A) CONCRETE CURB

The contract price per linear foot of Concrete Curb, of the depth specified, or Integral Concrete Curb and Gutter shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to construct the curb complete in place, including, but not limited to, excavation (other than rock excavation) and backfilling, in full compliance with the requirements of the specifications, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities, as may be required, and the cost of maintaining the curb in good condition as specified in **Section 5.05**.

(B) RECURBING, UNSCHEDULED ITEMS

The contract price, in addition to the coverage listed under (A), above, shall also include the removal of not more than one (1') feet width of roadway pavement along the curb line and the restoration of all removed pavement in full compliance with the applicable sections of these Standard Highway

Specifications. The restoration of pavement, removed beyond the above defined limits, shall be done by the Contractor at no additional cost to The City.

Payment will be made under:

Item No.	Item	Pay Unit
4.08 AA	CONCRETE CURB (18" DEEP)	L.F.
4.08 AC	CONCRETE CURB (19" DEEP)	L.F.
4.08 AD	CONCRETE CURB (20" DEEP)	L.F.
4.08 BA	CONCRETE CURB (21" DEEP)	L.F.
4.08 AE	CONCRETE CURB (22" DEEP)	L.F.
4.08 AF	CONCRETE CURB (23" DEEP)	L.F.
4.08 AG	CONCRETE CURB (24" DEEP)	L.F.
4.08 AH	CONCRETE CURB (25" DEEP)	L.F.
4.08 AI	CONCRETE CURB (26" DEEP)	L.F.
4.08 AJ	CONCRETE CURB (27" DEEP)	L.F.
4.08 CG	INTEGRAL CONCRETE CURB AND GUTTER	L.F.

SECTION 4.09 - Curb, Concrete, Steel Faced

4.09.1. INTENT. This section describes construction of Steel Faced Concrete Curb.

4.09.2. DESCRIPTION. Steel Faced Concrete Curb shall consist of the steel curb facing set in a concrete cradle extending to a minimum depth of nine (9") inches below the bottom of angles or a minimum of seven (7") inches below the bottom of bent plates, to provide the depth of curb specified. The cradle shall be flush with the face of the steel. The steel shall be backed with concrete for a width of eight (8") inches from the face of the steel facing or as shown on the Contract Drawings.

4.09.3. MATERIALS. Steel curb facing shall comply with the requirements of **Section 2.13** and shall be Type D, bent plate as per the New York City Department of Transportation's Standard Details of Construction Standard Drawing Nos. H-1010, H-1011, and H-1015, as required. Concrete shall comply with the requirements of **Section 3.05**, Class B-32, Type IIA. Cement shall be Type II Portland. Coarse aggregate shall comply with the requirements of **Section 2.02**, Type 1, Grade B, or Type 2, Size No. 57. An approved air-entraining agent shall be added at the time concrete ingredients are mixed with water.

Where proposed adjacent sidewalk is designated to be pigmented, curb shall also be pigmented to match in color. Pigmenting material shall comply with the requirements of **Section 2.19**. No additional payment will be made for the cost of pigmenting the steel faced concrete curb.

4.09.4. METHODS.

(A) GENERAL

The Contractor shall complete all curb construction before commencing any roadway grading operations; stripping, removing or placing any pavement; or commencing sidewalk work unless otherwise permitted by the Engineer, in writing. The Contractor will be permitted to encroach upon the area immediately adjacent to the curb only to the extent essential for curb construction.

Excavation for curb shall be safeguarded and protected as provided in **Sections 1.06.44** and **6.70**.

All other provisions of **Subsection 4.07.4** shall apply to the work to be done hereunder.

(B) EXCAVATION

Excavation shall be made to dimensions sufficient to permit the setting of forms and as required for the installation of curb. It shall be made to a depth of not less than nine (9") inches below the bottom of single- or double-bulb angle facings nor less than seven (7") inches below the bottom of bent-plate steel facings, and to a width of not less than the specified width of the curb. The trench shall be open to its full width and depth for a distance of not less than twenty (20') feet in advance of the setting of the curb facing.

Where curb is to be set in areas which were formerly occupied by vaults, cellars of buildings or other voids, the Contractor shall power tamp the subgrade material with machines approved by the Engineer. This power tamping shall be continued until such time as the subgrade has been sufficiently compacted to the satisfaction of the Engineer.

On contracts for recurbing only, in excavating for curb trench, the removal of a width of not more than one (1') feet of roadway pavement along the curb will be permitted. At the completion of curb setting, the roadway strip shall be backfilled to the subgrade of the pavement base, the backfill thoroughly compacted to the satisfaction of the Engineer and the pavement restored in accordance with the applicable sections of these Standard Highway Specifications.

(C) UNDERLYING MATERIAL

The material underlying the concrete cradle shall be satisfactory and thoroughly compacted. If unsatisfactory, the unsuitable material shall be removed and replaced with acceptable material and be thoroughly compacted.

(D) FORMS

Forms shall be of metal or planed lumber of sufficient thickness to resist distortion, support the front face of the steel curb facing and be rigidly held in position during construction. Back forms shall be set parallel to the steel facing.

(E) PLACING CURB, STEEL FACING

Steel facing shall be placed within the forms, upon suitable chairs, to the proper line and grade. When welding of joints is specified or directed, ends of steel facing shall be butted together. When no welding is required, ends shall be set one-eighth (1/8") inch apart except at expansion joints. At depressed curbs, facings shall be splayed as shown on the Contract Drawings.

Steel curb facing, having less than two (2) welded anchors, shall be welded to adjacent steel curb facing, except that when the end of the above facing falls at an expansion joint, said end shall not be welded.

Two (2) dowels, one-half (1/2") inch in diameter and twenty-four (24") inches long, shall be installed longitudinal to and into the concrete backing at all unwelded intermediate joints between expansion joints in such manner that one-half (1/2) the length of the dowel falls on either side of the joint. Intermediate joints may be welded in lieu of installing the aforesaid dowels.

On curves whose radii are less than four hundred (400') feet, curb shall be constructed to true arcs with radial joints. On curves whose radii are four hundred (400') feet or in excess thereof, curbs may be constructed by using individual straight pieces of facing which shall be not less than ten (10') feet nor greater than one-half of the square root of the radius of curvature in length. Joints shall be radial.

(F) EXPANSION JOINTS

Expansion Joints in steel curb facing and curb backing shall be coincident. The distance between expansion joints shall not exceed twenty-four (24') feet, except as noted hereinbelow for abutting concrete sidewalk.

Steel faced concrete curb expansion joints shall line up with the expansion joints in existing abutting concrete sidewalk or with the proposed location of expansion joints in new abutting concrete sidewalk.

Expansion joints shall be one-quarter (1/4") inch wide and shall be filled with an approved premoulded filler. Filler shall completely fill the joint and shall be cut flush with all curb surfaces.

(G) POURING CONCRETE

The concrete shall be poured and compacted into the forms behind the steel facing in order to retain the facing in proper position in accordance with the requirements of **Subsection 4.06.7.(C)** and **4.06.7.(D)**. It shall be worked around the anchors of the steel facing to insure satisfactory bond. It shall be placed in sections equal in length to the length of the steel facing, unless otherwise permitted, and the ends shall be provided with expansion joints as specified, directed or shown on the Contract Drawings.

(H) SURFACE FINISH

The top surface of the concrete shall be finished by trowelling, wood floating and, finally, by tooling all joints with approved tools. The top shall pitch one-quarter (1/4") inch downward toward the front. The color of the exposed portion of the concrete shall be uniform.

(I) BACKFILLING

Backfilling shall follow the removal of forms as soon as practicable and shall be of clean earth or other approved material, satisfactorily compacted.

(J) SURFACE CURING AND PROTECTION

The concrete shall be cured in compliance with the requirements of **Section 2.14**, Type 1-D, Clear. The sum of one (1) dollar will be deducted from any moneys due under the contract for each linear foot of curb which the Contractor fails to cure in accordance with this provision.

Concrete shall be carefully protected against injury from rain, frost, the drying effects of the sun and wind, traffic or other causes by means of suitable guards and covering, and shall be kept moist as required.

(K) PAINTING

All steel facing shall be given one (1) shop coat of Primer. All steel facing which will be exposed to view after installation shall be given one (1) shop coat of Intermediate Coat and one (1) shop coat (rolled field coat permitted) of Topcoat. The color of the top coat shall be gray, as approved by the Engineer. All paints shall be applied in compliance with the paint manufacture's data sheets. All components of paint shall be compatible and supplied by a single manufacturer. Prior to field painting, the surfaces to be painted shall be clean, dry, and lightly sand papered. The list of acceptable manufacturers of the paint system is shown in **Subsection 2.13.4**.

(L) SIDEWALKS TO BE CUT OFF

Concrete sidewalks interfering with curb setting shall, when directed, be cut off to a line two (2') feet back of the curb concrete and parallel thereto. Cutting shall be done by means of an approved power driven cutting machine with carborundum cutting wheel. Cuts shall be a minimum depth of one and one-half

(1-1/2”) inches. The space between the curb and sidewalk shall be filled with concrete sidewalk colored to correspond with the adjacent walk.

No concrete sidewalk shall be cut off or otherwise disturbed until the same has been examined by the Engineer.

4.09.5. MEASUREMENT. The quantity to be measured for payment shall be the number of linear feet of each type steel faced concrete curb constructed, complete, in place, as required, measured along the top of the exposed face of steel, and adjusted in accordance with **Section 5.04**.

Curb constructed in accordance with the New York City Department of Transportation’s Standard Details of Construction Standard Drawing H-1011, will be measured for payment under the appropriate Corner or Straight Steel Faced Concrete Curb item.

Curb constructed in accordance with New York City Department of Transportation’s Standard Details of Construction Standard Drawing No. H-1015, will be measured for payment under the appropriate Straight or Depressed Steel Faced Curb item.

Curved steel faced concrete curb will be measured as straight curb when the radius is greater than 100 feet and as corner curb when the radius is 100 feet or less. Corner steel faced curb will be measured only from PC to PT. All additional tangent lengths of steel faced curb attached to the corner steel faced curb will be measured for payment as straight steel faced curb, except when there is no scheduled item for straight steel faced concrete curb. Where there is no scheduled item for straight steel faced concrete curb, then the additional tangent lengths of straight steel faced concrete curb required to clear pedestrian ramps and other street hardware shall be paid for as Corner Steel Faced Concrete Curb.

Transitional steel faced concrete curb at driveways shall be measured for payment as Depressed Steel Faced Concrete Curb. All additional lengths of steel faced curb, outside of the depressed and transitional curb in driveways, will be measured for payment as straight steel faced concrete curb, except where there are no contract items for straight steel faced concrete curb. Where there is no scheduled item for straight steel faced concrete curb, then the additional lengths of straight steel faced concrete curb required shall be paid for as Depressed Steel Faced Concrete Curb.

4.09.6. PRICES TO COVER. When the proposed adjacent sidewalk is designated to be pigmented, no additional payment will be made for the cost of pigmenting the steel faced concrete curb to match the proposed adjacent pigmented sidewalk in color.

(A) The contract price per linear foot of steel faced concrete curb for each type of steel faced curb shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to construct the curb complete in place, including, but not limited to, excavation (other than rock excavation) and backfilling, in full compliance with the requirements of the specifications, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required, and maintaining the curb in good condition as specified in **Section 5.05**.

(B) On contracts where there is no scheduled item for wearing course and/or concrete base for pavement, the contract price shall also include the removal, by the Contractor, of not more than one (1’) feet width of roadway pavement along the curb line and the restoration, by the Contractor, of all removed pavement in compliance with the applicable sections of these Standard Highway Specifications. The restoration of pavement removed beyond the above defined limit shall be done by the Contractor at no additional cost to The City.

Payment will be made under:

Item No.	Item	Pay Unit
4.09 AD	STRAIGHT STEEL FACED CONCRETE CURB (18” DEEP)	L.F.
4.09 ADA	STRAIGHT STEEL FACED CONCRETE CURB (19” DEEP)	L.F.
4.09 ADB	STRAIGHT STEEL FACED CONCRETE CURB (20” DEEP)	L.F.
4.09 AE	STRAIGHT STEEL FACED CONCRETE CURB (21” DEEP)	L.F.
4.09 AEA	STRAIGHT STEEL FACED CONCRETE CURB (22” DEEP)	L.F.
4.09 AEB	STRAIGHT STEEL FACED CONCRETE CURB (23” DEEP)	L.F.
4.09 AEC	STRAIGHT STEEL FACED CONCRETE CURB (24” DEEP)	L.F.
4.09 AED	STRAIGHT STEEL FACED CONCRETE CURB (25” DEEP)	L.F.
4.09 AEE	STRAIGHT STEEL FACED CONCRETE CURB (26” DEEP)	L.F.
4.09 AF	STRAIGHT STEEL FACED CONCRETE CURB (27” DEEP)	L.F.
4.09 AG	STRAIGHT STEEL FACED CONCRETE CURB (28” DEEP)	L.F.
4.09 AH	STRAIGHT STEEL FACED CONCRETE CURB (29” DEEP)	L.F.
4.09 AI	STRAIGHT STEEL FACED CONCRETE CURB (30” DEEP)	L.F.
4.09 BD	DEPRESSED STEEL FACED CONCRETE CURB (18” DEEP)	L.F.
4.09 BDA	DEPRESSED STEEL FACED CONCRETE CURB (19” DEEP)	L.F.
4.09 BDB	DEPRESSED STEEL FACED CONCRETE CURB (20” DEEP)	L.F.
4.09 BE	DEPRESSED STEEL FACED CONCRETE CURB (21” DEEP)	L.F.
4.09 BEA	DEPRESSED STEEL FACED CONCRETE CURB (22” DEEP)	L.F.
4.09 BEB	DEPRESSED STEEL FACED CONCRETE CURB (23” DEEP)	L.F.
4.09 BEC	DEPRESSED STEEL FACED CONCRETE CURB (24” DEEP)	L.F.
4.09 BED	DEPRESSED STEEL FACED CONCRETE CURB (25” DEEP)	L.F.
4.09 BEE	DEPRESSED STEEL FACED CONCRETE CURB (26” DEEP)	L.F.
4.09 BF	DEPRESSED STEEL FACED CONCRETE CURB (27” DEEP)	L.F.
4.09 BG	DEPRESSED STEEL FACED CONCRETE CURB (28” DEEP)	L.F.
4.09 CD	CORNER STEEL FACED CONCRETE CURB (18” DEEP)	L.F.
4.09 CDA	CORNER STEEL FACED CONCRETE CURB (19” DEEP)	L.F.
4.09 CDB	CORNER STEEL FACED CONCRETE CURB (20” DEEP)	L.F.
4.09 CE	CORNER STEEL FACED CONCRETE CURB (21” DEEP)	L.F.
4.09 CEA	CORNER STEEL FACED CONCRETE CURB (22” DEEP)	L.F.
4.09 CEB	CORNER STEEL FACED CONCRETE CURB (23” DEEP)	L.F.
4.09 CEC	CORNER STEEL FACED CONCRETE CURB (24’ DEEP)	L.F.
4.09 CED	CORNER STEEL FACED CONCRETE CURB (25” DEEP)	L.F.
4.09 CEE	CORNER STEEL FACED CONCRETE CURB (26” DEEP)	L.F.
4.09 CF	CORNER STEEL FACED CONCRETE CURB (27” DEEP)	L.F.
4.09 CG	CORNER STEEL FACED CONCRETE CURB (28” DEEP)	L.F.

SECTION 4.10 (NO TEXT)

SECTION 4.11 - Excavation and Filling

4.11.1. INTENT. This section describes Excavation and Filling.

4.11.2. DESCRIPTION.

(A) The location, general character and essential details shall be as specified and as shown on the Contract Drawings.

(B) Earth Excavation shall include the removal and disposal of material of whatever nature encountered in the prosecution of the work, unless otherwise specified. Materials of whatever nature encountered shall be defined as including, but not be limited to, soil, stones, soft weathered rock that can be removed by mechanical means other than air hammer or drilling and blasting, and miscellaneous fill (excluding contaminated materials, debris and building demolition material consisting primarily of large wooden objects, plastic, asphalt shingles, metals, etc.) which is not classified as rock excavation or contaminated or hazardous materials that materially affect the cost of removal and disposal to the Contractor.

Earth excavation shall <u>not</u> include the cost of excavation and disposal of boulders or parts thereof more than one-half (1/2) cubic yard in volume (to be measured by multipling the maximum cross section area by seven tenths (7/10) of the length of that which is to be removed) in open cuts, rock as defined in **Subsection 4.11.2.(C),** materials which must be removed and disposed of as contaminated or hazardous material, manmade objects or structures not shown on the Contract Drawings or indicated in the specifications, that could not reasonably have been anticipated by the Contractor, were not anticipated by the City, and which materially affect the cost of excavation and disposal to the Contractor. Excavation and disposal of said materials will be paid for under other contract items where anticipated by the City or will be paid for as “Extra Work”, under Article 26 of the Standard Construction Contract, where the City deems the Contractor could not have reasonably anticipated the existence of such materials that significantly affects his costs of removal and disposal.

The dismantling and removal of the existing street lights, traffic signals and fire alarms will be done by the various departments having jurisdiction, except as otherwise provided. The existing foundations for these facilities shall be removed by the Contractor to a plane two (2’) feet below subgrade and such removal will be measured for payment under Earth Excavation.

(C) Rock Excavation shall include only the removal and disposal of unbroken ledge rock in its original formation which cannot be removed by ditching machines, ripper, rock plow, backhoe, or other mechanical means and which can only be removed by air hammers or by blasting, drilling or plug and feather in order to insure the prompt and proper prosecution of the work. It is not intended to cover softer rock formations encountered which can be removed by mechanical means other than air hammer or drilling and blasting.

(D) Grade shall mean the plane or planes through the tops of both curb lines.

(E) Rock subgrade for roadway area shall mean a plane two (2’) feet below and parallel to grade and two (2’) feet wider on each side than the roadway. Rock subgrade for sidewalk area shall mean a plane one (1’) foot below and parallel to grade. Rock subgrade for structures shall be to the depths required for the cradle and foundation of the structure.

(F) Filling shall include the furnishing, re-use, placement and compaction of approved material required. Filling shall be by Place Measurement or Vehicle Measurement, as specified.

(G) Excavation in earth for the footings of structures shall be carefully conducted so as to approach the neat lines as closely as possible without disturbing the underlying soil and hand excavation shall be used within the last twelve (12”) inches. Under no circumstances shall any backfilling material be placed upon surfaces to be used as foundation for footings. Where, in the opinion of the Engineer, the

slope of existing rock surfaces requires it, rock shall be suitably benched to give full and proper bearing to concrete in accordance with the directions of the Engineer. Rock surfaces shall be cleaned and if necessary washed before concrete is poured.

(H) All excavation and backfilling required for the installation of Sewers and Water Mains shall be done under the appropriately scheduled items in accordance with the requirements of the NYC Department of Design and Construction, Division of Infrastructure, Standard Sewer Specifications and Standard Water Specifications.

4.11.3. MATERIALS FOR FILL AND BACKFILL.

(A) GENERAL

All material for fill or backfill shall have an optimum moisture content as determined by the Standard Proctor Test conducted in accordance with AASHTO T-99 Method.

All material for fill or backfill shall be free from frost at the time of placement.

Miscellaneous fill material removed from trenches and excavations shall not be considered as acceptable backfill material unless found to be in compliance with these specifications and approved in writing by the Engineer. The project site subsurface conditions may consist partially of variable thickness layers of unsuitable material. This material may not be considered to be acceptable backfill material as described herein, or as determined by the Engineer.

(B) FILL AND BACKFILL

Filling and Backfilling materials whose composition is inorganic soil, blasted or broken rock and similar materials of natural or man-made origin, including mixtures thereof, shall be considered suitable materials provided it is free of shale or other soft, poor durability particles.

Glass or Recycled Porcelain Aggegate (RPA) from recycling facilities that meets the requirements of **Subsection 4.11.3.(E)** for Glass and **Subsection 4.11.3.(F)** for RPA shall be considered suitable material for mixing with fill provided the Contractor maintains the gradations specified herein. However, glass shall not be placed in contact with synthetic liners, geogrids, geotextiles or other geosynthetics.

Glass and/or RPA incorporated into fill shall be thoroughly mixed with other suitable material so that glass, RPA or combination of both constitutes no more than 30 percent by volume anywhere in the fill as visually determined by the Engineer.

The material within the top one (1') feet of subgrade shall have the following gradation:

Sieve Size	Passing Percent By Weight
4 Inch	100
1/4 Inch	30 to 75
No. 40	5 to 40
No. 200	0 to 10

Stone in filling shall not exceed the following maximum dimensions:

More than thirteen (13') feet below grade . . . . . Unlimited
More than four (4') feet and less than thirteen (13') feet below grade . . . . . 2'-0"
More than one (1') feet and less than four (4') feet below grade . . . . . 1'-0"
Within one (1') feet of grade . . . . . 0'-4"
Within two (2') feet of structures . . . . . 1'-0"
In embankment slopes beyond street lines . . . . . 1'-0"
Within five (5') feet of the center line of existing or proposed sewers, water
mains and their appurtenances . . . . . 1'-0"

The Contractor may use, as fill, that portion of the excavated material conforming to these specifications. However, all materials used for fill shall be free from organic material and other unsuitable material. The only exception would be the allowable contamination of recycled glass.

Excavated materials not complying with the above specifications shall be considered unsuitable for fill and shall be removed from the job site to an approved dump.

(C) SELECT GRANULAR FILL

Select Granular Fill shall be a natural sand, well graded crushed stone or approved clean earth of low silt and clay content, free from bricks, blocks, excavated pavement materials and debris, stumps, roots and other organic matter, as well as ashes, oil and other perishable or foreign material. All materials furnished under this item shall have no particles greater than 1/4 inch in maximum dimension for use in trenches and shall have the following gradation:

Sieve Size	Percent Passing by Weight
1/4”	100
No. 40	0-50
No. 200	0-8

(D) PROCESSED FILL

If approved in writing by the Engineer, excavated material determined to be unsuitable for fill may be processed (i.e. screened and/or crushed) to produce select granular fill material or fill material. Such processed materials for backfill must be in compliance with the material specifications herein for either Select Granular Fill or for Fill, as required. No separate or additional payment will be made for the cost of all labor, materials, plant, equipment, samples, tests and insurance necessary or required to perform this processing work. Payment for the costs of all labor, material, equipment and insurance necessary and required to furnish and deliver, and to place, compact, sample and test these processed acceptable backfill materials shall be in accordance with **Subsection 4.11.6(C)**. (Excavated material that is hand groomed and/or groomed with the use of excavating equipment of bricks, blocks, pavement materials, debris, stumps, roots, stones, boulders, timber, wood, etc., so as to render the excavated material acceptable for backfill, whether ordered by the Engineer or at the Contractor’s own discretion, shall not be considered as processed material but shall be considered as approved excavated suitable material. No separate or additional payment will be made for the use of this groomed excavated material as backfill, the cost of all labor and material shall be deemed included in the prices bid for all contract items of work.)

(E) GLASS

Glass shall be crushed to a maximum particle size of 3/8 inch.

Glass may contain up to a maximum of five (5%) percent by volume of china, ceramics, plate glass products, paper, plastics or other deleterious materials. The material shall be subject to visual inspection by the Engineer or his representative, and may be rejected based on this inspection. In case of rejection, the inspection must be documented in writing by the Engineer who shall indicate the basis of rejection.

(F) RECYCLED PORCELAIN AGGREGATE (RPA)

All porcelain to be used as RPA shall be crushed by a New York City Department of Environmental Protection (NYCDEP) approved recycling facility to a maximum particle size of 3/8 inch and graded to meet the gradation specified above for use in either fill, backfill or select fill, as may be required. RPA from any other source will not be permitted. The NYCDEP approved recycling facility will also certify that the RPA being furnished is free from organic material and other unsuitable material.

Should the Contractor desire to use RPA in his fill or backfill material, he shall contact Mr. Vasyl Kravchyk at NYCDEP (Tel. No. 718-595-7512) to determine the availability of RPA and from which recycling facility it can be obtained.

The Contractor shall be required to make arrangement with the recycling plant, at least two (2) weeks in advance of when he would need the material, to schedule the time, date and quantity available for pickup. The Contractor shall be required to furnish the recycling facility with a complete list of his trucks involved in transporting the material, which shall include the name of the registered owner (Contractor), Consumer Affairs or DOS Permit numbers, body license plate number, and truck volume. This information must be supplied to the facility prior to the start of picking up the RPA.

Weight ticket receipt slips given by the recycling facility to each truck driver picking up RPA shall be collected by the Contractor and given to the Engineer upon delivering fill or backfill material to the site that contains RPA, and the Contractor agrees and warrants that in obtaining the RPA that such material has originated only from a NYCDEP approved recycling plant and it has not been mixed with porcelain material from any other source.

The Contractor shall be required to transport said material from the approved recycling facility to his yard for storage and mixing with his fill material; however, there is not guarantee that the material will actually be available.

The Contractor is advised that there is no guarantee that RPA will in fact be available for his use from a NYCDEP approved recycling plant and he shall make no claim against the City for loss of anticipated profits should the material not be available upon request by the Contractor.

All excess RPA not used in the fill or backfill shall remain the property of the DDC Contractor.

The Contractor must comply with all rules and regulations of the Department of Transportation and the Department of Environmental Protections governing the use of RPA in its fill and backfill material.

4.11.4. EARTH EXCAVATION METHODS.

(A) Excavation for streets shall:

(1) be made and maintained to roadway crowns, sidewalk area slopes and side slopes specified until the entire work is accepted;

(2) be made below grade to exposed rock, when soundings indicate the existence of rock between grade and rock subgrade;

(3) include the removal, as directed, of unsatisfactory material below grade;

(4) include the cutting of the side slopes in earth excavation to a slope of one and one-half (1-1/2) horizontal to one (1) vertical or such other approved slope as may be rendered necessary by local conditions, and no measurement beyond such approved limits of slope will be made or allowed for payment.

(B) Excavation for walls and other structures shall be made to the dimensions specified and shall be done as follows.

(1) GENERAL. Trenches and pits shall be excavated to the depths required for cradle and foundation of structures. All trenches in earth shall be excavated with vertical sides, and shall be supported by close sheeting, properly braced. Sheeting and bracing shall extend from at least the existing surface of the ground to an adequate depth below the subgrade of the structure, except where otherwise specified on the Contract Drawings, or permitted by the Engineer in writing. Sheeting must be driven below the

area of the pilot cut. Driving of sheeting above the pilot cut is subject to the directions of the Engineer.

Pilot cuts for trenches shall not exceed five (5') feet at any time. The Engineer may reduce the depth of the pilot cut should soil and subsurface conditions warrant such action.

The Engineer may direct the Contractor to use other types of equipment, and to revise the procedure during the excavation of the pilot trench and the driving of the sheeting should it be found necessary to do so.

In accordance with 29 CFR 1926.650, a trench is a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than fifteen (15') feet. If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to fifteen (15') feet or less, the excavation is also considered to be a trench. The Contractor shall provide protection from collapse and cave-in for any employee who enters a trench or other excavation in accordance with the requirements of 29 CFR 1926 Subpart P, unless the excavation is less than five (5') feet in depth and examination of the ground by the Contractor's "competent person" provides no indication of a potential cave-in. The Contractor shall include the proposed procedures to meet the excavation safety requirements in his Project Safety and Health Plan. Trenching and excavation work shall be carried out under the supervision of the Contractor's "competent person." The Contractor shall provide ladders or ramps for access and egress within twenty-five (25') feet of an employee work area if a trench is four (4') feet or more deep. The Contractor shall keep traffic, equipment and materials at least two (2') feet away from the edge of any trench or excavation, or use retaining devices. When mobile equipment is operated near an excavation or must approach the edge of an excavation, either the operator must have a clear and direct view of the edge of the excavation; or a warning system of barricades, hand signals or mechanical signals shall be used. Workers shall not be permitted under loads that are being handled by lifting or digging equipment.

Trenches under five (5') feet in depth need not be sheeted and braced, except where one of the following conditions exist: the trenches are in close proximity to existing structures or subsurface structures; where the Engineer, in writing, specifically prohibits the use of a non-sheeted trench; or where examination of the ground by a "competent person" provides indication of a potential cave-in, and trenches need to be sheeted and braced.

For the purposes of open excavations and trenches, the term "competent person" shall be defined as a person designated by the Contractor, in writing, who has had specific training in, and is knowledgeable about, soil analysis, the use of protective systems and the requirements of 29 CFR 1926 Subpart P, who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Where shown, specified or permitted in writing by the Engineer, the sides of the trenches shall be sloped to elevations approved by the Engineer. Side slopes must be stable and shall be, in the dry, at least one and one half (1-1/2) vertical on one (1) horizontal.

The subgrade of trenches shall be constructed neat and to the grades as shown in the Contract Documents, and as directed by the Engineer.

Upon completion of the trenches and excavations and prior to placement of structures, the Contractor shall take in-place soil density tests of the subgrade (the number and

locations of these tests shall be as directed by the Engineer), and shall compact the subgrade, as directed by the Engineer, to a minimum of ninety five (95) percent of Standard Proctor Maximum Dry Density.

(2) ADDITIONAL REQUIREMENTS FOR TRENCHES

(a) Where structures are to be supported on piles and the Contractor deems it necessary to widen the trench beyond the maximum widths herein specified in order to permit the driving of such piles, the Contractor shall apply to the Engineer in writing for permission to widen the trench.

(c) Any widening or enlargement of excavation permitted in writing by the Engineer upon the request of the Contractor in order to perform the work as specified in the Contract Documents and/or to expedite his construction operations, will not be measured for any separate or additional payment, but the costs thereof shall be deemed included in the prices bid for all contract items of work.

(d) In rock trenches the Contractor may, with the written permission of the Engineer, omit the use of side forms. No rock shall project inside the minimum width vertical rock cut lines herein specified.

(e) Where the Contractor elects to cut his trench in rock by means that will result in overbreakage, rather than resorting to means which will insure adherence to the maximum allowable width of trench, he shall be required to fill the spaces between the edges of the external neat line of the poured-in-place structure and the sides of the rock cut with concrete, from subgrade of trench to a minimum height of two (2') feet above the top of the footing.

(f) If the Contractor elects to carry the excavation in earth below the required subgrade of the trench, the Contractor shall backfill the trench to the required subgrade with either properly compacted Stone Ballast or with concrete, as directed by the Engineer. If the Contractor elects to carry the excavation in rock below the required subgrade of the trench, the Contractor shall backfill the trench to the required subgrade with concrete or stone ballast as directed by the Engineer. No separate or additional payment shall be made for such backfilling where required, nor for any additional excavation and sheeting, the cost thereof shall be deemed included in the prices bid for all contract items of work.

(g) The construction of adjacent sewers and/or water mains in the same trench shall be in accordance with the requirements of Section 4.07 of the NYC Department of Design and Construction, Division of Infrastructure, Standard Sewer Specifications and/or Standard Water Specifications.

(3) LENGTH OF TRENCH EXCAVATION. The maximum length of trench excavation in roadway any time shall be as stipulated for the maintenance and protection of traffic.

Unless otherwise specified in the Contract Documents or ordered in writing by the Engineer, all trenches in rock shall be excavated to its full depth for a minimum distance of twenty (20') feet in advance of the length of structure permitted to be laid; however, the total length of trench shall not be less than fifty (50') feet. The only exception to this is at

its upper end or ends, where rock shall be excavated to its full depth to a distance of not less than five (5') feet beyond the sewer to be built.

(4) EXPOSED STRUCTURES TO BE PROTECTED. All exposed structures shall be carefully protected from the effects of blasts. Any damage done to such structures shall be promptly repaired by the Contractor at his own expense.

(5) DISPOSAL OF WATER FROM EXCAVATIONS. The Contractor shall at all times during the progress of the work keep the trenches and excavations free from water. The water from the trenches and excavations shall be disposed of in such a manner as will not cause injury to the public health, nor to public or private property, nor to the work completed or in progress, nor to the surface of the streets, nor cause any interference with the use of the same by the public. All sewers used for disposal of water from the trenches and excavation during construction shall be acceptably cleaned.

When in order to comply with the above, it is deemed necessary to widen the trench beyond the allowable maximum width, to permit the installation of well-points, the Contractor shall, as directed by the Engineer, provide either pipe of additional strength or concrete encasement at no additional cost to the City.

The Contractor shall, with his own equipment, provide dewatering where required at no additional cost to the City. The cost for all labor, equipment, materials, etc. required to dispose of water from the trenches shall be deemed included in the prices bid for all items of the Contract.

All dewatering and discharge pipes and hoses which cross traveled roadways shall be placed in such a manner so as to eliminate any disruption of traffic flow. If so ordered by the Engineer, the Contractor shall place the pipes and hoses in shallow trenches which will then be plated over. All header pipe shall be buried below existing roadway grade at driveways in order to maintain access to driveways.

All plates shall be firmly secured so as to eliminate any possible shift or movement.

All pumps used in the dewatering operation shall be electric and shall be powered directly from a Con Edison drop, unless otherwise unavailable.

Dewatering by means of well points or deep wells will not be allowed in the Boroughs of Brooklyn or Queens where the rate of pumping exceeds forty five (45) gallons per minute unless the appropriate permit has been secured from the New York State Department of Environmental Conservation.

Where the subgrade of the trench cannot be maintained in a dry condition, except in locations where the structures are on piles, the Contractor shall excavate the trench to an additional depth of six (6") inches below the subgrade of the sewer and backfill the trench to the subgrade of the sewer with stone ballast.

The cost for this additional excavation, sheeting, installation of stone ballast, labor, materials, plant, equipment and insurance required or necessary to complete this work shall be deemed included in the prices bid for the respective sewer or manhole items.

(C) Approved sheeting and bracing shall be used where necessary to support sides of excavation, in order to: prevent damage to subsurface structures and adjacent buildings; safeguard persons and property; minimize inconvenience to traffic and the public; protect the structure to be installed; and, provide suitable and safe working conditions. Except as otherwise provided, deviations from the above will be permitted only where, in the judgment of the Engineer, such exception will not result in any of the hazards described above.

In cases where sheeting and bracing will not adequately protect adjacent structures from damage and settlement, the Contractor will be required to use such methods as are necessary to safely support and maintain adjacent and abutting property and structures and to maintain the work safe to life, limb and property.

All sheeting and bracing systems that the Contractor elects to use or that are ordered to use by the Engineer or the Department shall comply with the requirements of **Section 40.05, "SHEETING AND BRACING**," of the NYC Department of Environmental Protection, Bureau of Water and Sewer Operations, Standard Sewer and Water Main Specifications, and must receive the approvals stated therein.

Unless otherwise specified in the Contract Drawings or these Specifications or specifically permitted in writing by the Engineer, the Contractor shall be required to withdraw and remove all sheeting and bracing simultaneously with the backfilling of trenches and excavations.

(D) When directed, soundings shall be made at intervals of about ten (10') feet to determine the existence of rock between grade and rock subgrade.

(E) When boulders, masonry, concrete, loose fragments of rock, tree stumps or other material are removed by blasting, all blasting operations shall be conducted in strict accordance with the City ordinances and regulations relative to rock blasting and the storage and use of explosives.

No blasting shall be done within five (5') feet of water mains, sewers or other structures.

(F) Excavation for the purpose of removing boulders, loose fragments of rock, tree stumps, roots and unsatisfactory material shall be backfilled with material complying with the specifications for Filling.

(G) Unless otherwise permitted, all earth excavation which is suitable and needed for fill shall be used within the contract limits.

4.11.5. ROCK EXCAVATION METHODS. When rock surfaces in streets, trenches or other excavations are uncovered, the Engineer shall be notified in order that he may make necessary measurements. Rock excavated before such measurements are made will not be paid for.

(A) Rock Excavation for Streets shall:

(1) be made to rock subgrade, when specified;

(2) be made and maintained to side planes specified until the entire work is accepted;

(3) be made in sections not less than fifty (50') feet in length, unless otherwise permitted.

(B) Rock Excavation for walls and other structures shall be made to the dimensions specified.

In rock trenches the Contractor may, with the written permission of the Engineer, omit the use of side forms. No rock shall project inside the minimum width vertical rock cut lines herein specified.

If the Contractor elects to carry the excavation in rock below the required subgrade of the trench, the Contractor shall backfill the trench to the required subgrade with either concrete or properly compacted stone ballast, as directed by the Engineer. No separate or additional payment shall be made for such

backfilling where required, nor for any additional excavation and sheeting, the cost thereof shall be deemed included in the prices bid for all contract items of work.

In addition, the filling of voids left by the removal of ledge rock from within the limits of rock excavation payment limits shall be done in accordance with the requirements of this **Subsection 4.11.6**.

Any widening or enlargement of excavation permitted in writing by the Engineer upon the request of the Contractor in order to perform the work as specified in the Contract Documents and/or to expedite his construction operations, will not be measured for any separate or additional payment, but the costs thereof shall be deemed included in the prices bid for all contract items of work.

(C) No blasting will be permitted unless otherwise specified. The Contractor shall use line drilling or other acceptable methods to excavate rock. But if blasting is permitted, blasting operations shall be conducted in strict accordance with The City ordinances and regulations relative to rock blasting, the storage and use of explosives and prevention of silicosis. Any rock excavation within five (5') feet of a water main less than thirty-six (36") inches in diameter, and within ten (10') feet of a water main thirty-six (36") inches or more in diameter, shall be done with very light charges of explosives, or if directed, without blasting, and the utmost care shall be used to avoid breaking or disturbing the main. No blasting shall be done within five (5') feet of water mains, sewers or other structures except by written permission of the Engineer.

4.11.6. BACKFILLING METHODS.

(A) BACKFILLING AROUND STRUCTURES

Unless otherwise specified or directed, all trenches and excavations shall be backfilled immediately after the structures are built and inspected, and permission to backfill has been granted by the Engineer.

All backfill shall be carefully deposited and spread by approved methods.

Backfill shall proceed simultaneously with the withdrawal of sheeting. Withdrawal of sheeting below levels previously backfilled and compacted is prohibited.

The use of backhoe buckets for the compaction of backfill material in all trenches and excavations will not be permitted.

(1) Select Granular Fill. The Contractor shall use Select Granular Fill for backfilling trenches and excavations within any area less than two (2') feet wide in its least dimension (i.e. space between face of trench and outside face of cavities behind sheeting, filling of voids left by removal of boulders beyond the limits of sheeted trench, etc.) and within eighteen (18") inches around all underground facilities (i.e. conduit, cable, etc.).

Select granular fill shall be deposited and spread by approved methods in uniform horizontal layers not exceeding twelve (12") inches in depth and each layer shall be thoroughly compacted to the satisfaction of the Engineer, before a successive layer is deposited. A minimum of 95 percent of Standard Proctor Maximum Density will be required after compaction.

The cost of providing Select Granular Fill as specified hereinabove, together with all labor, materials, plant, equipment, samples, and tests necessary and required for delivering, placing, compacting and testing of Select Granular Fill, shall be deemed included in the prices bid for all respective items of work. No separate or additional payment shall be made for this work unless otherwise specified.

(2) All excavated material from within the project limits which is considered as suitable material under the requirements of **Subsection 4.11.3.(B)**, shall be utilized for backfill.

The cost for all labor, materials, plant, equipment, samples, and tests necessary and required for the hauling, storing, placing, compacting and testing of suitable excavated fill material all in accordance with the Specifications and as directed by the Engineer, shall be deemed included in the prices bid for all respective items of work. No separate or additional payment shall be made for this work unless otherwise specified.

(B) BACKFILLING AROUND SHEETING

When sheeting is withdrawn all cavities remaining in or adjoining the trench shall be filled and compacted. When sheeting is left in place all cavities behind such sheeting shall be filled as directed. All materials used for such backfill and the compaction of such materials shall be as specified herein.

(C) DEFICIENCY IN FILL MATERIAL

Unless otherwise shown on the plan, trenches shall be backfilled to the height of the surface of the ground as it existed at the commencement of the work. Should there be a deficiency of suitable material for that purpose, the Contractor shall furnish and place such additional material as may be required.

Payment for the cost of all labor, material, and equipment necessary and required to furnish and deliver these acceptable backfill materials, where a deficiency of acceptable backfill material occurs, shall be made as follows:

(1) For providing acceptable select granular fill (whether natural or processed) to satisfy the requirements of Section 4.11.6(A)(1), payment shall be deemed included in the prices bid for all contract items of work. No separate payment will be made for this work.

(2) For providing acceptable clean fill (whether natural or processed) to satisfy the requirements of Section 4.11.6(A)(3) to fill voids left by the removal of ledge rock, payment shall be made under the Contract Item - ROCK EXCAVATION.

(3) For providing acceptable clean fill (whether natural or processed) ordered by the Engineer, payment shall be made under the Contract Item - FILL.

(D) REMOVAL OF SURPLUS MATERIAL

As the trenches are backfilled, the Contractor shall remove all surplus material, and regrade and leave free, clear and in good order all roadways and sidewalks adjacent to the completed work and within fifty (50') feet of the end of the completed work. All surplus material or any part thereof shall be deposited, if required by the Engineer and at his direction, on the streets and avenues within the limits of this Contract where they are below grade or contain depressions. Such fill shall be compacted to the required density (95% Standard Proctor Maximum Density) and in such a manner so as to leave the surfaces of the backfill even with the adjoining surfaces.

(E) TEMPORARY BULKHEADS

For retaining the backfilling only temporary bulkheads will be allowed over sewers, basin connections and drains. Such bulkheads shall not be of stone, and they shall be removed as the trenches are backfilled.

(F) SUBGRADE STUCTURES NOT TO BE COVERED

Subgrade structures shall not be covered until the Engineer shall have inspected, measured and located the same and given permission to backfill the trenches over them.

(G) FILL

Fill shall be deposited, satisfactorily compacted, and maintained until the entire work is accepted, between:

(1) the subgrade of proposed pavement and the surface of proposed curbs and sidewalks and the existing ground surface;

(2) the planes of the slopes of the embankment or the backs of retaining walls, as specified;

(3) rock subgrade and the finished surfaces of roadways and sidewalks.

Embankment slope shall be one and one-half (1-1/2) horizontal to one (1) vertical.

(H) The Contractor shall fill or backfill with material having a moisture content suitable for the proper compaction of that material. The Contractor shall be responsible for determining the proper limits as the work is progressed. Water added shall be thoroughly incorporated into the soil, and manipulation shall be provided whenever necessary to attain uniform moisture distribution to the soil. When the moisture content of a lift, that is about to be compacted, exceeds the required amount, compaction shall be deferred until the required moisture content is achieved or a more suitable material shall be used. Fill material shall be carefully deposited and spread by approved methods in uniform horizontal layers not exceeding twelve (12”) inches in depth, extending across the entire width of fill prior to compaction, and each layer being thoroughly compacted to the satisfaction of the Engineer before a successive layer is deposited. A minimum of 95 percent of Standard Proctor Maximum Density will be required after compaction.

No separate or additional payment be made for any costs associated with the achievement of optimum moisture content, including any additional excavation due to the removal of any layer not meeting the specified requirements and for the replacement of any layers with suitable material. Costs shall be deemed included in the prices bid for all items of work.

When placing fill or backfill around underground facilities in shallow excavations, twelve (12”) inch layers shall be deposited to progressively bury the facility to equal depths on both sides and for the full depth and width of the trench excavated for the facility.

(I) In deep trenches, in lieu of depositing and compacting the backfill from two (2’) feet above the underground facility to a plane five (5’) feet below final surface in accordance with the above specified procedure, the Contractor may submit to the Engineer, for approval, an alternate backfill method (i.e. puddling, jetting, deeper compaction layers, etc.). This submittal must fully describe the alternate method, including proposed equipment, backfill material, depth of compaction layer, and trench locations where it will be employed. However, approval of any alternate backfill method shall not relieve the Contractor from obtaining a minimum 95% standard Proctor maximum density. Should the Engineer determine that the specified density is not being obtained, the area must be re-excavated and backfilled at the Contractor’s own cost until the required compaction density is achieved.

(J) Backfill immediately adjacent to conduits shall not contain particles larger than one-quarter (1/4”) inch in diameter. Compaction shall be attained by the use of impact rammers, plate or small drum vibrators, or pneumatic button head compaction equipment and shall be capable of exerting a pressure equivalent to two hundred and fifty (250) to three hundred (300) pounds per inch width of compression roll, or an equivalent pressure if other than smooth wheel or pneumatic tired rollers are permitted.

Hand tamping will not be permitted except in the immediate area of the underground facility.

The backfill, within two (2') feet of such facilities, shall be wetted (except where clay is present) in twelve (12") inch lifts and lightly hand tamped with as many strokes as required to achieve maximum density.

(K) Where sheeting has been used for the excavation, it shall be pulled when the excavation has been filled or backfilled to the maximum unsupported depth allowed by New York State Department of Labor Industrial Code Rule 23 and Title 29 Code of Federal Regulations Part 1926, Safety and Health Regulations for Construction. Where a difference exists between regulations, the more stringent requirements shall apply.

(L) In-place soil density tests will be required to ensure that the soil compaction requirements of the specifications are met. In-place soil density tests shall be taken for each and every layer of backfill placed, at a maximum of one hundred (100') feet intervals along the length of each layer. However, the location of the tests shall vary horizontally along each successive layer, such that no two (2) tests are conducted at the same station location as any previous layers. The number and locations of in-place soil density tests shall be as directed by the Engineer.

For each one thousand (1,000) cubic yards of each type of backfill soil utilized, for which in-place soil density tests are to be performed, shall undergo a minimum of one (1) Proctor analysis in order to determine the maximum dry density and optimum moisture content of the soil material to be tested. Due to varying soil conditions, additional Proctor analyses may be required by the Engineer. The number and locations of all samples to undergo Proctor analysis shall be as directed by the Engineer.

The Contractor shall retain the services of a testing laboratory, in accordance with Section 7.12 - Soil Density Testing, to make all compaction tests of backfill materials used and placed. All compaction tests shall be witnessed and verified by the Engineer. Proctor analyses and in-place soil density tests shall be performed in accordance with Section 7.12.

Unless otherwise provided for in the Contract no separate or additional payment shall be made for the depositing, compacting and sampling of backfill nor for the services of the approved testing laboratory, the costs thereof, shall be deemed included in the prices bid for all items of work.

The Contractor shall furnish the Engineer with copies of in-process compaction reports certified by a Professional Engineer as to the compliance with the requirements of the aforementioned filling and backfilling specifications. This certified compaction report shall be submitted as directed by the Department's Quality Assurance and Construction Safety Unit.

The cost for all labor, materials, and equipment necessary and required to place, compact, sample and test provided acceptable backfill material shall be deemed included in the prices bid for all contract items of work. No separate or additional payment will be made for this work.

4.11.7. MEASUREMENT.

(A) EARTH EXCAVATION FOR STRUCTURES

Earth excavation within the limits of the work except for structures for which the contract prices include the cost of earth excavation, will be measured and allowed to the following limits:

	Payment Limits
For streets	Above the depth specified and between side limits specified.

For uncovering rock between grade and rock subgrade	Below grade and above the rock surface.
For the removal of boulders, loose fragments of rock, tree stumps, roots and unsatisfactory material.	Below the depth specified and between side limits as directed.
For dry retaining walls. . . .	To depth specified and to vertical planes passing through the neat lines of the footings of the walls.
For masonry walls (except dry rubble), culverts and drains (except pipe drains)	To depths specified and to vertical planes passing one (1') feet outside of the neat lines of the structure.

(B) ROCK EXCAVATION IN STREETS, TRENCHES AND STRUCTURES

When rock surfaces in streets or trenches are uncovered, the Engineer shall be notified in order that he may make necessary measurements. Rock excavated or blasted before such measurements are made will not be paid for.

The qualities of rock to be measured for payment under each Rock Excavation item shall be the volume of ledge rock actually removed from within the following payment limits:

	Payment Limits
For streets	Above rock subgrade and between side limits specified.
For walls, culverts and other structures	Below rock subgrade to depths and to the payment lines specified.

(C) ADDITIONAL INCREMENTAL COST TO EXCAVATE ROCK AT DEPTHS GREATER THAN FIVE (5') FEET IN TRENCHES AND FOR STRUCTURES

For rock excavation within trenches and for structures, where the depth of rock excavation exceeds 5 feet below grade, that quantity of rock removed below five (5') feet of grade will be measured, under Item 4.11 BAA, for an additional incremental payment over and above that made for rock excavation under Item 4.11 AA.

(D) FILL, PLACE MEASUREMENT

All filling required to complete the work, between the ground surface as determined by the Engineer before the work of filling is commenced and the surfaces specified, and between rock subgrade and the surfaces specified, will be measured in place after compaction.

No payment or allowance will be made for:

(1) sinkage, shrinkage, and settlement;

(2) backfilling holes below grade caused by the removal of boulders, loose fragments of rock, tree stumps, roots and other unsatisfactory material;

(3) backfilling to original ground surface for culverts, drains, basin connections, and between structures and sides of excavations;

(4) fill which may be spread out beyond the embankment slopes specified;

(5) spaces occupied by subsurface structures over one (1) cubic foot in volume when the placement or construction of such structures is made on newly placed fill and is started while fill operations are in progress.

The spaces occupied by curbs, crosswalks, flagging, concrete sidewalks, gutters, culverts, drains, basin connections, manholes, receiving basins, seepage basins, inlets, and gas or water pipes or any appurtenances thereof, will not be deducted from the volume of filling to be paid for when the aforesaid structures are placed or constructed after filling operations have been completed and excavation of the newly placed fill is required for such placement or construction.

(E) FILL, VEHICLE MEASUREMENT

All fill required to complete the work of filling on unstable ground by vehicle measurement, between the limits specified, will be measured in cars, trucks, etc., at the place of deposit. In computing the amount of fill to be paid for, one (1) cubic yard of measured material in the vehicle will be paid for as eight-tenths (0.8) of a cubic yard of fill. For carload and truckload deliveries, only water level loads will be accepted and no allowance will be made for any crown or peak of the load.

(F) SELECT GRANULAR FILL, PLACE MEASUREMENT

The quantity of select granular fill to be measured for payment shall be the number of cubic yards of select granular fill used outside the limits of trench excavation, as ordered in writing by the Engineer, measured in place after compaction.

No payment or allowance will be made for fill placed beyond the limits specified.

(G) SELECT GRANULAR FILL, VEHICLE MEASUREMENT

All select granular fill required to complete the work of filling on unstable ground by vehicle measurement, between the limits specified, will be measured in cars, trucks, etc., at the place of deposit. In computing the amount of select granular fill to be paid for, one (1) cubic yard of measured material in the vehicle will be paid for as eight-tenths (0.8) of a cubic yard of fill. For carload and truckload deliveries, only water level loads will be accepted and no allowance will be made for any crown or peak of the load.

No payment or allowance will be made for fill placed beyond the limits specified.

4.11.8. PRICES TO COVER.

(A) EARTH EXCAVATION FOR STRUCTURES

The contract price per cubic yard for earth excavation for structures shall cover the cost of all labor, materials, equipment, and insurance required to complete the work of earth excavation within the contract limits, in full compliance with the requirements of the specifications, without regard to the subsequent use of the excavated materials. .

(B) ROCK EXCAVATION IN STREETS, TRENCHES AND STRUCTURES

The contract price bid per cubic yard for rock excavation shall cover the cost of all labor, materials, equipment, and insurance required to complete the work of rock excavation within the contract limits, in full compliance with the requirements of the specifications without regard to the subsequent use of the excavated material.

In addition, included in the unit prices bid hereunder for rock excavation shall be the cost of all labor, material, plant, and equipment required to furnish and deliver acceptable select granular fill material required to fill the voids left by the removal of ledge rock.

(C) ADDITIONAL INCREMENTAL COST TO EXCAVATE ROCK AT DEPTHS GREATER THAN FIVE (5') FEET IN TRENCHES AND FOR STRUCTURES

The contract price bid per cubic yard for the additional incremental cost to excavate rock at depths greater than five (5') feet in trenches and for structures, shall cover the cost of all additional labor, materials, equipment required to complete the work of rock removal at depths exceeding five (5') feet below grade. Payment under this item will be made in addition to that made under Item 4.11 AA.

(D) FILL

The contract price per cubic yard for Fill, Place Measurement or Vehicle Measurement, shall cover the cost of all labor, materials, and equipment required to complete the work of filling within the contract limits in full compliance with the requirements of the specifications. All material excavated within the limits of the work which is used as filling will be paid for as filling.

When there is no price for Fill, the cost of furnishing and depositing any Fill required shall be covered by and included in the contract prices bid for all respective items of work.

(E) SELECT GRANULAR FILL

The contract price per cubic yard for Select Granular Fill, Place Measurement or Vehicle Measurement, shall cover the cost of all labor, materials, plant, equipment, insurance, and samples required to furnish and deliver the clean select granular fill material and to do all work incidental thereto, all in accordance with the Contract Drawings and Specifications and as directed by the Engineer.

Payment will be made under:

Item No.	Item	Pay Unit
4.11 AA	ROCK EXCAVATION IN STREETS, TRENCHES AND STRUCTURES	C.Y.
4.11 AS	EARTH EXCAVATION FOR STRUCTURES	C.Y.
4.11 BAA	ADDITIONAL INCREMENTAL COST TO EXCAVATE ROCK AT DEPTHS GREATER THAN FIVE (5) FEET IN TRENCHES AND FOR STRUCTURES	C.Y.
4.11 CA	FILL, PLACE MEASUREMENT	C.Y.
4.11 CB	FILL, VEHICLE MEASUREMENT	C.Y.
4.11 CC	SELECT GRANULAR FILL, PLACE MEASUREMENT	C.Y.
4.11 CD	SELECT GRANULAR FILL, VEHICLE MEASUREMENT	C.Y.

SECTION 4.12 - Header, Bluestone and Granite

4.12.1. **INTENT.** This section describes construction of Bluestone and Granite Header.

4.12.2. **DESCRIPTION.** Header shall be bluestone or granite as specified.

4.12.3. MATERIALS.

(A) HEADER

Header shall comply with the requirements of **Section 2.12, Curbs and Headers, Granite and Bluestone**, for the type and corresponding size specified.

(B) CONCRETE CRADLE

Concrete cradle for header shall comply with the proportion and strength requirements of **Section 3.05**, Class B-32, Type IA. The requirements for air entrainment shall not apply.

Coarse aggregate shall comply with the requirements of **Section 2.02**, Size No. 57, Type 1, Grade B, or Type 2.

Fine aggregate shall comply with the requirements of **Section 2.21**, Type 1A, except that 5 to 30 percent shall pass a No. 50 sieve.

4.12.4. METHODS.

(A) EXCAVATION

Excavation shall be made to dimensions sufficient to permit the construction of cradle and setting of header. It shall be made to a depth of six (6") inches below the specified depth of header, and to a width of not less than eighteen (18") inches. The trench shall be open to its full width and depth for a distance of not less than twenty (20') feet in advance of the setting of the header.

(B) UNDERLYING MATERIAL

The material underlying the header cradle shall be satisfactory and thoroughly compacted. If unsatisfactory, it shall be removed and replaced with acceptable material, thoroughly compacted.

(C) CONCRETE CRADLE

The cradle shall be eighteen (18") inches wide and extend six (6") inches below the specified depth of header. The concrete shall be brought up on both sides of the header for a height of six (6") inches. It shall be composed of stiff concrete thoroughly tamped in place. The concrete shall be laid not more than twenty (20') feet in advance of setting the header. The portions of the concrete cradle in front and back of header shall be placed and thoroughly compacted as soon as the header is brought to line and grade, and before the concrete under the header has set.

(D) SETTING

Header shall be set centrally on the concrete cradle with top at grade, and with joints not less than one-eighth (1/8") inch and not more than one-quarter (1/4") inch for four (4") inches below grade.

(E) BACKFILLING

Backfilling shall be of clean earth or other approved material satisfactorily compacted.

4.12.5. MEASUREMENT. The length of header constructed, as required, will be measured and paid for in accordance with **Section 5.04**.

4.12.6. PRICES TO COVER. The contract price per linear foot of header with cradle for each type of header shall cover the cost of all labor, materials, equipment, insurrace, and incidentals required to construct the header complete with cradle in place, including excavation (other than rock excavation)

and backfilling, in full compliance with the requirements of the specification, to furnish such samples for testing, and to provide such testing equipment, laboratory space and facilities as may be required and to maintain the header in good condition as required in **Section 5.05**.

Payment will be made under:

Item No.	Item	Pay Unit
4.12 BH	NEW BLUESTONE HEADER, 4” x 12”	L.F.
4.12 GH4	NEW GRANITE HEADER, 4” x 12”	L.F.
4.12 GH6	NEW GRANITE HEADER, 6” x 12”	L.F.

SECTION 4.13 - Sidewalk, Concrete

4.13.1. INTENT. This section describes construction of Concrete Sidewalk.

4.13.2. DESCRIPTION.

(A) Concrete Sidewalk shall be of the width specified and shall be laid on a foundation six (6”) inches thick, unless otherwise specified.

(B) Sidewalk shall consist of a single course of concrete four (4”) inches thick, except in driveways and corner quadrants where it shall be seven (7”) inches thick.

(C) Sidewalk joints shall be either the standard type where both expansion joints and scored dummy joints are tooled with neatly rounded edges and bounded on all sides by a troweled border about one (1”) inch in width; or, sidewalk joints shall be of a saw cut type where expansion joints are given a saw cut finish and scored dummy joints are saw cut. When saw cut type joints are not specified the standard type joint shall be used.

(D) Concrete shall be pigmented when specified.

(E) Pigmented concrete shall have a silicon carbide surface treatment when specified.

4.13.3. MATERIALS.

(A) Material for foundation shall consist of Size No. 3 broken stone or gravel complying with the requirements of **Section 2.02**, 100 percent of which passes a 2-1/2” square sieve; or approved broken concrete, 100 percent of which passes a 2-1/2” square sieve, containing not more than five (5) percent material passing a No. 200 mesh sieve, not more than five (5) percent material passing a 1/2” square sieve, not more than fifteen (15) percent passing a 1” square sieve, not more than thirty-five (35) percent passing a 1-1/2” square sieve, and not more than five (5) percent retained on a 2” square sieve; or other approved granular material, 100 percent of which passes a 2-1/2” square sieve, containing not more than five (5) percent material passing a No. 200 mesh sieve and not more than five (5) percent retained on a 2” square sieve, with not more than 30 percent by weight of glass or Recycled Porcelain Aggregate (RPA) or the combination of both glass and RPA. If used, glass and/or RPA shall conform to the applicable paragraphs of **Sections 4.11.3.(B), 4.11.3.(E) and 4.11.3.(F)**.

(B) Concrete shall comply with the requirements of **Section 3.05**, Class B-32, Type IIA, unless otherwise specified. Concrete shall be mixed in compliance with Methods A, B, C, or D of **Section 3.05**, except that hand mixing shall not be permitted unless specifically authorized by the Engineer. Coarse aggregate for one course sidewalk shall comply with the requirements of **Section 2.02**, Type 1, Grade B, Size No. 57, or Type 2, graded as follows:

Sieve Size	General Limits - % Passing
1-1/2”	100
1”	93-100
1/2”	27-58
1/4”	0-8

The water cement ratio (by weight) shall be 0.44. Slump values shall be 1-1/2” minimum to 3-1/2” with a 4” maximum.

An approved air-entraining agent shall be added at the time concrete ingredients are mixed with water, to produce an air content (by volume of concrete) of 6-1/2%, with a tolerance of 1-1/2%.

(C) Pigmenting material shall comply with the requirements of **Section 2.19**.

(D) Preformed expansion joints shall comply with the following requirements:

1) For Standard Type Sidewalks . The preformed expansion joints shall comply with the requirements of **Section 2.15**, and shall be one-quarter (1/4”) inch or one-half (1/2”) inch thick, at the Contractor’s option. Joint sealer for sealing joints over preformed joint filler shall comply with the requirements of **Section 2.22**, Type 2 - Cold application sealer. Where concrete is designated to be pigmented then the sealant shall match that color.

2) For Sidewalks Designated to have Saw Cut Type Joints. The preformed expansion joints shall be an approved non-bituminous premolded joint material in compliance with the requirements of **Section 2.15**, and shall be one-quarter (1/4”) inch thick except along the building line where they shall be one-half (1/2”) inch thick. Joint sealant for sealing joints over preformed joint filler shall comply with the requirements of **Section 2.22**, Type 2 – Cold applicatiion sealer. Color of sealant shall be charcoal to match that used at 120 Broadway in the Borough of Manhattan or shall match that of the adjacent existing sidewalk, as directed.

(E) Reinforcement shall comply with the requirements of **Section 4.14**, as applicable.

(F) Silicon Carbide shall be Silicarbid as manufactured by Anti-Hydro, telephone number (800) 777-1773; Sparkle Grain as manufactured by Pacific Palette Concrete Products, telephone number (831) 457-4566; Carborex WSC as manufactured by Washington Mills, contract Mr. Craig Williams, telephone number (508) 839-6511, ext. 214; or an approved equivalent. Silicon carbide crystals shall have a Moh Scale hardness of at least 9 and a grit size of either 16/30 or 16/36.

4.13.4. METHODS. In order to comply with ADA requirements, the Contractor may be required to break the transverse grade of sidewalks such that there shall be a minimum of five (5’) feet width of sidewalk with a transverse slope not exceeding 2% and the remaining sidewalk slope not exceeding 5%. No additional payment will be made for this work which may include, but not be limited to, providing additional form work, finishing, contouring to meet adjacent, and placement operations.

(A) EXCAVATION AND EARTH SUBGRADE

Excavation shall be made to dimensions sufficient to accommodate placement of foundation material and to permit the setting of forms.

Where directed, the Contractor shall sawcut the existing sidewalk along existing score lines and other partial panel or slab locations, as directed by the Engineer, to facilitate replacement of sidewalk while at the same time minimizing the impact on good sidewalk not requiring replacement. All work must be done in a safe and workmanlike manner, to the satisfaction of the Engineer. The sawcut shall be for the full depth of sound concrete or stone sidewalk to the top of the underlying foundation. The sawcut shall be straight with sharp edges. No cutting or encroachment into adjacent panels or slabs will be permitted. All saw cutting shall be done with a water lubricated diamond blade. No separate payment will be made for sawcutting existing sidewalk. The cost of sawcutting sidewalk shall be deemed included in the price bid for the concrete sidewalk item.

The earth subgrade, immediately before foundation material is placed on it, shall be compacted to a minimum of 95 percent of Standard Proctor Maximum Density, smooth, parallel to and at the required depth below the finished sidewalk surface and be dampened with water sufficient only to be absorbed by the subgrade. The subgrade shall not be in a muddy or frozen condition and unsuitable material shall be removed and replaced with acceptable material thoroughly compacted.

(B) FOUNDATION

All existing material within the required six (6”) inches of foundation shall be removed in its entirety and replaced with material complying with **Subsection 4.13.3.(A)** hereinabove. The excavated material shall become the property of the Contractor and shall be removed from the site to the Engineer's satisfaction.

Foundation material shall be placed on the prepared subgrade, in a manner to minimize segregation, using equipment and procedures approved by the Engineer. Uncontrolled spreading from piles dumped on the grade resulting in segregation will not be permitted. Foundation material shall then be wetted to the optimum moisture content, based on a laboratory 5 point Proctor density test, and thoroughly compacted using an approved plate compactor into a course not less than six (6”) inches thick. Compaction of foundation material shall range between 90% and 95% of the Standard Proctor Maximum Density, as directed by the Engineer, depending upon material used. Unsatisfactory subgrade material shall be removed and replaced with acceptable material thoroughly compacted to a minimum of 95% of Standard Proctor Maximum Density. The top surface of the foundation material shall be parallel to the finished grade and at a distance below the grade equal to the specified thickness of concrete. Additional depth of foundation material for special conditions shall be placed as directed by the Engineer.

(C) FORMS

Forms shall be made of substantial material (preferably steel) with suitable metal dividing plates and of sufficient strength to satisfactorily resist distortion when fastened together and secured in place. Forms and dividing plates shall be of a depth not less than that of the concrete sidewalk, be properly located with tops set to the designated sidewalk surface and be left in place until the concrete has hardened.

(D) REINFORCEMENT

Where sidewalk is specified to be reinforced, the Contractor shall furnish and install a welded wire fabric as per the New York City Department of Transportation’s Standard Details of Construction Standard Drawing No. H-1045. The wire fabric reinforcement shall be laid in sheets which are straight and true to form and shall be securely held in position by approved methods so that they will be in their prescribed position after the concrete has been placed.

(E) SLABS

Concrete sidewalk shall be built in approximately twenty (20’) feet slabs between expansion joints, as specified, or if in independent slabs, as directed. Expansion joints in sidewalk shall coincide with expansion joints in curb.

Around hydrants and wood poles, sidewalk slabs shall be constructed as independent slabs, separated by expansion joints, as directed.

Dummy scored joints one-eight (1/8") inch wide shall be provided where directed. For standard finish sidewalks the dummy scored joints shall be not less than one-half (1/2") inch in depth. For sidewalks designated to have a saw cut type joint finish the dummy scored joints shall be saw cut not less than three-quarter (3/4") inch in depth.

(F) EXPANSION JOINTS

Unless otherwise directed by the Engineer and excluding sign and parking meter posts, expansion joints shall be installed at all joints between the sidewalk slabs and curb, street hardware, wood poles, street light and traffic pole foundations, bollard foundations, hydrant foundation slabs, buildings, bridges, etc.

Expansion joints for tooled joint sidewalks shall be one-quarter (1/4") inch or one-half (1/2") inch in width, at the Contractor's option, and shall be filled with preformed joint filler to within one (1") inch of the sidewalk surface. The top one (1") inch shall be sealed with Type 2 - Cold application sealer poured on an approved bond breaker in accordance with the manufacturer's instructions.

Expansion joints for saw cut joint sidewalks shall be one-quarter (1/4") inch wide except along the building line where they shall be one-half (1/2") inch wide, and shall be filled with preformed joint filler to within one (1") inch of the sidewalk surface. The top one (1") inch shall be sealed with Type 2 – Cold application sealer poured on an approved backer rod in accordance with the manufacture's instructions. Color of sealant shall be charcoal to match that used at 120 Broadway in the Borough of Manhattan or shall match that of the adjacent existing sidewalk, as directed.

(G) CONCRETE COURSE

Foundation material shall be thoroughly wetted, to the satisfaction of the Engineer, immediately before concrete is placed. The greater the porosity of the material (i.e. broken concrete), the more water required to prevent water absorption from the concrete. The concrete shall be placed within the forms and thoroughly tamped until the surface is at the finished grade.

Along all joints and around all protrusions into the concrete such as manholes, valve boxes, vaults, etc., and along the inside of the forms, hand operated immersion type vibrators shall be used to thoroughly consolidate the concrete. Vibrators shall not come in contact with forms, shall not be used for moving concrete in the work, and in no case shall any vibrator be operated longer than four (4) seconds in any one location. The Contractor shall be required to furnish a minimum of three (3) hand operated immersion type vibrators to the job site, one of which shall be used as a backup for the other two.

(H) PIGMENTING

Where pigmenting is specified, the concrete sidewalks shall be pigmented with an admixture complying with the requirements of **Section 2.19** and the following requirements**:**

"Commercial Gray": In commercial districts C4–4 through C4–7, C5 and C6, as defined in the Zoning Resolution of the City of New York, and in areas under the jurisdiction of the Lower Manhattan Development Corporation the color of the concrete shall be integrally pigmented to produce a gray color equivalent to L.M. Scofield 'Landmarks Grey' K-157-4; L.M. Scofield 'Cool Black No. 4'; Davis Colors No. 884-3%; Lansco Color No. 437 'Strong Black' 5 lbs. per 94 lbs. Light Grey Portland Cement and 3 parts sand; Bayferrox NYC Landmark Commission Gray, 3.5 lbs. per 94 lbs. Light Gray Portland Cement; or an approved equivalent, unless otherwise specified.

"Bluestone": Where the color of the concrete is required to simulate the color of dark gray bluestone, the concrete shall be integrally pigmented to produce a gray color equivalent to: Davis

Colors No. 884-3%; Lansco Color No. 437 'Strong Black' 5 lbs. per 94 lbs. Light Grey Portland Cement and 3 parts sand; L.M. Scofield 'Cool Black No. 4'; Bayferrox Limestone 330, 2 lbs. per 94 lbs. Light Gray Portland Cement; or an approved equivalent, unless otherwise specified.

"Granite": Where the color of the concrete is required to simulate the color of light to medium gray granite, the concrete shall be integrally pigmented to produce a gray color equal to: Davis Colors No. 884-1%; Lansco Color No. 437 'Strong Black' 2.5 lbs. per 94 lbs. Light Grey Portland Cement and 3 parts sand; L.M. Scofield 'Cool Black No. 1'; Bayferrox Silver 330, 1 lb. per 94 lbs. Light Gray Portland Cement; or an approved equivalent, unless otherwise specified.

Prior to Commencement of Work, the Contractor shall submit the name of its proposed sidewalk installer upon which his bid is based, along with their respective work history experience in placing pigmented concrete. The installer shall have documented experience in working with pigmented concrete.

Prior to making any field samples and the placing of any pigmented concrete, the Contractor, its concrete supplier, installer, cement producer, laboratory, the pigmented admixture's representative, and the Engineer shall meet and agree on the specifications and methods of handling the pigmented concrete.

All pigmented concrete at different locations shall be identical, unless otherwise directed. Variations in color/tint/hue will not be acceptable. Therefore, the same brand and type of cement and the same source and type of aggregate shall be used throughout the project.

Prior to the mix design being made, the cement intended for use shall be checked to determine that its lightness/darkness is similar to the cement used in the original approved sample. The Pigmented Admixture shall be added in the standard proportion specified by the manufacturer. No fly ash or other admixtures (including, but not limited to, calcium chloride) shall be used except an air-entraining agent complying with ASTM Designation C 260, when directed by the Engineer.

Prior to commencing the placement of concrete, but after acceptance and approval of the pre-construction field sample, the Contractor shall submit properly labeled and identified samples of materials used in the approved sample, as follows:

Coarse Aggregate	20 pounds
Fine Aggregate	20 pounds
Cement	20 pounds
Pigmented Admixture	1 pint
Joint sealer	2 linear feet
Surface sealer	1 pint
Mix design	1 certified copy
Silicon Carbide Aggregate	20 pounds (when specified)

These samples shall be stored where directed by the Engineer and shall constitute material standards for the project. During construction, one (1) pint of cement from each load of cement delivered to the plant to be used in this specific job shall be retained and, after comparison with retained master sample, dated and stored with other retained samples. Aggregate source shall also be checked periodically, as directed by the Engineer, and compared with retained samples.

(I) SURFACE FINISH

1. Sidewalks with Standard Tooled Joint Finish. Top surfaces of sidewalk shall be finished to true smooth planes by screeding, and finally by wooden floats, then lightly broomed to a uniform texture. Each rectangular slab shall have all edges including, edges along buildings, walls, steps and other structures on abutting properties, neatly rounded with proper tools and be bounded on all sides by a trowelled border about one (1") inch in width. Unless otherwise specified in the contract documents, the concrete surface shall be scored and tooled parallel to and perpendicular to the curb line at intervals of five feet.

The City has established for each Borough an esthetic and/or visual quality standard for concrete sidewalks consisting of a full scale reference installation. Reference standards are located within the Boroughs at:

Brooklyn:	Willoughly St. between Flatbush Avenue and Gold Street, North Side
Queens:	226th Street from South Conduit Avenue to 148th Avenue
Manhattan:	125 West End Avenue (in front of ABC Studios), Center Mall in Malcolm X Blvd. between 120th St. and 121st St., and pedestrian ramp in the southwest corner quadrant of Malcolm X Blvd. and 121st St.
Bronx:	West side of Whittier Street northward of Ryawa Avenue, between the northwest corner of the intersection at Ryawa Avenue and the first driveway.
Staten Island:	Watchogue Road from Wooley Ave. to Demorest Ave.

The Contractor shall be required to visit and inspect the applicable Borough location as it will be used as a standard of reference for approving and/or rejecting the Contractor's workmanship. Workmanship will be judged for uniformity in surface finish, texture, color, joint construction, joint tooling, line and grade, and overall appearance of sidewalk in comparison to the reference standard. Where the Contractor fails to meet the established standard of workmanship for sidewalk installation, as determined by the Commissioner, he shall be required to replace or rebuild the finished work as directed, in accordance with the Maintenance and Guaranty provisions, under Article 24 of the Standard Contruction Contract.

Furthermore, prior to the start of any concrete sidewalk installation work, the Contractor shall construct, for each different concrete color, test standard(s) for the project consisting of approximately 100 linear feet of ribbon sidewalk, if any, and approximately 100 linear feet of full-width sidewalk, if any, at location(s) directed by the Engineer, which shall match, in all respects, the below reference standard. When approved by the Engineer, these test standards shall become the quality standards for the project. The Contractor shall not proceed with the balance of the concrete sidewalk work required for the project until the Engineer has approved, in writing, these test standards.

2. Sidewalks with Saw Cut Joint Finish. Top surfaces shall be finished to true smooth planes by screeding, and finally by wooden floats, then lightly broomed to a uniform texture. Broom finish shall be applied in straight lines, at right angles to the direction of sidewalk traffic. Unless otherwise specified in the contract documents, shrinkage control joints in the concrete surface shall be scored by sawcutting one-eight (1/8”) inch wide and three-quarters (3/4”) deep immediatedly after the concrete has reached its initial set which is typically anywhere from 4 to 8 hours after the concrete has been poured, depending upon the weather, but in no case shall it be later than 12 hours after pouring. All sawcuts are to be straight, clean, and of consistent width. Joints are to be either perpendicular to the curb or parallel to the curb at 5’-0” on center, unless otherwise shown on the contract drawings.

Top surfaces shall be finished as specified above, except that the final color of concrete mix shall closely match the sidewalks in Manhattan at 120 Broadway, as approved by the Engineer, unless otherwise specified. Before providing the required sample panel(s) under **Section 2.19**, the Contractor shall prepare 6 inch x 6 inch x 4 inch samples of pigmented concrete. As many samples as necessary shall be produced until the color is satisfactory to the Engineer. Final color of concrete curing membrane shall match the pigmented concrete pavement.

Furthermore, prior to the start of any concrete sidewalk installation work, the Contractor shall construct, for each different concrete color, test standard(s) for the project consisting of approximately 100 linear feet of ribbon sidewalk, if any, and approximately 100 linear feet of full-width sidewalk, if any, at location(s) directed by the Engineer, which shall match, in all respects, the below reference standard. When approved by the Engineer, these test standards shall become the quality standards for the project.

The Contractor shall not proceed with the balance of the concrete sidewalk work required for the project until the Engineer has approved, in writing, these test standards.

3. Sidewalks with Saw Cut Joint Finish and Silicon Carbide Surface. In addition to the requirements for Sidewalks with Saw Cut Joint Finish, above, the top surface of sidewalk shall have silicon carbide applied at the rate of 20 to 25 lbs./100 S.F., as follows, unless otherwise directed by the manufacturer.

Immediately after substrate surface has been leveled and wood floated, before bleed water has appeared, the silicon carbide shall be applied evenly while there is sufficient moisture in the slab to saturate at least two dust-on coats. Troweling must be started early enough to complete all operations without use of additional water on the surface. Distribute the silicon carbide crystals uniformly (at the rate of 20 – 25 lbs, per 100 sq.ft.) either by hand or mechanical spreader over prepared wet slab. Crystals shall be applied in three separate shake coats. Use one-third (1/3) of the required quantity of crystals for the first application. Apply second application slightly after first application is floated. Do not throw the crystals or broadcast them with a shovel. Use an evenly distributed hand broadcast.

Trowel crystals uniformily into surface after each shake coat. After the second shake coat of crystals have been troweled once, sprinkle the third coat over the surface. The surface must be uniformly coated. Use a steel trowel to leave grains at surface covered with a thin film of cement paste.

The final finish may be lightly troweled to produce a smooth surface free from defects or blemishes. Finish trowelling shall be delayed until surface has set sufficiently to avoid burying the crystals, but must be accomplished before finish has hardened.

Exposure of the silicon carbide crystals shall be accomplished with either of the following methods provided it results in a satifactory finish:

a) Water and a soft broom, or sponge. Allow concrete surface to set sufficiently so that light scrubbing will not cause pitting; or,
b) A light 5% to 10% Muratic acid washing to expose grains after the concrete is at least 2 weeks old. Acid shall be removed from the finished surface with clean water within 15 minutes after application; or,
c) Other methods, as approved by the Engineer.

(J) BACKFILLING

Backfilling shall follow the removal of forms as soon as practicable and, unless otherwise permitted, shall be of clean earth, satisfactorily compacted.

(K) SURFACE CURING AND PROTECTION

Pigmented concrete sidewalk shall be covered with a color-matched curing membrane complying with the requirements of **Section 2.19**.

Unpigmented concrete sidewalk shall be covered with a clear curing compound consisting of a wax-free vehicle, ready mixed for immediate use without alteration, containing a fugitive dye that will fade uniformly, and complying with the requirements of **Section 2.14, Curing Materials**, Type 1-D, Clear. When applied to freshly placed damp concrete at the rate of one gallon per one hundred fifty (150) square feet, it shall provide a curing membrane displaying the following properties:

(1) Drying. The compound shall produce a uniform coating at a minimum temperature of 40 Deg. F. and shall dry tack-free within four (4) hours.

(2) Permeability. The moisture loss through the membrane shall be no more than 0.04 grams per square centimeter of surface area after three (3) days.

(3) Durability. The membrane shall remain intact for at least seven (7) days.

Curing compound for pigmented concrete and for unpigmented concrete shall each be delivered to the Project only in the manufacturer's original containers which shall be legibly marked with the manufacturer's name, trade name, batch number and date. One batch number shall be used to represent not more than one formula. The containers shall only be opened in the presence of the Engineer.

After their use and prior to their disposal, the Contractor shall have available, for inspection by the Engineer, the empty compound containers, and may dispose of them only after certification by the Engineer. The re-use of any of the containers will be permitted only if approved by the Engineer.

Curing compounds shall be sprayed on the exposed sidewalk surfaces prior to the hardening of the sidewalk concrete and immediately after the concrete water sheen has disappeared. The application of the compounds shall comply with the requirements of **Section 2.14**. The treated surfaces shall be protected from injury for at least ninety-six (96) hours.

Where the Contractor fails to cure the concrete sidewalk in accordance with the requirements of this provision, the Contractor shall be required, at no additional cost to the City, to replace, in its entirety, any sidewalk slab which did not receive, in part or in whole, the specified cure.

Concrete sidewalk shall be carefully protected against injury from rain, frost, the drying effects of the sun and wind, traffic or other causes, by means of suitable guards and covering.

(L) MEETING EXISTING SIDEWALK GRADES

Asphaltic concrete mixture shall be placed, as directed, at locations designated by the Engineer behind newly constructed sidewalk in order to meet existing sidewalk grades.

4.13.5. MEASUREMENT. The area of concrete sidewalk in square feet and the amount to be paid for under each item shall be determined by cores as provided in **Section 5.04**.

In determining the area of Concrete Sidewalk to be paid for, the areas occupied by the tree wells, bases of columns, manhole heads, gate boxes and similar structures will be deducted from the measured area of concrete sidewalk when they measure more than one (1) square foot and will not be deducted when they measure one (1) square foot or less.

The Engineer's estimate of quantity of concrete sidewalk for comparing bids is approximate and is based on non-compliance of the owners of the properties abutting this highway improvement with the Commissioner's notice to them to construct the sidewalk in front of their premises. The aforesaid quantity may be reduced or eliminated, after contract award, in the event property owners comply with the Commissioner's notice.

The Contractor is not to proceed with any sidewalk construction unless ordered to do so by the Commissioner or his authorized representative.

4.13.6. PRICES TO COVER.

(A) CONCRETE SIDEWALK

The contract price per square foot for concrete sidewalk shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to construct concrete sidewalk of the thickness specified, complete in place with foundation material in accordance with **Subsection 4.13.4.(B)**, including, but not limited to, pigment when specified, silicon carbide when specified, curing, excavation (other than rock excavation) and backfilling, in full compliance with the requirements of the specifications, to construct test standards, to furnish such samples for testing and to provide such testing equipment, laboratory space

and facilities as may be required and the cost of maintaining the sidewalk in good condition as specified in **Section 5.05**.

(B) CONCRETE SIDEWALK WITH SPECIAL SCORING

The contract price per square foot for concrete sidewalk with special scoring shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to construct concrete sidewalk of the thickness specified, complete in place with foundation material in accordance with **Subsection 4.13.4.(B)** and special scoring patterns shown on the Contract Drawings, including, but not limited to, pigment when specified, curing, excavation (other than rock excavation) and backfilling, in full compliance with the requirements of the specifications, to construct test standards, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required and the cost of maintaining the sidewalk in good condition as specified in **Section 5.05**.

(C) CONCRETE SIDEWALK ON EXISTING FOUNDATION

The contract price per square foot for concrete sidewalk shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to construct concrete sidewalk of the thickness specified, complete in place on existing foundation material, including, but not limited to, pigment when specified, silicon carbide when specified, curing, excavation (other than rock excavation) and backfilling, in full compliance with the requirements of the specifications, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required and the cost of maintaining the sidewalk in good condition as specified in **Section 5.05**.

(D) REINFORCED CONCRETE SIDEWALK

The contract price per square foot for concrete sidewalk shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to construct a reinforced concrete sidewalk of the thickness specified, complete in place with foundation material in accordance with **Subsection 4.13.4.(B)**, including, but not limited to, reinforcement, pigment when specified, curing, excavation (other than rock excavation) and backfilling, in full compliance with the requirements of the specifications, to furnish such samples for testing and to provide such testing equipment, laboratory space and facilities as may be required and the cost of maintaining the sidewalk in good condition as specified in **Section 5.05**.

(E) SPECIAL SCORING FOR CONCRETE SIDEWALK

The contract price per square yard for special scoring of concrete sidewalk shall cover the cost of scoring dummy joints in new concrete sidewalks within the limits and in the pattern(s) shown on the Contract Drawings for Special Scoring.

New 4” and 7” Concrete Sidewalks will be paid for separately under their respective items. No separate payment will be made for standard scoring of sidewalk. Where no separate item of work is included in the contract, the cost of Special Scoring shall be deemed to be included in the price bid for Concrete Sidewalk.

(F) ASPHALTIC CONCRETE MIXTURE

Asphaltic concrete mixture placed in compliance with **Subsection 4.13.4.(L)** will be paid for at the upset price of Thirty Dollars ($30.00) per ton, in place, except that such mixture will be paid for at the price bid therefor per ton when there is a scheduled item for Asphaltic Concrete Mixture.

Payment will be made under:

Item No.	Item	Pay Unit
4.13 AAS	4” CONCRETE SIDEWALK (UNPIGMENTED)	S.F.

4.13 ABS	4” CONCRETE SIDEWALK (PIGMENTED)	S.F.
4.13 AAT	4” CONCRETE SIDEWALK ON EXISTING FOUNDATION (UNPIGMENTED)	S.F.
4.13 ABT	4” CONCRETE SIDEWALK ON EXISTING FOUNDATION (PIGMENTED)	S.F.
4.13 AAX	4” CONCRETE SIDEWALK WITH SPECIAL SCORING (UNPIGMENTED)	S.F.
4.13 ABX	4” CONCRETE SIDEWALK WITH SPECIAL SCORING (PIGMENTED)	S.F.
4.13 BAS	7” CONCRETE SIDEWALK (UNPIGMENTED)	S.F.
4.13 BBS	7” CONCRETE SIDEWALK (PIGMENTED)	S.F.
4.13 BAT	7” CONCRETE SIDEWALK ON EXISTING FOUNDATION (UNPIGMENTED)	S.F.
4.13 BBT	7” CONCRETE SIDEWALK ON EXISTING FOUNDATION (PIGMENTED)	S.F.
4.13 BAX	7” CONCRETE SIDEWALK WITH SPECIAL SCORING (UNPIGMENTED)	S.F.
4.13 BBX	7” CONCRETE SIDEWALK WITH SPECIAL SCORING (PIGMENTED)	S.F.
4.13 BR	7” REINFORCED CONCRETE SIDEWALK (UNPIGMENTED)	S.F.
4.13 BRP	7” REINFORCED CONCRETE SIDEWALK (PIGMENTED)	S.F.
4.13 BRX	7” REINFORCED CONCRETE SIDEWALK WITH SPECIAL SCORING (UNPIGMENTED)	S.F.
4.13 BRXP	7” REINFORCED CONCRETE SIDEWALK WITH SPECIAL SCORING (PIGMENTED)	S.F.
4.13 CABS	4" CONCRETE SIDEWALK (PIGMENTED) (SAW CUT TYPE JOINTS)	S.F.
4.13 CSABS	4" CONCRETE SIDEWALK (PIGMENTED) (SAW CUT TYPE JOINTS AND SILICON CARBIDE SURFACE TREATMENT)	S.F.
4.13 CABST	4" CONCRETE SIDEWALK ON EXISTING FOUNDATION (PIGMENTED) (SAW CUT TYPE JOINTS)	S.F.
4.13 CABXUN	4" CONCRETE SIDEWALK WITH SPECIAL SCORING (UNPIGMENTED) (SAW CUT TYPE JOINTS)	S.F.
4.13 CSABST	4" CONCRETE SIDEWALK ON EXISTING FOUNDATION (PIGMENTED) (SAW CUT TYPE JOINTS AND SILICON CARBIDE SURFACE TREATMENT)	S.F.
4.13 CBBS	7" CONCRETE SIDEWALK (PIGMENTED) (SAW CUT TYPE JOINTS)	S.F.
4.13 CSBBS	7" CONCRETE SIDEWALK (PIGMENTED) (SAW CUT TYPE JOINTS AND SILICON CARBIDE SURFACE TREATMENT)	S.F.
4.13 CBBST	7" CONCRETE SIDEWALK ON EXISTING FOUNDATION (PIGMENTED) (SAW CUT TYPE JOINTS)	S.F.
4.13 CBBXUN	7" CONCRETE SIDEWALK WITH SPECIAL SCORING (UNPIGMENTED) (SAW CUT TYPE JOINTS)	S.F.
4.13 CSBBST	7" CONCRETE SIDEWALK ON EXISTING FOUNDATION (PIGMENTED) (SAW CUT TYPE JOINTS AND SILICON CARBIDE SURFACE TREATMENT)	S.F.
4.13 X	SPECIAL SCORING OF CONCRETE SIDEWALK	S.F.

SECTION 4.13 DE – Embedded Preformed Detectable Warning Units

4.13DE.1. **DESCRIPTION**. This work shall consist of furnishing and installing embedded preformed detectable warning units on sidewalk pedestrian ramps as indicated on the plans or elsewhere in the contract documents. Sidewalk pedestrian ramps shall be constructed in accordance with the requirements of the New York City Department of Transportation’s Standard Details of Construction Standard Drawing No. H-1011. The ramp within two (2’) feet of the curb shall be finished with a detectable warning surface as specified herein.

4.13DE.2. **MATERIALS.**

A. GENERAL REQUIREMENTS: The Contractor shall supply the Manufacturer’s certification that the detectable warning surface material meets the requirements of these specifications, at least 30 calendar days prior to proposed installation. The detectable warning surface material shall:

- Meet the dimensional details and other requirements as noted on the New York City Department of Transportation's Standard Details of Construction Standard Drawing No. H-1011.
- Be composed of cementitious material, steel, iron, clay, shale, plastics, polymeric materials, resins, pigments, or as approved by Commissioner.
- Be an approximate visual match to the dark gray color of Federal Standard 595B #36081 or Munsell Book Notation 10BG 3/1, for use adjacent to light colored sidewalk surfaces; or, be an approximate visual match to the white of Federal Standard 595B #37886 or Munsell Book Notation N 9/ for use adjacent to dark colored sidewalk surfaces, such as pigmented concrete sidewalk used in landmark districts, unless otherwise specified. The detectable warning surface shall contrast visually with adjoining surfaces by at least a 70% as defined in the Americans with Disabilities Act Accessibility Guidelines (ADAAG) Specifications.
- Be uniform in color and texture.
- Have a good appearance, free of cracks or other defects.
- Have clean-cut and well-defined edges.
- Where applicable, the units shall adhere to Hot Mix Asphalt (HMA) or Portland cement concrete (PCC) surfaces at a minimum air temperature of 60ºF (16ºC), and a minimum substrate temperature of 70ºF (21ºC).
- Be weather resistant and durable to normal pedestrian wear and maintenance activities.
- Show no appreciable fading, lifting, or shrinkage.
- Have friction characteristics similar to a broomed Portland cement concrete sidewalk surface as determined by the Engineer.

Setting bed material and/or surface preparation materials for installation of detectable warning units shall be in accordance with the manufacturer's recommendations.

B. PHYSICAL PROPERTIES:

PROPERTY	REQUIREMENTS
Compressive Strength, Min., 28 days	8 ksi (55 Mpa) Minimum
Freeze-thaw Loss (25 Cycles, one per day, 10% NaCl solution)	1.0% Maximum

C. PACKAGING AND SHIPMENT: Embedded detectable warning units shall be shipped in accordance with commercially accepted standards. The following information shall be marked on each package or on the shipping invoice: the name of the product, the name and address of the manufacturer, and the quantity of material.

D. BASIS OF MATERIALS ACCEPTANCE: Acceptance of materials shall be based upon it being listed in the most current New York State Department of Transportation's Approved List of Detectable Warning Units.

4.13DE.3. CONSTRUCTION DETAILS. Preformed, embedded detectable warning units may be installed in plastic concrete, installed directly on existing subbase prior to placing concrete, inlaid on prepared concrete surfaces, or as otherwise recommended by the manufacturer or specified in the Contract Documents, such that the total combined thickness of concrete base and embedded detectable warning units in the pedestrian ramp area is seven (7") inches.

The Contractor shall be required to follow all applicable manufacturer's requirements for environmental conditions, surface preparations, installation procedures, curing procedures, and materials compatibility.

Immediately prior to setting each warning unit in place, the installer shall mortar the bottom of each unit to insure that full contact is made with the setting bed after each unit is set firmly and evenly bedded to the required grade and pitch, and brought to an even surface across joints. After the first unit is set in place and periodically thereafter as directed by the Engineer, to verify the Contractor's method of work, warning

units shall be lifted immediately after setting in place to verify that full contact is being made with the setting bed. Any gaps shall be filled with additional wet bedding mixture, as may be required, and the work method adjusted, as approved by the Engineer, to prevent the occurrence of voids.

Preformed detectable warning units (excluding their raised truncated domes) shall be set flush with a top surface elevation tolerance of 1/16" between adjacent units but not more than ±1/32" at perimeters between pavers and adjacent curb or sidewalk surfaces.

4.13DE.4. **MEASUREMENT.** The quantity of Embedded Preformed Detectable Warning Units to be measured for payment shall be the number of square feet, measured to the nearest tenth (0.1) of a square foot, installed to the satisfaction of the Engineer.

4.13DE.5. **PRICE TO COVER.** The unit price bid per square foot shall include all labor, material, equipment, insurance, and incidentals necessary to complete the work, including but not limited to bedding material, job site sample(s), repairs, and clean up.

Payment for this item, Embedded Preformed Detectable Warning Units, shall be in addition to payment for the 7" thick concrete sidewalk pavement item on which the preformed detectable warning unit is installed.

Also, no adjustment in payment shall be made for concrete removed to accommodate embedded units.

Payment will be made under:

Item No.	Item	Pay Unit
4.13 DE	EMBEDDED PREFORMED DETECTABLE WARNING UNITS	S.F.

SECTION 4.13 DSA – Surface Applied Detectable Warning Units

4.13DSA.1. **DESCRIPTION**. This work shall consist of retro-fitting existing corner quadrant sidewalk pavement with a detectable warning surface, when and as shown on the plans, by furnishing and installing surface applied detectable warning units within two (2') feet of the curb as specified herein.

4.13DSA.2. **MATERIALS**.

A. GENERAL REQUIREMENTS: The Contractor shall supply the Manufacturer's certification that the detectable warning surface material meets the requirements of these specifications, at least 30 calendar days prior to proposed installation. The detectable warning surface material shall:

- Meet the dimensional details and other requirements as noted on the New York City Department of Transportation's Standard Details of Construction Standard Drawing No. H-1011, unless otherwise specified herein.
- Be composed of a mixture of cementitious material, steel, iron, plastics, polymeric materials, resins, pigments, or as approved by the Commissioner.
- Be an approximate visual match to the dark gray color of Federal Standard 595B #36081 or Munsell Book Notation 10BG 3/1, for use adjacent to light colored sidewalk surfaces or white, Munsell Book Notation N 9/, for use adjacent to dark colored sidewalk surfaces, such as pigmented concrete sidewalk used in landmark districts, unless otherwise specified. The detectable warning surface shall contrast visually with adjoining surfaces by at least a 70% as defined in the Americans with Disabilities Act Accessibility Guidelines (ADAAG) Specifications.
- Be uniform in color and texture.

- Have a good appearance, free of cracks or other defects, and have clean-cut and well-defined edges.
- Adhere to granite slabs, Hot Mix Asphalt (HMA) or Portland cement concrete (PCC) surfaces, as applicable, at a minimum air temperature of 60ºF (16ºC), and a minimum pavement temperature of 70ºF (21ºC).
- Be weather resistant and durable to normal pedestrian wear and maintenance activities.
- Show no appreciable fading, lifting, or shrinkage.
- Be capable of molding or fitting itself to the contours, breaks, and faults of granite, HMA or PCC surfaces.
- Show no significant tearing, rollback, lifting, or other signs of poor adhesion.
- Have friction characteristics similar to a broomed Portland cement concrete sidewalk surface as determined by the Engineer.

Setting bed material and/or surface preparation materials for installation of detectable warning units shall be in accordance with the manufacturer's recommendations.

B. PHYSICAL PROPERTIES:

STANDARD	PROPERTY	RESULTS
ASTM C 501	Wear Resistance	Wear Index: ≥15
ASTM C1028	Slip Resistance	Dry Coefficient of friction 0.8 minimum
ASTM E 96	Water Vap. Transm.	0.33 oz./sq. ft./24 hours (100 grams/sq. meter/24 hours)
Various	Adhesion/Bonding Strength	See Note*

**Note:* *Due to the various types of materials available, the Manufacturer shall certify, through independent laboratory testing, that the type of material used for detectable warnings will bond to a prepared surface*.

C. PAVEMENT SURFACE PRIMER, IF REQUIRED:

- Shall be as recommended by the detectable warning surface manufacturer.
- Conform to Federal, State, and Local regulations for the emission of volatile organic compounds (VOC).

D. PACKAGING AND SHIPPING: Preformed, surface-applied, detectable warning units shall be packaged and shipped in accordance with commercially accepted standards. The name of the product, then name and address of the manufacturer, quantity of material, date of manufacture, and date of expiration or shelf life shall be clearly displayed on each container or on the shipping invoice.

E. BASIS OF MATERIALS ACCEPTANCE: Acceptance of materials shall be based upon it being listed in the most current New York State Department of Transportation's Approved List of Surface-Applied Detectable Warning Units.

4.13DSA.3. CONSTRUCTION DETAILS. Surface applied detectable warning units may be applied to existing curb ramps, formed and bonded to existing granite slabs, Hot Mix Asphalt (HMA) or Portland cement concrete (PCC) surfaces, or as otherwise directed by the manufacturer or specified in the Contract Documents.

The Contractor shall follow all applicable manufacturer's requirements for environmental conditions, surface preparation, installation procedures, curing procedures, and materials compatability.

Prior to the start of work, the Contractor shall show evidence of successful completion of similar installations and provide a job site sample for the approval of the Engineer. The sample size shall be five (5') feet x two (2') feet, minimum, and applied at a location selected by the Engineer. All subsequent work

shall conform to the appearance of the approved sample. The sample shall not be incorporated into the work and shall be removed when ordered by the Engineer.

The Contractor shall follow all applicable suppliers and manufacturer's requirements for environmental conditions, surface preparation, installation procedures, curing procedures, and materials compatibility.

At a minimum, surfaces shall be cleaned by the use of mechanical sweepers, power brooming, or hand brooming. Curing compounds or heavier contamination shall be cleaned by abrasive blasting or other means as approved by the Engineer.

Differences in elevation between adjacent surfaces of sidewalk, curb and the detectable warning surface shall not be more than 3/32" at the perimeters.

4.13DSA.4. MEASUREMENT. The quantity of Surface Applied Detectable Warning Units to be measured for payment shall be the number of square feet, measured to the nearest tenth (0.1) of a square foot, installed to the satisfaction of the Engineer.

4.13DSA.5. PRICE TO COVER. The unit price bid shall include all labor, material, equipment, insurance, and incidentals necessary to complete the work, including but not limited to job site sample(s), surface preparation, repairs and clean up.

Payment will be made under:

Item No.	Item	Pay Unit
4.13 DSA	SURFACE APPLIED DETECTABLE WARNING UNITS	S.F.

SECTION 4.14 - Steel Reinforcement in Concrete

4.14.1. INTENT. This section describes installation of Steel Reinforcement in Concrete.

4.14.2. DESCRIPTION. Steel Reinforcement for Concrete shall be of steel bars or welded steel wire fabric, as specified and as shown on the Contract Drawings.

4.14.3. MATERIALS.

(A) Steel reinforcement shall comply with the requirements of the following sections:

Steel Bars -- **Section 2.23**

Welded Steel Wire Fabric -- **Section 2.25**

(B) Size and placement shall be as specified and as shown on the Contract Drawings.

(C) Dowel bars, if required, shall be of a type, size and placement as specified and as shown on the Contract Drawings.

(D) Shop drawings of reinforcing steel showing the location and type of supports and tie wires shall be submitted to the Engineer for his approval before any work covered by these drawings is undertaken.

Any errors discovered in these drawings will be corrected by the Engineer, but failure to discover errors shall not relieve the Contractor of responsibility, and any incorrect work resulting therefrom shall be corrected by the Contractor at no expense to The City.

The Contractor shall obtain the Engineer's approval of the reinforcement he proposes to use before ordering.

4.14.4. METHODS.

(A) FABRICATION AND PROTECTION

Steel reinforcement bars shall be delivered in bundles or fabricated mats, and shall have the manufacturer and size of steel identified by attached metal tags when one-quarter (1/4") inch or less in size and by rolled raised symbols or letters when greater than one-quarter (1/4") inch, or by other means acceptable to the Engineer. Where reinforcement bars are delivered in bundles, they shall be securely wired. Bars shall be identified with heat number marked on attached tag.

Bar mats shall have bars of the size and spacing required and be made up in sections of the length and width required. They shall be fastened together in an approved manner at each intersection.

Reinforcement bars shall be protected at all times from mechanical injuries and from the weather and, when placed in the work, shall be free from injurious dirt, defects, paint and oil, and have a workmanlike finish. Bars which will remain exposed for some time after being placed in the work shall, if directed, be immediately coated with thin grout composed of equal parts of cement and sand.

Steel wire fabric shall be protected from moisture, and, when placed in the work, shall be free from grease, injurious rust, dirt or other foreign substances.

(B) BENDING BARS

Reinforcement bars shall be bent cold to the exact shapes shown on the Contract Drawings and, if required, in conformity with approved templates. Bars having kinks or bends not shown on the plan will be rejected.

(C) SPLICES AND LAPS

Reinforcement bars under flexural stress shall be of the full lengths required, or if permitted, be spliced with approved clamps or other approved devices which will transfer the full working stress of the bar. Reinforcement bars under temperature and shrinkage stresses shall be as long as can be conveniently used. Where necessary, laps shall be as directed. Laps shall be not less than forty (40) times the nominal diameter of the bars. Splices and laps shall be staggered. The distance between splices and laps and adjacent bars, and the distance between a splice or lap and the exposed surface of concrete shall be not less than two (2") inches, or as shown on the plan.

Welded steel wire fabric shall have transverse or longitudinal end members overlapping each other by not less than a full mesh length or width respectively. Overlapping sheets shall be securely and properly fastened together.

(D) SUPPORTS

Steel reinforcement shall be supported at the specified depth in such a manner that no displacement will occur during concreting operations. It shall be supported either on approved devices or upon a layer of concrete which has been evenly struck off. The method of supporting the steel at the proper elevation shall be as approved by the Engineer.

(E) PLACING

Reinforcement bars shall be placed, spaced, securely fastened together and held in their positions in an approved manner until the concrete is placed around them.

Steel wire fabric shall be laid in sheets which shall be straight and true to form and shall be securely held in position by approved methods so that they will be in their prescribed position after the concrete has been thoroughly compacted.

No concrete shall be deposited until the Engineer has inspected the placing of the reinforcing steel and has given permission to place the concrete. All concrete placed in violation of this provision will be rejected and removed at the Contractor's own expense.

4.14.5. MEASUREMENT. The weight of steel reinforcement bars to be paid for will be that of all reinforcement bars incorporated in the work, as required, which shall be computed from theoretical lengths and weights of bars.

The weight of steel wire fabric to be paid for will be that of all material incorporated in the work, as required, which shall be computed from the theoretical lengths, widths and weights.

No payment will be made for steel reinforcement which is part of a structure for which there is a contract price including such reinforcement; nor will any payment be made for laps, splices and dowels shown on approved shop drawings but not shown on the contract Contract Drawings as bid upon, nor for chairs, wires, clamps or other spacing, fastening or supporting devices.

4.14.6. PRICES TO COVER. The contract price per pound for Steel Reinforcement in Concrete shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to furnish and install reinforcement complete in place in full compliance with the requirements of the specifications, and to furnish such samples for test as may be required.

Payment will be made under:

Item No.	Item	Pay Unit
4.14	STEEL REINFORCEMENT BARS	LBS.
4.14 W	WELDED STEEL WIRE FABRIC	LBS.

SECTION 4.15 - Topsoil

4.15.1. INTENT. This section describes Topsoil.

4.15.2. MATERIALS. Topsoil shall comply with the requirements of **Section 2.26**.

4.15.3. METHODS. Before placing topsoil, the subgrade shall be trimmed to a smooth uniform surface at the required distance below the finished grade. All hollows, depressions and gullies shall be filled with acceptable material free from stones over two (2") inches in diameter, rubbish and other material which is unsuitable in the opinion of the Engineer. All surplus material and debris shall be removed and disposed of as directed by the Engineer. This process of shaping and filling shall be repeated until there are no depressions.

Loosen subsoil by scarifying, ripping or tilling using disks, harrows or other suitable equipment to a depth of four (4) to six (6) inches immediately before placing topsoil. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

After the subgrade has been prepared to the proper grades, the topsoil shall be spread over such areas and to such depths as specified, shown on the Contract Drawings or as directed by the Engineer. No topsoil should be handled when, in the opinion of the Engineer, the topsoil is too wet or in a frozen condition.

Topsoil spread in grass areas shall be raked or otherwise manipulated to form smooth draining grades.

Topsoil shall be satisfactorily compacted.

4.15.4. **MEASUREMENT**. The quantity of Topsoil to be paid for shall be the number of cubic yards measured in place after compaction. No payment or allowance will be made for topsoil placed beyond the limits specified.

4.15.5. **PRICE TO COVER**. The contract price per cubic yard of topsoil shall cover the cost of all labor, materials, insurance, and equipment required to prepare the subgrade and to place the topsoil in its final compacted position, and in full compliance with the requirements of the specifications, and to furnish such samples for testing as may be required.

Payment will be made under:

Item No.	Item	Pay Unit
4.15	TOPSOIL	C.Y.

SECTION 4.15 SS – Structural Soil Foundation Material

4.15SS.1. **DESCRIPTION.** Under this Item, the Contractor shall furnish and install Structural Soil Foundation Material in accordance with the plans, specifications, and directions of the Engineer.

4.15SS.2. **MATERIALS.**

A. Structural Soil Foundation Material: Shall conform to CU-Soil™, as patented by Cornell University, patent #5,849,069. The product shall be obtained from a licensed producer and proof of such licensing shall be submitted to the Engineer prior to delivery. Tri-State licensed providers as of this date are East Coast Mines & Materials, Inc., East Quogue, NY 631-653-5445; Ascape Landscape, Blauvelt, NY, 845-353-6500; and, Advanced Soil Technologies, Brick, NJ, 732-840-1700. For further information on licensed providers or licensing requirements and application, contact Brian Kalter Operations Manager at Amereq, Inc., New City, NY 800-832-8788 (patentholder rights granted to Amereq, Inc. by Cornell Research Foundation).

Structural Soil components shall be mixed by the licensed producer to the following proportion:

Component	Unit of Weight (Dry)
Crushed Stone	83%
Clay Loam	17%
Hydrogel	As recommended by “CU Soil” licensed provider

B. Crushed Stone: Shall be crushed granite or traprock; no limestone or sandstone shall be accepted. No recycled material shall be accepted. Stone shall meet the AASHTO/ASTM C 33 requirements for #4 crushed angular stone graded within the following limits:

Passing Sieve (dry analysis)	Percent by Weight
2 inch	100%
1-1/2 inch	90-100%
1 inch	20-55%
3/4 inch	0-15%
3/8 inch	0-5%

Stone shall be clean and certified to meet NYCDOT aggregate soundness requirements for use in road construction. A single sized stone near one-inch (1") will be preferable to a wider size distribution or smaller single size stone fitting the general description.

C. Clay Loam: Shall be as determined by the USDA Classification System and mechanical analysis, as per ASTM D 422. Clay loam shall be of uniform composition, without admixture of subsoil, and free of stones greater than one-half inch (1/2") diameter, leaves, roots, debris, toxic materials, or lumps or clods over one inch (1") diameter. It shall have been obtained from naturally well drained areas which have never been previously stripped for topsoil and shall have a history of supporting satisfactory vegetative growth. It shall contain not less than two percent (2%) nor more than six percent (6%) organic matter, as determined by loss on ignition of oven-dried samples, dried to a constant weight at a temperature of 230° F, plus or minus 9 ^{o} F. Mechanical analysis for clay loam shall be as follows:

Textural Class	Percent of Total Weight (Dry)
Gravel	Less than 5%
Sand	20 - 50%
Silt	20 - 45%
Clay	20 - 40%

Clay loam shall meet or be amended to meet the following chemical analysis criteria:

1. pH between 5.5 and 6.5.
2. Organic matter 2 - 6 percent by dry weight.
3. Nutrient levels as required by the testing laboratory recommendations for the types of plants to be grown in the structural soil.
4. Toxic elements and compounds below the US EPA Standards for Exceptional Quality Sludge, or local standards, whichever are more stringent.
5. Soluble salts less than 1.0 millimho per cm.
6. Cation exchange capacity (CEC) greater than 10.
7. Carbon/ Nitrogen ratio less than 33: 1.

Clay loam shall be the product of a commercial processing facility specializing in production of stripped natural topsoil. No clay loam shall come from USDA classified prime farmland.

D. Slow Release Fertilizer: Commercial fertilizer shall comply with U.S. and N.Y. State fertilizer laws. Fertilizer shall be delivered in original unopened containers. The fertilizer shall be 15-2-15 liquid slow release (50%), or approved equivalent, formulated for mixing into the soil and certified by the manufacturer to provide controlled release of nitrogen continuously for a period of not more than twelve (12) months. Fertilizer shall be delivered in original unopened containers, which shall bear the manufacturer's certificate of compliance covering analysis, and shall be furnished to the Engineer.

E. pH Adjustment: To lower the clay loam pH to acceptable levels, commercial granular ferrous sulfate, ninety-six percent (96%) pure sulfur may be added to lower soil pH above 6.5. To raise

pH levels, the manufacturer may add agricultural limestone containing a minimum of eighty-five percent (85%) carbonates. Minimum gradation: 100% passing 10 mesh sieve, 98% passing 20 mesh sieve, 55% passing 60 mesh sieve, and 40% passing 100 mesh sieve.

F. Hydrogel: Shall be Gescape®, a potassium propenoate-propenamide copolymer hydrogel, as manufactured by Amereq, Inc., New City, N.Y., or an approved tested equivalent. However, no substitution is recommended since small changes in the hydrogel structure greatly change the quality of the structural soil.

4.15SS.3. SOIL MIXING AND QUALITY CONTROL TESTING. All Structural Soil shall be mixed using appropriate soil measuring, mixing, and shredding equipment of sufficient capacity and capability to assure proper quality control and consistent mix ratios. Structural soil must be mixed in the presence of the licensee, and no soil shall be placed until inspected by the licensee. No mixing of Structural Soil at the project site will be permitted unless a large paved area is available for mixing and the site has been pre-approved for use by the DDC Engineer. No Structural Soil shall be mixed or placed in air temperatures below 40º F or delivered or placed in frozen, wet, or muddy conditions. Material shall be delivered at or near optimal compaction moisture content, as determined by AASHTO T 99 (ASTM D 698). No material shall be delivered or placed in an excessively moist condition, beyond two percent (2%) above optimal compaction moisture content, as determined by AASHTO T 99 (ASTM D 698).

Warning: Do not mix or transport structural soil when rain is expected. Place pavement immediately after placing and compacting structural soil to prevent excessive hydration.

Structural Soil components and the finished mixture shall be protected from excess water absorption and erosion at all times. Do not store materials unprotected from rainfall, nor allow excess water to enter the site prior to compaction. If water is introduced into the material after grading, allow material to drain to near optimal compaction moisture content.

Add moisture gradually and evenly during the blending and mixing operation as required to produce the required moisture content. Add soil amendments to alter soil fertility, including fertilizer and pH adjustment at the rates recommended by soil test results. The soil pH shall be adjusted to fall between 5.5 and 6.5 two months after mixing, if the material is stored. The soil component Carbon/ Nitrogen ratio shall be adjusted to be less than 1:33 within two months after mixing.

The licensed supplier shall mix sufficient quantity in advance of the time the material is needed at the job site to allow adequate time for the required quality control testing. Storage piles shall be protected from rain and erosion by covering with plastic sheeting.

4.15SS.4. INSTALLATION. The Contractor shall notify the Engineer of any subsurface conditions which will affect the Contractor's ability to complete the work, and shall locate and confirm the locations of all underground utility lines and structures prior to starting any excavation in the area to receive Structural Soil by calling New York City/Long Island Call One Center, (800) 272-4480. The Contractor shall be liable to repair any damage to underground utilities or structures caused by their activity during the progress of this work, at their own expense. Where tree roots larger than one inch (1") diameter are damaged, the Contractor shall ensure that damaged root sections are cleanly cut with sterilized pruning equipment.

Structural Soil shall only be installed after the installation of all walls, curbs, footings, and utility work in the area has been completed. For site elements dependent on the Structural Soil for foundation support, postpone installation until immediately after the installation of the Structural Soil. The Contractor shall be responsible for any and all damage caused by the installation of structural soil and all disturbed areas shall be restored to their original condition, to the satisfaction of the Engineer.

Site Preparation: The Contractor shall excavate and compact the proposed subgrade to the required depths and dimensions indicated on the drawings or as directed in the field. Do not over excavate

compacted subgrades of adjacent pavement or structures. Confirm that the subgrade is at the proper elevation and compacted as required. The excavation shall be cleared of all construction debris, trash, rubble, and foreign material.

Topsoil meeting the requirements of **Section 4.15** can be used around the tree ball, with CU-Soil™ under the ball and under any pavement, both pervious, and non-pervious.

Install the first six inch (6") lift of Structural Soil mix over the prepared subgrade. Install succeeding layers in six inch (6") lifts and compact each lift. Compact all materials to not less than ninety-five percent (95%) of peak dry density from a standard AASHTO compaction curve (AASHTO T 99). No compaction shall occur when moisture content exceeds the maximum listed herein. Delay compaction at least twenty-four (24) hours if moisture content exceeds the maximum allowable, and protect the Structural Soil during delays in compaction with plastic or plywood, as directed by the Engineer.

Prior to placing pavement, the licensed CU-Soil™ provider and the Engineer shall check the CU-Soil™ material for consistency with the color and texture of the approved sample supplied by the Contractor. In the event that the material supplied varies significantly from the approved sample, the Engineer may request that the Contractor test the installed Structural Soil. Any mix which varies significantly from the approved testing results, as determined by the Engineer, shall be removed and new Structural Soil installed that meets the specifications.

4.15SS.5. SUBMITTALS. All submittals shall be in accordance with the requirements of the General Conditions, **Subsection 1.06.31**. The Contractor shall submit test reports for Structural Soil Foundation Material components from an approved independent testing laboratory indicating the following:

1. License: Submit the manufacturer's license to produce the patented CU-Soil™.

2 Clay Loam: Submit test results for particle size, bulk density, pH, percent organic content by weight, nutrient levels including nitrogen, phosphorus, and potassium, soluble salts in ppm, and chemical analysis. In addition, submit the locations of all field sources for the clay loam and a list of all chemicals, insecticides, and herbicides applied to the clay loam in the previous five (5) years, and a list of all crops grown in the clay loam source fields in the previous three (3) years.

3. Crushed Stone: A three pound (3 lb.) bag of crushed stone shall be submitted with test results and contract name and number attached for approval prior to installation. Submit test results for particle size, loose and rodded unit weight, bulk specific gravity, soundness, absorbance, and stone dimension description, as per ASTM D 4791, for the crushed stone.

4.15SS.6. MEASUREMENT. The quantity of STRUCTURAL SOIL FOUNDATION MATERIAL to be paid for under this Item shall be the number of CUBIC YARDS incorporated in the finished work to the satisfaction of the Engineer, measured in trucks used for delivery at the project site. Only water level loads will be accepted and no allowance will be made for any crown or peak of the load.

4.15SS.7. PRICE TO COVER. The contract price bid per CUBIC YARD of Structural Soil Foundation Material, measured in trucks, shall include the cost of all labor, materials, plant, equipment, insurance, and incidentals necessary to prepare and place the structural soil mix, which shall include, but not be limited to, clay loam, Hydrogel, crushed stone, fertilizer, pH adjustment, all required testing, submittals, licensing fees, and incidental expenses, in accordance with the plans, the specifications, and the directions of the Engineer.

Unclassified Excavation, Concrete Pavement without Base or Concrete Pavers, and Plant Material shall be paid for under their respective Contract Items.

Payment will be made under:

Item No.	Item	Pay Unit
4.15 SS	STRUCTURAL SOIL FOUNDATION MATERIAL	C.Y.

SECTION 4.16 - Trees (Removal, Transplanting, Planting)

4.16.1. INTENT. This section describes the removal, transplanting and planting of trees.

4.16.2. DESCRIPTION. The Contractor and/or subcontractors shall be certified by the New York State Department of Agriculture & Markets to perform work within the Asian Longhorned Beetle Quarantine Zone. The Contractor must review and abide by the description of the quarantine and compliance agreements as presented in the publication entitled Part 139 of the New York State, Department of Agriculture & Markets law. Full information can be obtained from Federal and State Pest Control personnel. Quarantine areas, for the purpose of this contract shall be defined as all five Boroughs of the New York City.

Due to current Federal and New York State laws and regulations concerning Asian Longhorned Beetle management, the following host species may not be planted in the quarantine zone. Host species are as follows: Acer-Maple, Aesculus-Horsechestnut/Buckeye, Salix-Willow, Betula-Birch, Populus-Poplar, Ulmus-Elm, Albiza-Mimosa/Silk Tree, Celtis-Hackberry, Fraxinus-Ash, Platanus-London Planetree, Sycamore, Sorbus-Montain Ash.

The Contractor must comply with all Federal, State, and City laws pursuant to the handling and disposal of woody organic material that is host material for the Asian Longhorned Beetle. All wood that is host material for the Asian Longhorned Beetle must be chipped, ground, or shredded inside the quarantine zone to a size of less than one (1”) inch in at least two dimensions before it is permitted to leave the quarantine zone. Please refer to Part 139 of the New York State Department of Agriculture and Markets law and contact State personnel for further details.

In addition, Nurseries located within the quarantine zone shall comply with State and Federal Law and all Contractors and/or Subcontractors shall be certified by the New York State Department of Agriculture and Markets to perform work within the Quarantine Zone.

(A) REMOVAL

Removal of trees, for disposal away from the site, shall consist of topping, felling, removing and disposing of the entire tree, including the stump and root system, to a minimum depth of three (3’) feet below the existing adjacent grade, unless otherwise required.

Removal of tree stumps, for disposal away from the site, shall consist of removing and disposing of designated existing stumps over six (6”) inches in diameter. Stumps shall be defined as the lower end of a tree or plant remaining in the ground after most of the stem or trunk has been cut off by others prior to the start of work. All stumps six (6”) inches in diameter and under shall be removed in accordance with the requirements of **Section 6.01**.

Removal of trees and tree stumps shall include all necessary excavation of materials of whatever nature encountered; backfilling of excavations with acceptable material; and disposing of trees and stumps away from the site, as herein specified or as directed by the Engineer.

(B) TRANSPLANTING (up to four (4”) inch caliper)

Transplanting shall consist of the removal of existing trees; re-planting at new locations; storing on the site for later replanting; or delivering removed trees to such locations, away from the site, as the Engineer shall direct.

Transplanting shall include all necessary digging, bailing, burlapping, platforming, hauling, handling and heeling-in; and, when necessary or directed, re-digging, re-balling, re-burlapping, re-hauling and re-handling of trees designated to be transplanted and maintaining said trees as provided in **Subsection 4.16.6.**

(C) PLANTING

Planting shall consist of furnishing, when required; delivering; hauling; and handling and planting of new trees at locations shown on the Contract Drawings or directed by the Engineer.

Planting shall include, but not be limited to, all labor, materials, plant and equipment required for excavation of all materials of whatever nature encountered; furnishing topsoil; placing topsoil in new tree pits; constructing tree wells; staking, spraying, pruning, protecting and maintaining all trees; and furnishing and installing all other incidentals required for the proper performance of the work; all, in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

4.16.3. GENERAL.

(A) REMOVAL

No trees shall be removed without first obtaining a permit from the Department of Parks and Recreation (DPR).

Trees which are wholly or partly within roadway areas shall be removed. Trees wholly within sidewalk areas shall only be removed when permitted by DPR. Trees on abutting properties shall be removed when shown on the Contract Drawings or when directed by the Engineer.

Tree stumps shall be removed when directed.

(B) LANDSCAPE CONTRACTOR

All work shall be done by competent Landscape Contractors acceptable to the Engineer.

(C) PLANTING OPERATIONS

1. Tree planting shall commence at the first available planting season but no later than at 50% of contract duration period milestone and all newly planted trees shall be protected from adjacent construction as required for existing trees in accordance with the requirements of Section 4.22. Trees shall be transplanted and/or planted only while dormant in the season as the Engineer may direct. Tree planting operations shall be done in accordance with the following specifications. Spring planting shall commence no earlier than March 1st and finish no later than May 15th. Fall planting shall proceed from October 1st through December 15th, unless otherwise directed by the Engineer.

2. Upon the Engineer's determination that it is impracticable or impossible to plant all required new trees or transplant all required existing trees or any smaller number of them within a planting season which falls within the contract time, the Engineer's Final Certificate may be issued, provided the Contractor presents evidence that he has deposited with the Commissioner a sum of money equal to eighty (80) percent of the contract price bid for each tree not then planted or transplanted, to cover the cost of furnishing or removing the tree; its planting or transplanting, as specified; and maintenance for twenty-four (24) months.

3. The Contractor, however, will be required to excavate the tree pits to size and furnish and place topsoil in accordance with the requirements of the specifications. Such tree pits, in areas subject to pedestrian traffic and where directed by the Engineer, shall have the topsoil overlaid with a two (2") inch thickness of binder to be paid for under Item No. 4.02 CA or 4.02 CB (as provided in the Bid Schedule).

4.16.4. MATERIALS.

(A) TREES

1. Plant Schedule

Type and size of trees to be planted shall be as specified in the Bid Schedule or as shown on the Contract Drawings.

NOTE: All trees, except as otherwise permitted by the Engineer due to non-availability in certain species, shall have single straight trunks with leader intact, and symmetrical, well-branched tops.

Trees having limb cuts over three-quarters (3/4) of an inch on nursery-grown trees or over one and one-half (1-1/2") inches on collected trees which have not completely calloused over will not be accepted.

Heavy fibrous root system is essential. No cut back trees will be accepted.

2. Names

Plant names shall agree with the nomenclature of "Standardized Plant Names" as adopted by the American Joint Committee on Horticultural Nomenclature 1942 edition: size and grading standards shall conform to those of the American Association of Nurserymen *American Standards for Nursery Stock*, 1996 Edition, unless otherwise specified. No substitutions shall be permitted except by written permission of the Engineer. All tree cultivars, patented or otherwise, must be certified by the supplying nursery. All nurseries shall be required to have a registration certificate from the Department of Agriculture & Markets, Division of Plant Industry, New York State certifying that plant material is free from injurious insect and plant diseases. A similar certificate shall be required from other states where plant material is obtained.

3. Quality

All trees shall be typical of their species or variety. They shall have normal well-developed branches and a vigorous fibrous root system. They shall be sound, healthy, vigorous trees, free from defects, disfiguring knots, sunscald injuries, abrasions of the bark, plant diseases, insect eggs, borers and all forms of infestations. Containerized material shall be free from girdling roots. Trees shall not have damaged or missing leaders, multiple leaders, Y-crotches, or indications of topping or heading back. All trees including replacement trees shall be inspected and tagged at the nursery prior to digging and planting. All trees shall be nursery grown and shall have been growing under the same climatic conditions as those occurring in New York City for at least two (2) years prior to date of the contract. Trees held in storage shall be rejected if they show signs of growth during storage. All trees shall be limbed up to a minimum of five feet (5') from the ground.

4. Dimensioning

A tree shall be dimensioned as it stands in the nursery, and shall be calipered at a point six (6") inches above the ground for trees six (6") inches or less in diameter. The stock furnished shall be a fair average of the minimum and maximum sizes specified.

5. Preparation for Shipping

Care shall be exercised in digging and precautions customary in good trade practice shall be taken in preparing trees for shipment and transplanting. Workmanship that fails to meet the highest standards will be rejected and the Contractor shall replace the damaged or rejected stock with acceptable material at no additional cost to The City. Trees shall be dug to retain as many fibrous roots as possible and immediately before moving, unless otherwise specified. Balled and burlapped trees shall have a solid ball of earth securely held in place with biodegradable burlap and stout rope or wire baskets. No manufactured balls will be accepted. If the specified tree size is unavailable, oversize trees may be substituted at no extra cost to the City.

Ball diameters shall be not less than the following:

Tree Caliper	Minimum Root Ball Diameter
from 2-1/2" to under 3"	30"
from 3" to under 3-1/2"	36"
from 3-1/2" to under 4"	42"
from 4" to under 4-1/2"	46"
from 4-1/2" to under 5"	52"
from 5" to under 6"	60"

6. Shipments and Certification

All plants shall be packed, transported and handled with utmost care and in such manner as to insure adequate protection against desiccation, climatic, seasonal and other injuries. When transported in closed vehicles, plants shall receive adequate ventilation to prevent sweating. When transported in open vehicles, plants shall be protected by tarpaulins or other suitable cover material. Unloading shall be carefully done to prevent injury to plants. Balled and burlapped trees shall be set on the ground and balls covered with mulch if not immediately planted. Until planted, all materials shall be properly maintained and kept adequately watered. Each shipment shall be certified by the State and Federal Authorities to be free from disease and infestation. Any inspection certificates required by law to this effect shall accompany each shipping invoice or order of stock and on arrival, the certificate shall be filed with the Engineer. Plants from areas infested with London Plant Disease or Canker shall be accompanied by a certificate stating that the trees are free from these infestations.

7. Inspection

Inspection of plants may be made before digging if the Engineer directs but no shipment of plant materials shall be planted by the Contractor until such material has been inspected by the Engineer at the site of the work. All rejected material shall be immediately removed from the site and replaced with acceptable material at no additional cost. Final inspection shall be made on completion of the contract.

(B) TOPSOIL

Topsoil shall comply with the requirements of **Section 2.26**.

(C) MULCH

Shredded bark mulch shall be a natural forest product of at least 98% bark containing less than 2% wood or other debris. It shall be of White or Red Fir and/or Pine bark of a uniform grade with no additives or any other treatment. Size of bark shall be from 5/8" to 1-1/4". The pH factor should range from 5.8 to 6.2. Shredded bark may also be used. Samples shall be submitted to and approved by the Engineer prior to use.

Shredded bark mulch shall be applied to the surface of tree pit areas, as shown on the Contract Drawings and as directed by the Engineer. Mulch shall be applied to a uniform depth of three (3) to four (4) inches over the tree pit, and shall be so distributed as to create a smooth level cover over the exposed soil.

(D) WATER

If conditions do not allow the use of New York City water sources, the Contractor must obtain its own source of water.

(E) MYCORRHIZAL FUNGI INOCULANT

Mycorrhizal fungi inoculant shall be applied by means of a three ounce (3 oz.) premeasured dry formulation packet, such as Mycor Tree Saver Transplant®, as manufactured by Plant Health Care, Inc., Pittsburgh, PA; Rhizanova Tree Transplant, as manufactured by Becker Underwood, Inc., Ames, IA; DIEHARD®, as manufactured by Horticultural Alliance and distributed through Atlantic Irrigation, White Plains, NY; or, an approved equivalent. Packets shall contain, as a minimum: one thousand (1,000) live spores of Vesicular-Arbuscular fungi, including: *Entrephosphora columbiana*, *Glomus clarum*, *Glomus etunicatum*, and *Glomus sp.;* seventeen million five hundred thousand (17,500,000) live spores of Ectomycorrhizal fungi, including: *Pisolithus tinctorius*; biostimulants including *Yucca schidigera* extract; soluble sea kelp extract derived from *Ascophylum nodosum*; humic acids; and acrylamide copolymer gel as a water absorbent medium.

Inoculant shall be added after the trees have been placed in their hole. Three (3) packets for each 2-1/2" to 3" caliper tree and four (4) packets for each 3-1/2" to 4" caliper tree shall be added to the top six to eight inches (6 to 8") of backfill soil added to each pit and thoroughly mixed to distribute the inoculant. The opened packets shall be given to the Engineer at the end of each day. Mycorrhizal innoculant is a dated material and must be used before it expires.

The material shall be applied according to the following chart:

Size of rootball or container	Ounces per plant
30" B&B	9
36" B&B	12
42" B&B	12

(F) WATER RETENTION ADDITIVE

Water retention additives shall be a granular polyacrylamide polymer of a potassium base and not a sodium base that slowly releases water into the root zone such as Terra Sorb®, as manufactured by Plant Health Care, Inc., Pittsburgh, PA; Soil Moist™ as manufactured by JRM Chemical, Inc., Cleveland, OH; or, an approved equivalent. The water retention additive shall be applied at the time of planting during a dry planting season as defined by the Department of Parks and Recreation. Each tree shall receive three (3) ounces or an amount specified by the product instructions. When planting shrubs, perennials or annuals, apply as per product instructions.

(G) BURLAP

Burlap shall be a natural fabric. No nylon burlap shall be permitted.

(H) CORD OR ROPE

Cord or rope shall be sisal twine. Nylon rope shall not be permitted.

4.16.5. METHODS.

(A) TREE REMOVAL

1. All tree removals must be completed by a tree company approved by the Department of Parks and Recreation (DPR), and said company must obtain the necessary permits from DPR before undertaking any removal work.

2. Trees to be removed but not designated to be transplanted, shall be completely removed, including the root systems, to a depth of not less than three (3') feet below the existing adjacent grade. After removal, the Contractor shall dispose of said trees, away from the site. The disposal of trees by burning in open fires will not be permitted.

3. The topping of a tree without the immediate removal of its trunk will not be permitted. Once the Contractor initiates removal of a tree, the operation must continue without interruption to a height no greater than six (6") inches above existing grade. The remaining tree stump and root system may be removed during another operation subject to approval of the Engineer; however, the cost of removal and disposal of the remaining tree stump and root system shall be deem included in the price bid for tree removal.

(B) STUMP REMOVAL

1. Tree stumps designated to be removed and their roots shall be completely excavated to a minimum depth of three (3) feet below the existing grade. A portable stump cutter may be required in some locations. It may be necessary to remove concrete, asphalt, pavers, and/or other types of material surrounding the base of the stump. All excess debris, including chips from tree stumps, shall be removed and disposed of by the Contractor, away from the site prior to backfilling and the area shall be restored by completion of the workday, to the satisfaction of the Engineer. The disposal of tree stumps by burning in open fires will not be permitted.

2. All voids and excavations left after the removal of the stump and roots shall be backfilled to grade with clean earth fill. Fill shall be placed and compacted to a minimum of 95 percent of Standard Proctor Maximum Density by acceptable methods to the satisfaction of the Engineer. Where paving blocks exist, they are to be reset to the existing grade as directed.

3. Maximum safety and care must be used by Contractor during stump removal. The Contractor shall carefully protect against damage all existing trees, plants, curbs, sidewalks and utilities and other features to remain. The Contractor is responsible for locating and protecting underground utilities from damage during stump removal procedures. During stump grinding operations, plywood must be used to protect adjacent vehicles, real property, and pedestrians. If, when removing stumps, existing sidewalks or curbs are disturbed, the Contractor shall restore and/or reset these sidewalks and curbs, at no additional cost to the City. Restoration work shall be done to match the existing, to the satisfaction of the Engineer. All damaged trees, curbs, sidewalks, real property, vehicles and utilities must be addressed within three (3) days.

(C) TRANSPLANTING

1. The Contractor shall transplant trees and maintain and replace all trees as specified, in accordance with the plans, the specifications, and directions of the Engineer.

2. The Contractor shall be liable for any damages to property by transplanting operations and all areas disturbed shall be restored to their original condition, to the satisfaction of the Engineer.

3. Preparation of Plants: All precautions customary in good trade practice shall be taken in preparing plants for moving, and workmanship that fails to meet the highest standards will be rejected. All plants shall be dug immediately before moving unless otherwise directed. All plants shall be dug to retain as many fibrous roots as possible. Plants shall be balled and

burlapped having a solid ball of earth of minimum specified size according to the American Association of Nurserymen Standards (November 1996) securely held in place by burlap and sisal twine. Root balls require Drum Lacing and shall be laced with three (3) ply sisal. All root balls shall be inspected by the Engineer before moving. Loose, broken, and wire caged balls will be rejected. All rejected material shall be immediately removed from the site and replaced with acceptable material at no additional cost.

4. Time of Transplanting: Unless otherwise directed by the Engineer, material shall be transplanted from March 1st to May 15th and from October 1st to December 15th.

5. Excavation of Planting Pits: Sizes of planting pits shall be determined by the Engineer, in consultation with the Contractor's Tree Consultant.

6 Planting: No transplanting shall be done except in the presence of the Engineer.

7. Replacement: The Contractor shall replace in accordance with the contract plans and specifications any transplanted trees that are dead or, in the opinion of the Engineer in consultation with the Contractor's Tree Consultant, are in an unhealthy or unsightly condition, and/or have lost their natural shape due to dead branches, excessive pruning, inadequate or improper maintenance, or other causes.

8. Care shall be exercised in digging and preparing trees for transplanting. Each tree shall be dug with sufficient roots and shall have a solid ball of earth securely held in place by burlap and stout rope and shall be platformed. No manufactured balls will be accepted. Each tree shall be dug with a ball of earth not less in diameter than that specified for new trees.

9. Trees to be stored on the site for later replanting shall be prepared as in the preceding paragraph, hauled to a location to be designated by the Engineer and heeled-in at such location to the satisfaction of the Engineer until such time as replanting may be progressed. At the time of replanting, heeled-in trees shall be dug up and hauled to the replanting or delivery location. When required by the Engineer, heeled-in trees shall be re-balled, re-burlapped or re-platformed before hauling to the replanting location or delivery point.

10. The Contractor shall haul and deliver designated trees, prepared for transplanting or replanting as above, to such locations on or away from the site as the Engineer shall direct.

11. Trees designated to be transplanted, damaged due to the Contractor's operations, shall be replaced with new trees, by the Contractor, to the satisfaction of the Engineer at no additional cost to The City.

12. Hauling and unloading of trees to be transplanted, shall be carefully done to prevent injury. All trees transplanted, or to be transplanted, shall be protected by the Contractor and such trees as are injured or removed before the acceptance of the work shall be replaced with new trees at the expense of the Contractor.

13. At the time of transplanting and as frequently thereafter as weather conditions require, the soil around each tree shall be thoroughly saturated with water until acceptance of the work.

14. The work of planting trees designated to be transplanted and trees furnished as replacements for injured trees shall be as specified in (D), below.

(D) PLANTING

1. Excavation for Tree Pits

The Contractor shall excavate all materials of whatever nature encountered (except excavation of boulders in open cut and ledge rock) for all tree pits to a minimum depth of twenty-four (24") inches, but not more than the depth of the root ball.

For street trees, the pits shall be made as large as possible as determined by the Engineer, in accordance with the New York City Department of Transportation's Standard Details of Construction Standard Drawing No. H-1046, unless otherwise shown on the Contract Drawings, and the items provided in the Bid Schedule. For trees to be planted in open areas, the excavated pit shall be three (3) time the diameter of the rootball. All pits shall have vertical sides unless otherwise directed. The Contractor shall scar the surface of the excavated pit walls to avoid the smooth glaze created by machinery.

No plant pits shall be dug until the proposed locations have been staked on the ground by the Contractor and approved by the Engineer; no plant pits shall be backfilled until approved by the Engineer. Subsoil from planting excavation shall be removed from the site and disposed of as directed by the Engineer. The area is to be made safe and secure at the end of the work day.

2. Backfilling for Tree Pits

Backfill for tree pits shall consist of topsoil.

3. Barricades

During excavation and planting operations, all pits, trees, and planting materials shall be protected carefully with strong, well constructed temporary barricades, where required, to the satisfaction of the Engineer. Any material which for any cause is damaged during operations shall be replaced by the Contractor at no cost to The City, with the same size, type and quality approved by the Engineer.

4. Planting

No planting shall be done except in the presence of the Engineer or his authorized representative. All trees shall stand, after settlement, at the same levels at which they have grown, i.e., at the base of the trunk flare. Care shall be exercised in setting the trees plumb. Ropes, stones, etc., shall be removed from the holes before backfilling; and all topsoil for backfilling shall be loose and friable and not frozen.

All girdling roots shall be removed. Circling roots shall be separated and spread out so as to not impede future growth. Place balled and burlapped material in the prepared planting pit by lifting, and carry it by the rootball so that the ball will not be loosened. Set the tree straight and in the center of the pit with the most desirable side facing toward the predominant view. The Contractor's attention is called to the different widths of curbs and that a uniform distance shall be maintained from the center of the tree to the outside of the curb, or as directed by the Engineer, in consultation with the Contractor's Tree Consultant. All trees shall set, after settlement, at the level of the base of the trunk and the beginning of the roots known as the "trunk flare." If the top of the rootball is not consistent with this area, soil will be added or removed to make it so, and the depth of the planting site adjusted accordingly. Care shall be exercised in setting the trees plumb.

Cut and remove rope or wire from the top two-thirds (2/3) of the rootball. Remove as much woven product and twine as possible. All plastic or synthetic fabric must be removed from the ball at the time of planting. Remaining lateral wires must be cut to prevent future root interference. Wire must not be galvanized or aluminum wire.

At least two-thirds (2/3) of the burlap shall be removed from the tree pit and the remaining burlap pulled back and adjusted to prevent the formation of air pockets. Where directed by the Engineer, in consultation with the Contractor's Tree Consultant, the burlap shall be entirely removed. All ropes, stones, etc. shall be removed from the planting site before backfilling. Backfilling mixture shall be loose

and friable, and not frozen. Soil shall be firmed at six (6) to eight (8") inch intervals and thoroughly settled with water.

5. Tree Wrap

No tree trunks shall be wrapped. The Contractor shall be required to remove all nursery tags and protective wrapping.

6. Staking of Trees

All staking of trees shall be done during planting operations and stakes shall be maintained until date of Engineer's Final Certificate. Trees shall stand plumb after staking. Stakes shall be removed by the Contractor one (1) year after planting of said trees and prior to the final acceptance of the work.

All trees shall be supported by two (2) stakes. Stakes for street trees shall be parallel to the curb. Stakes shall be eight (8') feet long of white cedar with bark attached and shall show no sign of cracking or decay. They shall have a maximum allowable deflection of ten (10%) percent. In the event that the stakes are not long enough to produce secure supports, the Contractor shall, when so directed by the Engineer, furnish and install longer stakes for the purpose, at no additional cost to the City. Stakes shall have a diameter at the middle of not less than two (2") inches nor more than two and three-quarter (2-3/4") inches and a diameter of not less than one and three-quarter (1-3/4") inches at the tip nor more than three (3") inches at the butt.

Stakes shall be driven about thirty (30") inches into the ground and fastened securely to the trees with a suitable length of three-quarter (3/4") inches wide, flat, woven polypropylene material such as Arbortie™ as manufactured by DeepRoot®, San Francisco, CA; Arborbrace Tree-tie Webbing as manufactured by Arborbrace Staking Systems, Inc., Miami, Fl. 33156, tel. (305) 992-4104; TreeTie™ as manufactured by Nelco, 22 Riverside Dr., Pembroke, MA. 02359, tel. (800) 491-2812; or, an approved equivalent that is knotted or nailed to the stakes with one (1") inch galvanized roofing nails as directed by the Engineer. No wire or hose is to be used to stake trees.

All stakes shall be driven about one (1') foot away from the trunk face, taking care to stay clear the root ball.

7. Pruning

Only dead, crossing, broken or badly bruised branches shall be removed by pruning with a clean cut. All pruning shall be done with sharp tools. At the time of planting, pruning cuts shall be made at the base of the branch at such a point and angle that neither the branch collar nor the bark of the stem is damaged, and that no branch stub extends from the collar. Crowns of young trees shall not be cut back to compensate root loss. No leaders shall be cut.

8. Watering

At the time of planting, the soil around each tree shall be thoroughly saturated with at least twenty (20) gallons of water. Soil shall be firmed at six (6) to eight (8") inch intervals and thoroughly settled with water. Water shall be free from oil, have a pH not less than 6.0 nor greater than 8.9 and shall be free from impurities injurious to vegetation. Unless otherwise directed, water may be drawn from mains owned by or supplying water to the City of New York.

Water shall not be applied in a manner which damages plants, plant saucers, stakes or adjacent areas. Each plant saucer shall be carefully filled with water in a manner which does not erode the soil or the plant saucer. Watering shall not cause uprooting or exposure of plant's roots to the air.

9. Concrete Sidewalk

When required for the construction of new tree pits, the Contractor shall carefully saw cut existing sidewalk so as not to destroy any sidewalk beyond the limits of the tree pit. Any sidewalk disturbed beyond the limits of the tree pit shall be restored by the Contractor at his own cost and expense; the restoration to be in accordance with the standard specification for concrete sidewalk.

4.16.6. MAINTENANCE. The Contractor shall maintain all trees at his own expense and at no additional cost to The City, to the satisfaction of the Engineer as provided in Section 5.05. Maintenance shall include watering, mulching, weeding, cultivating, edging, control of insects, fungus and other diseases by means of spraying with approved insecticide or fungicide, pruning, anchoring, adjusting and tightening fasteners and adjusting stakes, and other horticultural operations necessary for the proper growth of all plants and for keeping the whole area neat in appearance.

4.16.7. REPLACEMENT. The Contractor shall replace in accordance with the Contract Drawings and specifications, at no additional cost to The City, any tree that dies during planting, transplanting or removal for transplanting; or which, in the opinion of the Engineer, is in unhealthy, stunted or unsightly condition; unable to flourish and/or has lost its natural shape due to dead branches, excessive pruning, inadequate or improper maintenance or other causes during the maintenance period. The Engineer shall be the sole judge of the condition of the trees in question. The replacement shall be with new trees of the same size and species as originally planted, except when such death unhealthiness, stunting, unsightliness or inability to flourish is due to vandalism or damage resulting from causes over which the Contractor has no control, as certified by the Engineer. However, the Engineer may, at his discretion, direct a substitution of species.

4.16.8. MEASUREMENT.

(A) TREE REMOVAL

1. The quantity to be measured for payment shall be the number of trees, four (4”) inches or more in diameter, removed and disposed of as shown on the Contract Drawings, as specified and as directed by the Engineer.

2. No payment will be made hereunder for trees removed and disposed of under other Sections or other provisions of this Section when the contract prices bid for the work to be done thereunder includes the cost of removing and disposing of such trees.

3. No direct payment will be made for the removal of trees less than four (4”) inches in diameter but the cost thereof will be deemed to be included in all the scheduled contract prices.

4. The removal of existing stumps, including root systems, is provided for elsewhere and no payment will be made hereunder for such removal and disposal.

5. Measurement of the diameter of trees shall be made four and one-half (4-1/2’) feet above the adjacent ground.

6. A tree having a single root system and more than one trunk at a height four and one-half (4–1/2’) feet above the adjacent ground shall be considered a multiple-trunk tree. The caliper of a multiple-trunk tree, to be measured for payment, shall be the square root of the summation of the squares of the calipers of the several trunks, except that trunks of less than three (3”) inch caliper will not be considered or included.

(B) STUMP REMOVAL

The quantity of stump removal to be measured for payment shall be the number of stump units of tree stumps over six (6”) inches in diameter calculated in accordance with the payment schedule specified under **Subsection 4.16.9**, and the directions of the Engineer.

Measurement of the diameter of each tree stump shall be made two (2') feet above the adjacent ground or at the top of the tree stump, whichever is lower.

Tree stumps of trees removed under other contract items shall not be measured for payment under this item.

(C) TRANSPLANTING

The quantity to be measured for payment hereunder shall be the number of existing trees transplanted and maintained in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

(D) PLANTING

The quantity to be measured for payment hereunder shall be the number of new trees, of each size, furnished, planted and maintained in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

4.16.9. PAYMENT SCHEDULE FOR STUMP REMOVAL. The Contractor will be paid at the following rates for the different size groups of stumps removed based on the unit bid price for removing a stump over six (6") inches to twelve (12") inches in diameter (base Unit).

STUMP DIAMETER	STUMP UNITS	PAYMENT PER STUMP REMOVED
Over 6" to 12"	1.0 (base Unit)	100% of Unit Bid Price
Over 12" to 18"	1.25	125% of Unit Bid Price
Over 18" to 24"	1.5	150% of Unit Bid Price
Over 24" to 30"	2.0	200% of Unit Bid Price
Over 30" to 36"	2.25	225% of Unit Bid Price
Over 36" to 42"	2.5	250% of Unit Bid Price
Over 42"	3.5	350% of Unit Bid Price

For example, removal of one (1) 16" diameter stump would receive payment for 1.25 stump units, removal of one (1) 36" diameter stump would receive payment for 2.25 stump units and one (1) 26" diameter stump would receive payment for 2.0 stump units for a total of 5.50 stump units.

4.16.10. PRICES TO COVER.

(A) TREE REMOVAL (UNIT PRICE)

The contract price shall be a unit price per existing tree, of the size specified, removed; and shall cover the cost of all labor, materials, equipment, insurance, and incidentals required to complete the work including the necessary excavation of all materials of whatever nature encountered; backfilling of excavations with acceptable material; and the disposal of removed trees; all, together with necessary incidentals, in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

Additional trees to be removed and disposed of from abutting properties at the direction of the Engineer, when such removal and disposal is not shown on the Contract Drawings, will be measured and paid for in accordance with Provisions 4.16.8.(A).

(B) STUMP REMOVAL

The contract price per each stump unit shall cover the cost of all labor, materials, equipment, insurance, and incidentals necessary to remove stumps, including, but not limited to, disposal of any generated material and required fees for disposal, borrowed fill, restoration of walks and curbs disturbed by this

operation, maintenance and repair of utilities and all other incidentals necessary to complete the work in accordance with the specifications to the satisfaction of the Engineer.

The stump diameter shall be measured in the presence of the Engineer.

Stumps 6" diameter and under shall be removed in accordance with the requirements of **Section 6.01**, "**Clearing and Grubbing**".

(C) TRANSPLANTING

The contract price for transplanting shall be a unit price per tree and shall cover the cost of all labor, material, plant, equipment, insurance, and incidentals necessary to complete the work of transplanting existing trees, as shown on the Contract Drawings, as specified and as directed by the Engineer.

The cost of furnishing and incorporating topsoil in tree pits, and spreading mulch over tree pits are also included in the unit price bid for each transplanting item.

(D) PLANTING

The contract price for planting shall be a unit price per tree and shall cover the cost of all labor, materials, plant, equipment, inspections, insurance, and incidentals necessary to complete the work of planting new trees, as shown on the Contract Drawings, as specified and as directed by the Engineer.

The cost of furnishing and incorporating topsoil in tree pits, and spreading mulch over tree pits are also included in the unit price bid for each planting item.

Payment will be made under:

Item No.	Item	Pay Unit
4.16 AA	TREES REMOVED (4" TO UNDER 12" CALIPER)	EACH
4.16 AB	TREES REMOVED (12" TO UNDER 18" CALIPER)	EACH
4.16 AC	TREES REMOVED (18" TO UNDER 24" CALIPER)	EACH
4.16 AD	TREES REMOVED (24" CALIPER AND OVER)	EACH
4.16 ADE	TREES REMOVED (24" TO UNDER 48" CALIPER)	EACH
4.16 AE	TREES REMOVED (48" CALIPER AND OVER)	EACH
4.16 BA405	TREES PLANTED, 2-1/2" TO 3" CALIPER, ALL TYPES, IN 4' X 5' TREE PITS	EACH
4.16 BA505	TREES PLANTED, 2-1/2" TO 3" CALIPER, ALL TYPES, IN 5' X 5' TREE PITS	EACH
4.16 BA510	TREES PLANTED, 2-1/2" TO 3" CALIPER, ALL TYPES, IN 10' X 5' TREE PITS	EACH
4.16 CA405	TREES PLANTED, 3" TO 3-1/2" CALIPER, ALL TYPES, IN 4' X 5' TREE PITS	EACH
4.16 CA505	TREES PLANTED, 3" TO 3-1/2" CALIPER, ALL TYPES, IN 5' X 5' TREE PITS	EACH
4.16 CA510	TREES PLANTED, 3" TO 3-1/2" CALIPER, ALL TYPES, IN 5' X 10' TREE PITS	EACH
4.16 DA405	TREES PLANTED, 3-1/2" TO 4" CALIPER, ALL TYPES, IN 4' X 5' TREE PITS	EACH
4.16 DA505	TREES PLANTED, 3-1/2" TO 4" CALIPER, ALL TYPES, IN 5' X 5' TREE PITS	EACH
4.16 DA510	TREES PLANTED, 3-1/2" TO 4" CALIPER, ALL TYPES, IN 5' X 10' TREE PITS	EACH
4.16 EA405	TREES PLANTED, 4" TO 4-1/2" CALIPER, ALL TYPES,	

	IN 4' X 5' TREE PITS	EACH
4.16 EA505	TREES PLANTED, 4" TO 4-1/2" CALIPER, ALL TYPES, IN 5' X 5' TREE PITS	EACH
4.16 EA510	TREES PLANTED, 4" TO 4-1/2" CALIPER, ALL TYPES, IN 5' X 10' TREE PITS	EACH
4.16 CAT405	TREES TRANSPLANTED, 3" TO 3-1/2" CALIPER, ALL TYPES, IN 4' X 5' TREE PITS	EACH
4.16 CAT505	TREES TRANSPLANTED, 3" TO 3-1/2" CALIPER, ALL TYPES, IN 5' X 5' TREE PITS	EACH
4.16 CAT510	TREES TRANSPLANTED, 3" TO 3-1/2" CALIPER, ALL TYPES, IN 5' X 10' TREE PITS	EACH
4.16 DAT405	TREES TRANSPLANTED, 3-1/2" TO 4" CALIPER, ALL TYPES, IN 4' X 5' TREE PITS	EACH
4.16 DAT505	TREES TRANSPLANTED, 3-1/2" TO 4" CALIPER, ALL TYPES	EACH
	IN 5' X 5' TREE PITS	EACH
4.16 DAT510	TREES TRANSPLANTED, 3-1/2" TO 4" CALIPER, ALL TYPES	EACH
	IN 5' X 10' TREE PITS	EACH
4.16 *xxxxxx*	TREES PLANTED, (*Size and type of tree and tree pit size as specified in Bid Pages*)	EACH
4.16 *xxxxxx*	TREES TRANSPLANTED, (*Size and type of tree and tree pit size as specified in Bid Pages*)	EACH
4.16 STUMP	STUMP REMOVAL	UNIT

Note: *xxxxxx* denotes serialized pay item.

SECTION 4.17 - Shrubs and Groundcover

4.17.1. INTENT. This section describes the planting of shrubs and groundcovers.

4.17.2. DESCRIPTION. The Contractor and/or subcontractors shall be certified by the New York State Department of Agriculture & Markets to perform work within the Asian Longhorned Beetle Quarantine Zone. The Contractor must review and abide by the description of the quarantine and compliance agreements as presented in the publication entitled Part 139 of the New York State, Department of Agriculture & Markets law. Full information can be obtained from Federal and State Pest Control personnel. Quarantine areas, for the purpose of this contract shall be defined as all five Boroughs of the New York City.

Due to current Federal and New York State laws and regulations concerning Asian Longhorned Beetle management, the following host species may not be planted in the quarantine zone. Host species are as follows: Acer-Maple, Aesculus-Horsechestnut/Buckeye, Salix-Willow, Betula-Birch, Populus-Poplar, Ulmus-Elm, Albiza-Mimosa/Silk Tree, Celtis-Hackberry, Fraxinus-Ash, Platanus-London Planetree, Sycamore, Sorbus-Montain Ash.

The Contractor must comply with all Federal, State, and City laws pursuant to the handling and disposal of woody organic material that is host material for the Asian Longhorned Beetle. All wood that is host material for the Asian Longhorned Beetle must be chipped, ground, or shredded inside the quarantine zone to a size of less than one (1") inch in at least two dimensions before it is permitted to leave the quarantine zone. Please refer to Part 139 of the New York State Department of Agriculture and Markets law and contact State personnel for further details.

In addition, Nurseries located within the quarantine zone shall comply with State and Federal Law and all Contractors and/or Subcontractors shall be Certified by the New York State Department of Agriculture and Markets to perform work within the Quarantine Zone.

Planting shall consist of the furnishing, delivering, hauling, and handling and planting of new shrubs and groundcover at locations shown on the Contract Drawings or directed by the Engineer.

Planting shall include all labor, materials, plant and equipment required for all excavation of all materials of whatever nature encountered (except excavation of boulders in open cut and ledge rock); furnishing soil amendments and topsoil; incorporating soil amendments into topsoil; placing topsoil and incorporated soil amendments in new shrub and groundcover beds; fertilizing; spraying, pruning, protecting and maintaining all plants; and furnishing and installing all other incidentals required for the proper performance of the work; all, in accordance with the Contract Drawings, the specifications and the direction of the Engineer.

4.17.3. GENERAL. Requirements for Landscape Contractor and Planting Operations shall comply with the requirements of **Subsection 4.16.3**.

4.17.4. MATERIALS.

(A) PLANT MATERIAL

Type and size of plants shall be as specified in the Bid Schedule or as shown on the Contract Drawings.

Requirements for Plant Names, Quality, Dimensioning, Preparation for Shipping, Shipments, Certification and Inspection shall comply with **Subsection 4.16.4**. The word “SHRUB” as used herein shall include all groundcover, vines and other planting materials required, with the exception of plant material listed under Item Nos. starting with “4.16” and Item Nos. 4.19 and 4.20.

All plants shall be typical of their species or variety and nursery-grown, unless otherwise stated. They shall have normal, well-developed branches and vigorous fiborous root systems. They shall be sound, healthy, vigorous plants free from defects, disfiguring knots, sun scald injuries, dead or broken branches, abrasions of the bark, plant diseases, insect eggs, borers, and all forms of infestation. All plant material shall be delivered in pots, pans, or other containers, or balled and burlapped. Containerized material shall be free from girdling roots. Bare root plant material, as well as any other plant material not meeting the above requirements, delivered to the site will be rejected. All rejected material shall be removed from the site and replaced with acceptable material at no additional cost to the City.

All shrubs shall have been grown under similar climatic conditions as the project site two (2) years prior to the date of the project. Plants held in storage will be rejected if they show signs of growth during storage. Collected plants shall be taken from a soil favorable to good root development. All collected materisl shall be clean sound stock, free for decaying stumps.

Herbaceous plants, vines, and groundcover shall be vigorous healthy plants, a minimum two (2) years old, from cuttings, seed, or division, with well-developed root systems and crowns, as specified in the Plant Schedule. Bulbs, corms, tubers and rhizomes shall be firm, non-desiccanted, and certified free of disease and viral infection, of the sizes, grades, and varieties indicated in the Plant Schedule.

There shall be no substitution of plant types by the Contractor without prior written approval by the Engineer.

(B) TOPSOIL

Topsoil shall comply with the requirements of **Section 2.26**.

(B) COMPOST

Compost shall contain organic matter, or material of generally humus nature capable of sustaining the growth of vegetation, with no admixture of refuse or material toxic to plant growth. The Compost shall be free of pathogens and stones, lumps, or similar objects larger than two (2") inches in greatest diameter, as well as roots, brush, and weeds.

Composts that have been derived from organic waste such as food and agriculture residues, animal manures, and sewage sludge that meet the above requirements, and are approved by the New York State DEC, are acceptable compost sources. Compost shall have an approximate N-P-K analysis of at least 1-1-0 as delivered, with a pH between 5.5 and 8.5 and a solids content of at least fifty (50%) percent. Compost shall have a minimum of fifty (50%) percent organic material.

Compost shall be "Nature's Choice Compost" by Nature's Choice Corp., Union, NJ, or an approved equivalent. For areas that are not community gardens, Contractor may also substitiure an organic biosolid humus such as "Landscapers' Advantage™" Class A compost (30 cubic yard minimum), manufactured by J.P. Mascaro & Son, Harleyville, PA; or "AllGro Compost", as manufactured by AllGro, Inc., Hapton, NH; or an approved equivalent.

(D) FERTILIZER

Commercial fertilizer shall be a complete fertilizer, part of the elements of which are derived from organic sources, and shall contain the following percentages by weight: nitrogen 5%; phosphoric acid 10%; potash 5%. It shall be uniform in composition, dry, free flowing and shall be delivered to the site in unopened original containers, all bearing the manufacturer's guaranteed analysis.

Where indicated on the Contract Drawings or where directed by the Engineer, sludge compost shall be incorporated in the soil instead of, or in addition to, commercial fertilizer. The amount of sludge compost shall be as indicated on the Contract Drawings or directed by the Engineer.

(E) LIME

Lime shall be ground dolemitic limestone not less than 85% total carbonated, ground so that 50% passes 100 mesh sieve and 90% passes 20 mesh sieve. Amount of lime shall be determined by the soil test and the plant requirements.

(F) BONE MEAL

Bone meal shall be firmly ground and have a minimum analysis of 2% nitrogen and 20% phosphoric acid.

(G) HERBICIDE

Herbicide shall be equivalent to Balam, as manufactured by Elanco Products Corp., a division of Eli Lilly and Co., Indianapolis, Indiana 46206. Product is a selective preemergence herbicide for the control of crabgrass and other annual weed grasses. Product shall be used in planting beds. Product shall never be used on new lawns or topsoil designated for seeded areas.

(H) MYCORRHIZAL FUNGI INOCULANT

Mycorrhizal fungi inoculant shall be applied by means of a three ounce (3 oz.) premeasured dry formulation packet, such as Mycor Tree Saver Transplant®, as manufactured by Plant Health Care, Inc., Pittsburgh, PA; Rhizanova Tree Transplant, as manufactured by Becker Underwood, Inc., Ames, IA; DIEHARD®, as manufactured by Horticultural Alliance and distributed through Atlantic Irrigation, White Plains, NY; or, an approved equivalent. Packets shall contain, as a minimum: one thousand (1000) live spores of Vesicular-Arbuscular fungi, including: *Entrephosphora columbiana*, *Glomus clarum*, *Glomus etunicatum*, and *Glomus sp.;* seventeen million five hundred thousand (17,500,000) live spores of Ectomycorrhizal fungi, including: *Pisolithus tinctorius*; biostimulants including *Yucca schidigera* extract;

soluble sea kelp extract derived from *Ascophylum nodosum*; humic acids; and acrylamide copolymer gel as a water absorbent medium.

Mycorrhizal innoculant should be used for planting trees, woody shrubs and woody groundcovers only; it is not needed for herbaceous material. Mycorrhizal fungi inoculant shall be added to the top six (6) to eight (8") inches of backfill soil in each planting pit and thoroughly mixed to distribute the inoculant. The opened packets shall be given to the Engineer at the end of each day. Mycorrhizal innoculant is a dated material and must be used before it expires.

The material shall be applied according to the following chart:

Size of rootball or container	Ounces per plant
1 gallon	1
2 gal.	2
3 gal.	3
5 gal.	3
7 gal.	3
10 gal.	3
15 gal.	3
20" B&B	6
24" B&B	9
30" B&B	9
36" B&B	12
42" B&B	12

(I) WATER RETENTION ADDITIVE

Water Retention Additives shall comply with the requirements of **Subsection 4.16.4.(F)**.

(J) MULCH

Shredded bark mulch shall be a natural forest product of at least 98% bark containing less than 2% wood or other debris. It shall be of White or Red Fir and/or Pine bark of a uniform grade with no additives or any other treatment. Size of bark shall be from 5/8" to 1-1/4". The pH factor should range from 5.8 to 6.2. Shredded bark may also be used. Samples shall be submitted to and approved by the Engineer prior to use.

Shredded bark mulch shall be applied to the surface of the beds, as shown on the Contract Drawings or as directed by the Engineer. Mulch shall be applied to a uniform depth of three (3) to four (4) inches over shrub bed areas and two (2) to three (3) inches over groundcover beds, and shall be so distributed as to create a smooth level cover over the exposed soil. Plants shall not be covered.

4.17.5. METHODS. Planting methods shall comply with **Subsection 4.16.5.(D) PLANTING** with the following exceptions:

(A) TIME OF PLANTING

Unless otherwise directed by the Engineer, deciduous material shall be planted from March 1st to May 1st and from October 15th to December 15th. Evergreen material shall be planted from April 1st to May 15th and from September 1st to October 15th, or as approved by the Engineer.

(B) EXCAVATION AND PLANTING

No planting shall be done except in the presence of the Engineer. All material shall be inspected by the

Engineer as it is removed from the truck, prior to placing in an approved storage area or the designated planting site. All rejected material shall be removed from the site and replaced with acceptable material at not additional cost to the City.

Bare root material shall be adequately protected from drying out. It shall be removd from its plastic bag and planted immediately after inspection. The bundles of heeled-in plants shall be set upright on the ground, covered with mulch, and kept adequately moist until the time of installation. Until the time of planting, all plant material shall be stored in an approved location, securely fenced and maintained, to the satisfaction of the Engineer, at no additional cost to the City. All plants not planted immediately shall be watered as necessary to maintain optimal health until planting.

For containerized material, girdling roots shall be removed. Circling roots shall be separated and spread out so as to not impede future growth. All shrubs shall be planted in the planting beds previously prepared or, where free standing, in individual pits. Individual shrub pits shall be 18" deep and at least one foot wider than the ball of earth or spread of roots. All pits shall be circular in outline and dug with vertical sides. The Contractor shall scar the surface of the excavated pit walls to avoid a smooth glaze.

Place balled and burlapped material in the prepared planting pit by lifting, and carry it by the rootball. Set shrub straight and in the center of the pit, with the most desirable side facing toward the predominant view. All material shall be set, after settlement, at the same level at which they have grown in the nursery, i.e., at the base of the crown. Care shall be exercised in setting the plants plumb. All ropes, stones, etc. shall be removed from the pit before backfilling. Soil for backfill shall be loose and friable and not frozen or compacted. Cut and remove rope or wire from the top two-thirds (2/3) of the rootball and cut off the burlap back to the edge of the ball. Remove as much woven product and twine as possible. All plastic or synthetic fabric must be removed from the ball at the time of planting. Remaining lateral wire must be cut to prevent future root interference. Wire must not be galvanized or aluminum wire. Balled and burlapped plants shall be handled so that the ball will not be loosened. After the soil has been thoroughly firmed under and around the ball, the burlap shall be cut away from the upper half of the ball, and the remaining burlap shall be entirely removed. Soil shall be firmed at six (6) to eight (8") inch intervals and thoroughly settled with water.

Plants with exposed roots shall be placed in the proper position in the center of the pit after the soil in the bottom of the pit has been firmed. Roots shall be arranged in their natural position and existing soil worked in among them, firmed at intervals, and mycorrhizal inoculant and water retention additive worked into the top eight (8") inches of backfill soil in the correct proportions. The plants shall then be thoroughly settled in with water. Care shall be taken to avoid bruising or breaking the roots when tamping the soil. All large and fleshy roots that are bruised or broken shall be pruned, making a clean cut before planting.

Evergreen groundcovers shall be planted in 12 inch deep topsoil planting bed consisting of three parts by volume of topsoil thoroughly mixed with one part compost. Fertilizer shall be incorporated with the soil previous to setting out plants, at the rate of one (1) pound of fertilizer to twenty (20) square feet of area. Entire area shall be graded so that surface contour is not altered from the overall surface drainage pattern. Apply mulch and herbicide as herein specified.

Vines, Herbaceous, and Groundcover plants shall be carefully removed from containers or flats immediately prior to planting and set to the same depths as they were grown in the nursery bed or container, to the correct spacing indicated on the plans. Roots shall be arranged to their natural position and topsoil worked in among them, taking care to avoid bruising or damaging the roots, and fertilizer tablets added to the top four (4") inches of backfill soil in the correct proportion for the respective pot size. No later than one hour after planting, all plants shall be thoroughly settled in with water.

Annual flowering plants shall be carefully removed from the flats or cell-packs to avoid damaging roots or stems and planted in prepared planting beds, at the same depth they were growing in the containers. Soil shall be thoroughly firmed around each crown, and plants thoroughly firmed around each crown, and plants thoroughly watered in no longer than one hour after planting.

Bulbs shall be planted in the locations indicated on the plans and to the depth and spacing indicated on the Plant Schedule. Spring Flowering Bulbs, Corms, Tubers, and Rhizomes shall be planted in late September or October, no more than six (6) weeks before frost. Summer and Fall Flowering Bulbs, Corms, Tubers, Rhizomes and Plugs shall be planted in spring, after the last frost, or as directed by the Engineer. Prior to planting, bulbes shall be stored in a cool, dry, well-ventilated location for no longer than two (2) weeks before planting.

All of the above shall be planted according to best horticulture practice.

(C) BACKFILLING

Backfill for shrub beds shall consist of topsoil as specified in **Section 2.26**. Commercial fertilizer shall be added at the rate of six ounces for each shrub under four (4') feet in height and eight ounces for each shrub four (4') feet in height or over.

(D) FINISHING SURFACE AFTER BACKFILLING

The Contractor shall cultivate and rake over finished planting areas and shall leave the site in an orderly condition. On level ground or slight slopes, a shallow basin a little larger than the diameter of the plant pit shall be left around each plant, as shown on the plans, or as directed by the Engineer. On steep slopes, the soil on the lower side of the plant shall be graded in such a manner that it will catch and hold water, as shown on the plans, or as directed by the Engineer. Upon completion of planting, all debris and waste material resulting from the planting operation shall be removed from the project area, and the affected area raked and cleaned as necessary.

All work done in preparing shallow basins or grading of plant pits on steep slopes and regarding and reseeding of plant saucers shall be deemed included in the unit price bid per plant. All berms raised for shallow basins in level or gently sloping grass areas shall be removed at the end of the guarantee period, as well as tree stakes and irrigation bags, if present. This topsoil shall be cast evenly over the surrounding grass areas and grass seed sown over the removed berms.

4.17.6. SECURITY. Where indicated on the drawings, various types of shrubs shall be secured against theft by the provision and installation of steel anchoring cables, clips, bolts, rubber or plastic cable sheaths, and various anchoring devices, as detailed on the Contract Drawings. No separate payment will be made for this work when it is indicated on the Contract Drawings, the cost of which shall be deemed included in the unit price bid for the various shrub planting items.

4.17.7. MAINTENANCE. Maintenance shall comply with the requirements of **Subsection 4.16.6**.

4.17.8. REPLACEMENT. Replacement shall comply with the requirements of **Subsection 4.16.7**.

4.17.9. MEASUREMENT. The quantity to be measured for payment hereunder shall be the number of plants of each species and size, furnished, planted and maintained in accordance with the Contract Drawings, specifications and directions of the Engineer.

4.17.10. PRICES TO COVER. The contract price for planting shall be a unit price per plant of each species and size and shall cover the cost of all labor, material, plant, equipment, inspection, insurance, and necessary incidentals required to complete the work of planting new plant materials, as shown on the Contract Drawings, as specified and as directed by the Engineer.

The cost of furnishing and incorporating topsoil, commercial fertilizer and mulch are also included in the unit price bid for each planting item.

Payment will be made under:

Item No.	Item	Pay Unit
4.17	SHRUBS PLANTED, CHINESE JUNIPER	EACH
4.17 AA	SHRUBS PLANTED, 15”-18” HIGH, ALL TYPES	EACH
4.17 AB	SHRUBS PLANTED, 30” TO 36” HIGH, ALL TYPES	EACH
4.17 EF	SHRUBS PLANTED, EUONYMUS FORT-UNEI “EMERALD GAIETY”	EACH
4.17 F	SHRUBS PLANTED, FORSYTHIA	EACH
4.17 IG	SHRUBS PLANTED, 2’ TO 3’ HIGH, ILEX GLABRA	EACH
4.17 JH	SHRUBS PLANTED, JAPANESE HOLLY	EACH
4.17 MP	SHRUBS PLANTED, 2-1/2’ TO 3’ HIGH, MYRICA PENSYLVANICA	EACH
4.17 TCD	SHRUBS PLANTED, 2-1/2 TO 3 FEET HIGH, TAXUS CUSPIDATE DENSIFORMIS	EACH
4.17 *xxxxxx*	SHRUBS PLANTED, (*Size and type as specified in Bid Pages*)	EACH
4.17 EFC	GROUNDCOVER PLANTED, 9” TO 12” RUN EUONYMUS FORTUNEI COLORATUS	EACH
4.17 HHT	GROUND COVER PLANTED, HEDER HELIX “THORNDALE”	EACH
4.17 JHW	GROUNDCOVER PLANTED, 12 TO 15 INCH RUN, JUNIPERUS HORIZONTTALIS WILLOW	EACH
4.17 L	GROUND COVER PLANTED, LIRIOP MUSCARI “BIG BLUE”	EACH
4.17 PT	GROUNDCOVER PLANTED, PACHYSANDRA TERMINALIS	EACH
4.17 PU	GROUNDCOVER PLANTED, VINCA MINOR “ALBA, ATROPURPUREA AND BOWLES”	EACH
4.17 PV	GROUNDCOVER PLANTED, HERMERO-CALLIS “STELLA DE’ORO, RUBENS”	EACH
4.17 PW	GROUNDCOVER PLANTED, TIBURON	EACH
4.17 *xxxxxx*	GROUNDCOVER PLANTED, (*Size and type as specified in Bid Pages*)	EACH
4.17 *xxxxxx*	PERENNIALS PLANTED, (*Size and type as specified in Bid Pages*)	EACH

Note: *xxxxxx* denotes serialized pay item.

SECTION 4.18 - Tree Pruning

4.18.1. INTENT. This section describes the pruning of trees.

4.18.2. DESCRIPTION. The Contractor shall prune designated trees in accordance with the specifications and as directed by the Engineer, under permit issued by the New York City Department of Parks and Recreation (D.P.R.) which may be obtained from the Borough’s Forestry Office.

4.18.3. MATERIALS AND METHODS.

(A) GENERAL

The Contractor and/or subcontractors shall be certified by the New York State Department of Agriculture & Markets to perform work within the Asian Longhorned Beetle Quarantine Zone. The Contractor must review and abide by the description of the quarantine and compliance agreements as presented in the publication entitled Part 139 of the New York State, Department of Agriculture & Markets law. Full information can be obtained from Federal and State Pest Control personnel. Quarantine areas, for the purpose of this contract shall be defined as all five Boroughs of the New York City.

Due to current Federal and New York State laws and regulations concerning Asian Longhorned Beetle management, all wood that is host material for the Asian Longhorned Beetle must be chipped, ground, or shredded inside the quarantine zone to a size of less than one (1") inch in at least two dimensions before it is permitted to leave the quarantine zone. Host species are as follows: Acer-Maple, Aesculus-Horsechestnut/Buckeye, Salix-Willow, Betula-Birch, Populus-Poplar, Ulmus-Elm, Albiza-Mimosa/Silk Tree, Celtis-Hackberry, Fraxinus-Ash, Platanus-London Planetree, Sycamore, Sorbus-Montain Ash. Please refer to the Part 139 of the New York State Department of Agriculture and Markets law and contact State personnel for further details.

The tree care pruning contractor/subcontractor shall be a certified by the New York State Department of Agriculture and Markets to perform pruning work within the Asian Longhorned Beetle quarantine zone. The Contractor must review and abide by the description of the quarantine and compliance agreements as presented in the publication entitled Part 139 of the New York State, Department of Agriculture & Markets law. Full information can be obtained from Federal and State Pest Control personnel.

All pruning of limbs and roots must be performed by a qualified arborist trained in proper pruning techniques, tree biology, diagnosis and treatment of plant diseases, and cabling and bracing. The tree care pruning contractor/subcontractor shall have a minimum of three (3) years experience performing non-utility pruning as well as documentation of eight (8) hours of education in any combination of the specialties listed above. Certification by the International Society of Arboriculture (I.S.A.), Champaign, Illinois, shall be considered proof of the requisite experience and educational requirements, provided that experience is non-utility pruning.

The Contractor shall prune designated trees and remove all trash and debris within the area limits, in accordance with the specifications and/or as directed by the Engineer and under permit issued by the Department of Parks and Recreation.

Trees shall be measured by diameter for size at the height of four feet six inches (4' – 6") above mean grade.

(B) EQUIPMENT

Workmen shall only be permitted to climb trees with climbing spurs if said tree is being removed. Otherwise, workmen shall employ accepted alternative tree-climbing methods. All tools used and methods employed shall be as approved by the Engineer. The cutting surfaces of all tools, ladders, ropes, soles of workmen's shoes and other objects coming into contact with the tree shall be washed with an approved disinfectant at the start of any work on a tree to prevent the spread of plant diseases.

(C) MAINTENANCE PRUNING

Tree Pruning (Preparatory): Pruning of tree limbs and roots shall be performed by the Contractor where directed. Pruning shall occur for, but not limited to, the following situations: interference with new fences, lights or utilities, to achieve the required clearance for pedestrian or vehicular passage, to permit establishment of grass, ground cover, and other plant material, or for aesthetic considerations.

All work shall be performed in a professional manner and in accordance with the most current revision of the American National Standards for Tree Care Operations: Tree, Shrub, and Other Woody Plant Maintenance and Standard Practices, A-300-(Part 1)-2001 Pruning, published by the American National Standards Institute (ANSI).

All pruning must be approved by the Department of Parks and Recreation (D.P.R.) and specified on the D.P.R. permit in advance of any tree work. No trees shall be pruned except as directed by the Engineer. Pruning of the crown shall be performed in such a manner as to maintain the shap of the particular species and the balance and symmetry of the tree in general while retaining as much fine growth as possible. All nails, spikes, wire or other materials driven into or fastened to the trunk or branches shall be removed or, if approved, they shall be cut flush in a manner to permit complete healing over. On trees

known to be diseased or where there is known danger of transmitting disease, tools are to be disinfected with wood alcohol after each cut and after completion of each tree.

In general, pruning shall consist of cutting back and removal of all dead, broken, fungus- and insect-infected, or intertwining branches, suckers, and all other undesirable growth, as directed by the Engineer. All injured areas where healing is not taking place properly shall be bark traced in accordance with the accepted horticultural practice. All branches shall be removed to a height sufficient to permit free passage of both pedestrian and vehicular traffic, approximately eight (8') foot clearance for paths and fourteen (14') feet for roadways, as directed by the Engineer. All branches interfering with sight distance or signs shall also be removed as directed. In lifting the bottom branches of trees for underclearance, care shall be given to maintain symmetrical appearance. At no time shall more than 20% of a tree's canopy be removed. All reduction points must be no greater than 1/3 size of parent stem. Excessive lifting of trees and cutting back of large limbs to the main stem is not permitted by the Department of Parks and Recreation.

The Contractor shall carefully protect from damage all existing vegetation, site features, and all other property which is to remain. The Contractor shall be liable for any and all damage to the above resulting from tree pruning operations and shall be responsible for the replacement or restoration of same where damaged, at the direction of and to the satisfaction of the Engineer.

All trees which require maintenance due to root and trunk damage shall be guaranteed for one year against death. If during this time, said trees die due to root and trunk damage, they shall be removed and replaced according to D.P.R.'s removal and tree planting specifications.

Prior to guarantee inspection and final acceptance, trees shall be pruned again to eliminate excessive water sprouts and to reshape them as described.

The Contractor shall carefully protect against damage all existing trees, plants, other growth and other features to remain as per **Section 4.22**. He shall be liable for any and all damage to such trees, plants and other growth, features and other real property, and vehicles caused by tree pruning operations, and all damaged trees, plants, other growth features and other real property, and vehicles shall be replaced or restored or provided for to their original condition to the satisfaction of the Engineer.

The Contractor shall prune every damaged tree directed except trees tagged for removal within the boundary specified. Pruning shall be performed by experienced pruners and with the proper tools in a good workmanlike manner. All cuts shall be made sufficiently close to the parent stem so that healing can readily start under normal conditions. All limbs one (1") inch in diameter (the size of a quarter) and over must be precut to prevent splitting.

(D) CLEANING AND DISPOSAL

All pruned material and all other debris shall be removed from the site within 24 hours, and disposed of as directed by the Engineer.

(E) SUBMITTALS

The Contractor shall submit the name and the following qualifications of the proposed tree care Contractor or Subcontractor for review and approval prior to performing work under this Section.

1. Proof of three (3) years of non-utility pruning experience or I.S.A. certification with documented non-utility pruning experience.
2. Documentation of eight (8) hours of required education or I.S.A. certification.
3. Name, address, and phone numbers for three (3) professional references associated with non-utility pruning work performed within the past three (3) years.

4. State Certification - The Contractor must submit a copy of a valid Compliance Agreement issued by the State of New York Department of Agriculture and Markets, Division of Plant Industry.

4.18.4. MEASUREMENT. The quantity to be measured for payment under each item shall be the number of trees in each size group actually pruned where and as directed in accordance with these specifications, to the satisfaction of the Engineer.

4.18.5. PRICES TO COVER. The contract prices for Maintenance Tree Pruning shall be a unit price per each tree size group maintenance pruned and shall cover the cost of all labor, materials, plant, equipment, inspection, insurance, and incidentals required to complete the work, all in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

Payment will be made under:

Item No.	Item	Pay Unit
4.18 A	MAINTENANCE TREE PRUNING (Under 12” Cal.)	EACH
4.18 B	MAINTENANCE TREE PRUNING (12” to under 18” Cal.)	EACH
4.18 C	MAINTENANCE TREE PRUNING (18” to under 24” Cal.)	EACH
4.18 D	MAINTENANCE TREE PRUNING (24” Cal. and Over)	EACH

SECTION 4.19 - Sodding

4.19.1. SCOPE. This section describes the work of sodding.

4.19.2. DESCRIPTION. Sodding shall consist of the preparation of the area to be sodded; the removal and disposal of existing soil and undesirable materials; the furnishing and incorporation of topsoil, ground limestone, and/or commercial fertilizer, when and as directed; furnishing, delivering, and incorporation of sod; and all required maintenance.

4.19.3. MATERIALS.

A. Topsoil. Topsoil shall comply with the requirements of **Section 2.26**.

B. Ground Limestone. The total carbonates in ground limestone (Calcium Carbonate) shall not be less than 80% (or 44.8% Calcium Oxide equivalent). For calculation purposes, total carbonates shall be considered as Calcium Carbonate.

C. Commercial Fertilizer: Low Phosphorus (Slow Release). Commercial fertilizer mixture shall contain, by weight, Nitrogen (N) 7% min. to 10% max. of which 50% is slow-release; Phosphorus (P) 1% min. to 2% max.; and soluble Potash (K) 4% min. to 12% max.

Fertilizer shall be *pesticide free* (no weed-and-feed) product such as Healthy Turf (8-1-9) as manufactured by Plant Health Care, Inc, Pittsburgh, PA; or Safer Ringer Lawn Restore (10-2-6) as manufactured by Woodstream Corp., Lifitz, PA; or Nutrients Plus (7-2-12) as manufactured by Nutrients Plus, Virginia Beach, VA; or an approved equivalent.

D. Stakes. Stakes for pegging sod shall be approximately 1" x 2" and of sufficient length to penetrate the sod, the topsoil, and a minimum depth of two inches of subsoil, and shall be of a material and size as approved by the Engineer.

E. Sod. The approved Sod shall be of superior quality, from seed of known origin and shall be accompanied by a certificate indicating compliance with the regulations of the New York State Department of Agriculture and Markets. Sources of sod shall be made known to the Engineer at least five days before cutting. Sod shall be cut into squares or rectangular portions which shall be twelve (12") inches or eighteen (18") inches wide, or as approved, and may vary in length, but must be of a size which will permit them to be lifted without breaking. The sod, when delivered to the contract site, shall be sufficiently moist so the soil will adhere firmly to the roots when it is handled. Before cutting, Sod shall be mowed uniformly to a height of one and one-half (1-1/2") inches. The sod shall be cut to a minimum soil thickness of five-eights (5/8") of an inch, plus or minus one-quarter (±1/4") of an inch. The sod shall be reasonably free from weeds in conformance with accepted commercial practice and shall consist of a mixture of permanent grasses such as blue grass, rye grass, and/or fine leafed fescues, in proportions as follows:

65%-85%	TALL FESCUE - One or more of the following varieties: Aache II, Arid 3, Conchise III, Coronado Gold, Falcon IV, Jaguar III, Lancer (SH), Masterpiece, Rebel IV, Rebel Jr.(SH), Rebel Sentry, Rembrandt, Tomahawk E+, RTF or approved equal.
15%-25%	BLUEGRASS - One or more of the following varieties: Able I (SH), Blacksburg, Glade (SH), Moonlight, Midnight, America (SH), Brilliant, Ram (SH), Touchdown (SH), Warren's A-34(SH), Bristol (SH), Lofts 1757(SH) or approved equal.
0-10%	PERENNIAL RYEGRASS - One or more of the following varieties: Brightstar II, Manhattan 4, Citation, Elfkin, or approved equal.

F. Certifications. The Contractor, prior to ordering any of the foregoing materials into the work, shall submit Certificates of Compliance to the Engineer. The said certificates shall be obtained as follows:

1. For Sod - from an approved supplier and shall include a specification sheet from the supplier listing the percentage of each type of grass seed used in the mix; and
2. For Fertilizer, Limestone and Topsoil - from an approved analytical chemist.

The aforesaid certifications shall not, in any way, affect the Engineer's right of on-site rejection of materials because of deterioration, adulteration or patent inferiority; nor his right to sample and test any of the supplied materials.

4.19.4. METHODS. When referred to or used herein, the words topsoil, limestone, fertilizer, and sod shall mean topsoil, ground limestone, commercial fertilizer, and sod, all of which are described and meet the requirements specified under **Subsection 4.19.3**., above.

When referred to or used herein, the word soil shall mean the fill placed in accordance with **Section 4.11** or existing soil found in the area to be sodded.

The Contractor may elect (a) to remove and dispose of soil from area to be sodded, or (b) to allow the soil in a portion of or all of the area to be sodded to remain provided it can be amended to meet the requirements for topsoil and is graded to a depth of one (1") inch below the proposed grade.

The removal and disposal of existing soil under (a), above, shall be made to a depth of six (6") inches below the proposed grade. Removed soil shall be replaced with five (5") inches of topsoil.

Before any sod is placed, all areas to be sodded shall be thoroughly loosened with a rototiller to a depth of nine (9") inches below the proposed grade. All sticks, stones, roots or other objectionable materials which might interfere with the formation of a finely pulverized bed shall be removed from the soil and a smooth uniform surface grade shall be established. Hollows, depressions, and gullies shall be filled by raking to level and topsoil added as necessary to provide a smooth surface prior to sodding. The area shall be thoroughly compacted with an approved lawn roller, to the satisfaction of the Engineer.

Soil allowed to remain under (b), above, shall be broken up by harrowing or other approved means to a minimum depth of nine (9”) inches below the proposed grade and the top five (5”) inches of soil to remain shall be amended in place, as necessary, to meet the requirements for topsoil for the full depth of five (5”) inches.

The Contractor shall take a representative sample of soil or topsoil (existing or furnished and placed by the Contractor) from each four hundred (400) square feet of planting area (but not less than three samples from a given planting area) and have the said sample(s) tested by an approved analytical chemist. The Contractor shall obtain from the chemist a signed report showing the organic content, acidity range, sieve analysis and clay content of the sample(s) tested together with the chemist's recommendations, if required, for making the tested soils comply with the specified requirements for topsoil. That report shall be submitted to the Engineer and the Contractor shall make all recommended corrections prior to progressing further sodding operations.

Ground limestone shall be spread by machine and evenly distributed and worked lightly into the top three (3”) inches of soil at least five (5) days before applying fertilizer. Rate of application shall be as follows, depending on the Hydrogen Ion concentration (pH) shown by a pH test (pH test to be provided by the Contractor at no additional cost to the City):

pH	RATE (LBS.)
5.0 to under 5.5	100
5.5 to under 6.0	50
6.0 to under 6.8	25
6.8 and over	0

Commercial fertilizer shall be worked lightly into the top three (3”) inches of soil or topsoil prior to placement of sod. Commercial fertilizer shall be applied by machine at the rate of one thousand (1,000) pounds per acre. All areas to receive Sod shall then be compacted using a two hundred pound (200 lb.) roller. The area shall then be thoroughly watered prior to the placement of Sod; but only after it has dried out sufficiently shall the area be considered ready to recieve the Sod.

The Contractor shall notify the Engineer at least forty-eight (48) hours in advance of the time he intends to begin sodding and shall not proceed with such work until permission has been granted. Under no condition shall frozen sod be placed or shall sodding be done on frozen earth. Sodding shall be laid on reasonable moist (not wet) soil which shall be wetted, if so directed.

The Contractor shall exercise extreme care to retain the native soil on the roots of the sod during transplanting operations. Dumping of sod from vehicles will not be permitted. Sod shall be placed within thirty-six (36) hours from the time of harvesting. Sod that is dry or fails to meet the specification requirements will be rejected.

When laid in strips adjacent to sidewalks and curbs, sod shall be flush with the surface of the adjacent structures.

The sod shall be laid smoothly, edge to edge and all openings shall be plugged with sod. Sod shall be laid with the longest dimension parallel to the contours. Sodding shall start at the base of slopes and progress upward in continuous parallel rows. Vertical joints between sods shall be staggered. Immediately after laying, sod shall be pressed firmly into contact with the sod bed by tamping, rolling, or by other approved methods so as to eliminate air pockets, provide true and even surface, insure knitting and protect all exposed sod edges, but without displacement of the sod or deformation of the sod surface. At the time of planting the sodded areas shall be watered evenly and at a rate of 5 gallons per square yard, unless otherwise directed.

On all slopes 1 to 2 or steeper and elsewhere where specified or as directed, sods shall be held in place by stakes. Pegging shall be done immediately after tamping. At least one (1) stake shall be driven

through each sod to be pegged and the stakes shall be not more than two feet apart. Stakes shall have their flat sides against the slope and be driven flush.

4.19.5. MAINTENANCE. The sodded area shall be maintained by the Contractor until the issuance of the Engineer's Final Certificate. Such maintenance shall consist of providing protection against traffic by approved warning signs or barricades, and mowing to a height of between one and one-half (1-1/2") and three (3") inches, or as directed by the Engineer. At no time shall more than forty (40%) of the grass blade be removed.

When, in the judgment of the Engineer, at any time prior to the acceptance of the Contract, any area which has been sodded fails for any reason to produce a satisfactory turf after a suitable period of time has elapsed, the Contractor shall re-sod and re-fertilize such areas as specified for the original sodding. Re-sodding, and re-fertilizing shall be at the Contractor's expense.

All sod shall be kept adequately moist. In the absence of adequate rainfall, watering shall be perormed daily or as often as necessary and in sufficient quantities to maintain moist soil to a depth of five (5") inches. Watering shall be done in a manner which will not cause erosion nor other damage to the finished surfaces. Any surfaces which become gullied or otherwise damaged shall be repaired to re-establish the graded and conditions of the soil prior to sodding and shall then be refertilized and re-sodded as specified under this work.

4.19.6. MEASUREMENT. The work for this item shall be measured in square yards of surface area which have been acceptably sodded.

4.19.7. PRICE TO COVER. The contract price shall be a unit price per square yard of area initially sodded and shall cover the cost of furnishing all labor, materials, plant, equipment, insurance, and necessary incidentals required and completing the work in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

When there is a scheduled item for topsoil, its measurement and payment will be made only for the additional topsoil furnished and incorporated, as directed, added below the five (5") inch depth of topsoil that is included for payment under this Sodding item.

Where fill is required to raise the subgrade to the required depth for placement of sod, it shall be deemed included in the contract price for Unclassified Excavation or Fill, Place Measurement, as appropriate.

Payment will be made under:

Item No.	Item	Pay Unit
4.19	SODDING	S.Y.

SECTION 4.20 - Seeding

4.20.1. INTENT. This section describes the work of planting grass seed.

4.20.2. DESCRIPTION. The planting of grass seed shall consist of the preparation of the area to be seeded; the removal and disposal of existing soil and undesirable materials; the furnishing and incorporation of topsoil, ground limestone, and/or commercial fertilizer, when and as directed; necessary reseeding; and all required maintenance.

4.20.3. MATERIALS.

(A) TOPSOIL

Topsoil shall comply with the requirements of **Section 2.26**.

(B) GROUND LIMESTONE

Ground limestone shall be spread by machine and evenly distributed and worked lightly into the top three (3") inches at least five (5) days before applying fertilizer. Rate of application shall be as follows, depending on the Hydrogen Ion concentration (pH) shown by a pH test (pH test to be provided by the Contractor at no additional cost to the City):

pH	RATE (LBS.)
5.0 to under 5.5	100
5.5 to under 6.0	50
6.0 to under 6.8	25
6.8 and over	0

(C) COMMERCIAL FERTILIZER

Commercial fertilizer mixture shall contain, by weight, Nitrogen (N) 7% min. to 10% max. of which 50% is slow-release; Phosphorus (P) 1% min. to 2% max.; and soluble Potash (K) shall be 4% min. to 12% max. Fertilizer shall be *pesticide free* (no weed-and-feed) product such as Healthy Turf (8-1-9) as manufactured by Plant Health Care, Inc, Pittsburgh, PA; or Safer Ringer Lawn Restore (10-2-6) as manufactured by Woodstream Corp., Lifitz, PA; or Nutrients Plus (7-2-12) as manufactured by Nutrients Plus, Virginia Beach, VA, or approved equivalent.

Fertilizer shall be worked lightly into the top three (3") inches of soil or topsoil. Commercial fertilizer shall be applied by machine at the rate of one thousand (1,000) pounds per acre. All areas to receive Seed shall then be compacted using a two hundred pound (200 lb.) roller. The area shall then be thoroughly watered prior to Seed placement; but only after it has dried out sufficiently shall the area be considered ready to recieve the Seed.

(D) GRASS SEED

Grass seed shall be fresh, recleaned seed of the latest crop and mixed in the following proportions by weight and meeting the following standards of pure live seed content (Purity & Germination) and maximum allowable weed seed content. All seed shall be free of noxious weeds and undesirable grasses.

TABLE 4.20-A

GRASS SEED MIXTURE
Percent by Weight

Grass Seed		Seed Purity	Max. Germination	Max.Weed
60%	TALL FESCUE - One or more of the following varieties: Aache II, Arid 3, Cochise III, Coronado Gold, Falcon IV, Justice, Jaguar III, Lancer (SH), Masterpiece, Rebel IV, Rebel Jr.(SH), Rebel Sentry, Rembrandt, Tomahawk E+, RTF, or approved equivalent.	98%	85%	0.25%
20%	BLUEGRASS - One or more of the following varieties: Able I (SH), Blacksburg, Glade (SH), Moonlight, Midnight, America (SH), Brilliant, Ram (SH), Touchdown (SH), Warren's A-34(SH), Bristol (SH), Lofts 1757(SH), or approved equivalent.	98%	80%	0.10%
20%	PERENNIAL RYEGRASS - One or more of the following varieties: Brightstar II, Manhattan 4, Citation, Elfkin, or approved equivalent.	98%	85%	0.25%

(E) CERTIFICATIONS

The Contractor, prior to incorporating any of the foregoing materials into the work, shall submit Certificates of Compliance to the Engineer. The said certificates shall be obtained as follows:

1. For Seed - from an approved seed testing laboratory which is not engaged in selling seed; and
2. For Fertilizer, Limestone and Topsoil - from an approved analytical chemist.

The aforesaid certifications shall not, in any way, affect the Engineer's right of on-site rejection of materials because of deterioration, adulteration or patent inferiority; nor his right to sample and test any of the supplied materials.

4.20.4. METHODS. When referred to or used herein, the words topsoil, limestone, fertilizer, and seed shall mean topsoil, ground limestone, commercial fertilizer, and grass seed, all of which are described and meet the requirements specified under **Subsection 4.20.3**., above.

When referred to or used herein, the word soil shall mean the existing soil found in the area to be seeded.

The Contractor may elect (a) to remove and dispose of soil from, or (b) to allow soil to remain in, a portion of, or all of the area to be seeded.

The removal and disposal of soil under (a), above, shall be made to a depth of five (5”) inches below the proposed grade. Removed soil shall be replaced with topsoil.

Soil, allowed to remain under (b), above, shall be broken up by harrowing or other approved means to a minimum depth of nine (9”) inches below the proposed surface and the top five (5”) inches of soil shall be amended in place, as necessary, to meet the requirements for topsoil for the full depth of five (5”) inches below the proposed grade.

Before any seed is placed, all areas to be seeded shall be thoroughly loosened with a rototiller to a depth of nine (9”) inches below the proposed grade. All sticks, stones, roots or other objectionable materials which might interfere with the formation of a finely pulverized bed shall be removed from the soil and a smooth uniform surface grade shall be established. Hollows, depressions, and gullies shall be filled by raking to level and topsoil added as necessary to provide a smooth surface prior to sodding. The area shall be thoroughly compacted with an approved lawn roller, to the satisfaction of the Engineer.

The Contractor shall take a representative sample of soil or topsoil (existing or furnished and placed by the Contractor) from each four hundred (400) square feet of planting area (but not less than three samples from a given planting area) and have the said sample(s) tested by an approved analytical chemist. The Contractor shall obtain from the chemist a signed report showing the organic content, acidity range, sieve analysis and clay content of the sample(s) tested together with the chemist’s recommendations, if required, for making the tested soils comply with the specified requirements for topsoil. The said report shall be submitted to the Engineer and the Contractor shall make all recommended corrections prior to progressing further seeding operations.

All areas to be seeded shall be thoroughly loosened and graded to true lines, free from all unsightly variations, bumps, ridges or depressions. All sticks, stones, roots or other objectionable materials which might interfere with the formation of a finely pulverized seed bed shall be removed. The area shall be thoroughly compacted with an approved lawn roller, or equivalent, to the satisfaction of the Engineer.

Ground limestone, when required, shall be spread by machine at the recommended rate and shall be evenly distributed and worked lightly into the top three (3”) inches at least five (5) days before applying fertilizer.

Grass seed shall be sown in the Fall during August and September or in the Spring during March, April or May, except when the Engineer permits otherwise. Seeding shall be done in moderately dry to moist (not wet) soil and at times when the wind does not exceed five (5) m.p.h. The rate of seeding shall be ten (10) pounds per thousand (1,000) square feet. The seed shall be sown and covered to the proper depth and firmed in such manner that a uniform stand will result.

4.20.5. MAINTENANCE. The seeded area shall be maintained by the Contractor until the issuance of the Engineer’s Final Certificate.

Maintenance shall consist of all necessary watering, mowing, weeding and reseeding, as required. Initial watering shall be done carefully so that no washing out of planted grass seed occurs.

Mowing shall be done, when necessary, to maintain a maximum grass height of three (3”) inches. At no time shall more than forty (40%) of the grass blade be removed. Prior to each mowing operation, the Contractor shall remove and dispose of all weed growths.

In areas where the stand of grass is deemed unsatisfactory by the Engineer, the Contractor shall resow grass seed to produce a stand which shall be acceptable. In these areas, the Contractor shall loosen, break up, pulverize, rake and roll the soil or topsoil and incorporate necessary corrective additives, all, as required for the initial seeding operation.

4.20.6. **MEASUREMENT**. The quantity to be measured for payment hereunder shall be the number of square yards of area initially seeded to the satisfaction of the Engineer. Measurement will be made on a one-time basis and no additional measurement will be made for any area resown as directed.

4.20.7. **PRICE TO COVER**. The contract price shall be a unit price per square yard of area initially seeded and shall cover the cost of furnishing all labor, materials, plant, equipment, insurance, and incidentals necessary to complete the work in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

When there is a scheduled item for topsoil, its measurement and payment will be made only for the additional topsoil furnished and incorporated, as directed, added below the five (5") inch depth of topsoil that is included for payment under this Seeding item.

Payment will be made under:

Item No.	Item	Pay Unit
4.20	SEEDING	S.Y.

SECTION 4.21 - Tree Consultant

4.21.1. **INTENT.** The Contractor shall engage the services of an arborist who shall serve as an advisor to the Engineer and to direct the Contractor's excavation work around existing trees under all stages of work.

4.21.2. **DESCRIPTION.** The Tree Consultant shall be an arborist approved by the Engineer, who shall advise the Engineer on which trees shall be pruned and which trees shall be removed. He shall be a person independent of and not associated with those persons performing the tree pruning and tree removal operations under this contract; and, he shall be certified by the New York State Department of Agriculture & Markets (NYSDAM) to perform work within the Asian Longhorned Beetle Quarantine Zone. The Contractor shall furnish to the Engineer the Tree Consultant's professional credentials for evaluation. Additional minimum qualifications for the Tree Consultant shall be:

> Associate degree in forestry, arboriculture, horticulture, or related plant science field, and three (3) years of full-time professional experience in arboriculture, specifically in the field supervision of techniques to mitigate damage to existing trees from the negative impacts of construction and International Society of Arboriculture (ISA) Certification; or
>
> B.S. in forestry, arboriculture, horticulture, or related plant science field, and two (2) years of full-time professional experience in field supervision of techniques to mitigate damage to existing trees from the negative impacts of construction and ISA Certification; or
>
> M.S. in forestry, arboriculture, horticulture, or related plant science field, and one (1) year of full-time professional experience and the field supervision of techniques to mitigate damage to existing trees from the negative impacts of construction and ISA Certification; or
>
> Arborist certification by the International Society of Arboriculture (ISA) and four (4) years of full-time professional experience in arboriculture, specifically in the field supervision of techniques to mitigate damage to existing trees from the negative impacts of construction.

The Tree Consultant shall be required to appear on the work site when directed by the Engineer. He shall be required to advise the Engineer on tree pruning operations and the removal of trees where

necessary; he shall personally witness and direct all excavation work around trees, approving both the Contractor's choice of hand tools for excavation under Items 8.02 A and 8.02 B, or 8.02 AB-S, as appropriate, and his manner of work around existing trees; he shall assess any damage caused by the Contractor's equipment, etc.; and, he shall identify trees, recommend construction alternatives to the Engineer in order to save existing trees from damage due to construction, recommend new tree planting locations, and evaluate an appropriate species mix.

4.21.3. MEASUREMENT. The quantity to be measured for payment shall be the time, measured in person hours, that the Tree Consultant actually performed the work as specified and to the satisfaction of the Engineer.

4.21.4. PRICE TO COVER. The contract price bid for Tree Consultant shall be a unit price per person hour and shall cover the cost of all labor, material, reports, plant, equipment, inspection, insurance, and incidentals required to complete the work, all in accordance with the Contract Drawings, the specifications and the directions of the Engineer.

Payment will be made under:

Item No.	Item	Pay Unit
4.21	TREE CONSULTANT	PERSON-HOUR (P/Hr)

SECTION 4.22 - Protective Tree Barrier

4.22.1. INTENT. This section describes the work of providing a Protective Tree Barrier around existing trees during construction.

4.22.2. DESCRIPTION. The work shall consist of the fabrication, furnishing, installation, erection, maintenance, and subsequent removal and disposal of a Protective Tree Barrier around existing trees which are designated to remain.

4.22.3. MATERIALS. All timber shall be Douglas Fir Grade No. 1. Fasteners, such as nails, shall meet the standard industrial fastener specifications for the intended application, and be galvanized in conformance with ASTM Designation A 123.

4.22.4. METHODS. The Contractor shall construct and install protective tree barrier as shown on the New York City Department of Transportation's Standard Details of Construction Standard Drawing No. H-1046A and as directed by the Engineer.

All work shall conform to National Design Specifications for Stress Grade Lumber and its fastenings.

All timber at the site of the work shall be stored in piles on supports at least twelve (12") inches above the ground surface, and so piled as to prevent warping and to shed water. When required by the Engineer, it shall be protected from the weather by suitable covering. The timber shall be close-stacked. The ground under and in the vicinity of all stacks shall be cleared of weeds and rubbish and shall be drained to prevent accumulation of water.

Workmanship shall be first class and only competent carpenters shall be employed. All timber shall be accurately cut and framed to a close fit in such manner that the joints will have even bearing over the entire contact surfaces. No blocking or shimming will be allowed in joints. Timber shall be cut off with a saw; no axe is to be used. Unless otherwise specified, heads of nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood. Deep hammer marks in wood

surfaces shall be considered evidence of poor workmanship and sufficient cause for rejection of the pieces affected.

The timber shall be carefully handled, without sudden dropping, breaking of outer fibers, bruising, or penetrating the surface with tools. The timber may be handled with rope slings. Cant hooks, peaveys, pikes, or hooks shall not be used.

Protective Tree Barriers shall be maintained for the duration of the contract in a condition safe to the public and satisfactory to the Engineer.

Upon completion of construction work around the area, all Protective Tree Barriers shall be disassembled, removed and disposed of away from the site.

4.22.5. MEASUREMENT. The quantity of Protective Tree Barrier to be measured for payment shall be the number of Protective Tree Barriers, of each type, actually constructed according to the Contract Drawings, around each tree which is to remain, and subsequently removed at each location as directed by the Engineer.

4.22.6. PRICE TO COVER. The contract price bid per each type of Protective Tree Barrier shall cover the cost of furnishing all labor, materials, plant, equipment, insurance, and incidentals required to construct, maintain and subsequent removal of the barrier in the locations as directed by the Engineer, in accordance with the Contract Drawings, the specifications, and the directions of the Engineer.

Where there are no scheduled items for Protective Tree Barriers, the cost of fabrication, furnishing, installation, erection, maintenance, and subsequent removal and disposal of a Protective Tree Barrier around existing trees which are designated to remain shall be deemed included in the unit prices bid for all scheduled items.

Payment will be made under:

Item No.	Item	Pay Unit
4.22 A	PROTECTIVE TREE BARRIER, TYPE A	EACH
4.22 B	PROTECTIVE TREE BARRIER, TYPE B	EACH

(NO TEXT ON THIS PAGE)

DIVISION V - INSPECTION AND TESTING OF MATERIALS, ADJUSTMENTS FOR DEFICIENCIES, AND MAINTENANCE

(NO TEXT ON THIS PAGE)

DIVISION V

INSPECTION AND TESTING OF MATERIALS AND ADJUSTMENTS FOR DEFICIENCIES

SECTION 5.01- Inspection of Materials

5.01.1. RESPONSIBILITY FOR TESTING.

(A) The Contractor will be required to retain the services of an independent testing laboratory, that is licensed in the State of New York to perform materials testing on the project. All laboratories shall be subject to approval by DDC's Quality Assurance and Construction Safety (QACS) Bureau and their "MIX DESIGN, LABORATORY AND PLANT APPROVAL PROTOCOL". The minimum requirement for approval is that the laboratory must have the current AMRL/AASHTO R-18 accreditation in the category of service proposed and must be currently licensed by the NYC Department of Buildings (DOB). Prior to the start of manufacture the Contractor shall submit the name of a Testing Laboratory to the Resident Engineer for approval. Upon approval this laboratory will be required to set up a program for testing materials to be utilized on the project. The tests that the Resident Engineer will require the laboratory to perform are for in-place soil density, concrete compressive strength, and in-place density of compressed bituminous mixtures.

The Laboratory shall provide, to the satisfaction of the Commissioner or his duly appointed representative, testing services in accordance with the procedures and specifications described herein.

Unless otherwise specifically provided for, all costs associated with the testing of materials shall be borne by the Contractor and the costs thereof shall be deemed included in the prices bid for all items of work.

(B) The City reserves the right, as part of its quality assurance program, that all materials, as well as the plant and methods of manufacture, shall be subject at all times to the inspection and approval of DDC's Director of QACS. All materials inspected and approved at place of manufacture, quarry, dock or siding may be subject to further inspection at the place of use, and any materials failing to comply with the specification requirements will be rejected.

The Director of QACS may at any time order such other and further inspection, examination, and tests as he may deem necessary and proper to satisfy himself that the work and materials are in compliance with these Specifications, including the taking of samples and performance of tests by technicians employed by the City.

The Contractor shall give the Director of QACS sufficient advance notice prior to starting the manufacture of the materials. The Director of QACS shall have free entry at all times, while work on the Contract is being performed, to all parts of the manufacturer's works that concern the manufacture of the materials, and shall be permitted to take such samples therefrom as they may deem necessary. The manufacturer shall afford the Inspector, without charge, all reasonable facilities to satisfy him that the material is being furnished in accordance with these Specifications. In the absence of an Inspector at the plant during manufacture, a certificate of test may be accepted by the Director of QACS.

The Contractor shall give the Engineer written notice of manufacture and of delivery of materials forty-eight (48) hours in advance of the beginning of the construction, and of any changes in the work force for the purpose of proper and timely inspection. Materials other than pipe and other castings, valves, or hydrants, may be inspected at the point of manufacture or upon delivery, as the Engineer may determine.

The Contractor hereby agrees not to use any materials which have not been inspected and accepted, nor to perform any Work except under inspection, to which end he further agrees to notify the Engineer when lines, grades or inspection are required, so that the Engineer may have time to provide the same. It is hereby agreed that the right of inspection herein provided for is intended solely for the benefit of the City, and the City shall not in any manner be bound by such inspection or by failure to inspect, or by the failure to discover any defective Work or materials used in the Work or non-compliance with any provisions of the Contract Documents, to accept Work which does not in fact comply with the Contract Documents, or relieve the Contractor of the obligation to comply with each of the provisions of this Contract. No inspection, approval or acceptance of any part of the Work herein contracted for, or of the materials used herein, or any payment on account thereof, shall prevent the Commissioner from refusing to accept the Work or materials at any time thereafter during the existence of this Contract, because the same do not comply with the requirements of the Contract.

The Commissioner reserves the right at all times to undertake and perform such work as may be necessary in opening or removing portions of the Work for the purpose of examination. The Contractor shall satisfactorily restore the Work so disturbed. Should the Work be found faulty in any respect, the portions disturbed shall be restored without cost to the City.

(C) The tests for in-place soil density, concrete compressive strength, and in-place density of compressed bituminous mixture required by the Resident Engineer, and testing performed by DDC's Director of QACS shall not relieve the Contractor of responsibility to conduct its own quality control program to ensure that all materials incorporated into the Work are in accordance with the Specifications.

5.01.2. ACCEPTANCE TEST. All equipment and appliances furnished and installations made under the Contract shall conform to the requirements of the Specifications, and shall in no event be less than that necessary to comply with the minimum requirements of all governmental agencies having jurisdiction. Whenever the Specifications and/or any governmental agency having jurisdiction requires the acceptance test, the Contractor shall give written notice to all concerned of the time when these tests will be conducted.

The Engineer is hereby authorized and empowered to reject and refuse all labor and materials or methods of installation or application, or any part thereof, offered under or in fulfillment of this Contract, that do not comply in kind, quality or quantity with the terms thereof. Any materials delivered or offered to be delivered under this Contract, which are rejected by the Engineer as not conforming to the terms thereof, shall be forthwith removed by the Contractor, and materials which do so conform shall be forthwith furnished and delivered by him in place thereof.

The Contractor shall furnish all labor, materials, energy, fuel, water, light and instruments for the tests at no additional cost to the City.

The final acceptance by the Commissioner shall be contingent upon the Contractor delivering to the Commissioner all necessary certificates evidencing compliance in every respect with the requirements of the agencies having jurisdiction.

If the results of tests and controlled inspections indicate that the material or procedures do not meet requirements as set forth on the drawings or in the specifications or are otherwise unsatisfactory, the Contractor shall only proceed as directed by the Engineer. Additional costs resulting from retesting, reinspecting, replacing of material and/or damage to the work of other trades and any delay caused to the schedule shall be borne by the Contractor.

5.01.3. CONCRETE, ASPHALT PAVING MIXTURE, AND ASPHALT PAVING BLOCKS. The manufacture of concrete, asphalt paving mixture and asphalt paving blocks shall be subject to inspection at all times. The Contractor shall give the Resident Engineer at least five (5) days advance notice prior to starting the manufacture. All apparatus, applicable specifications and other facilities needed for making the required tests or examinations including scales, sieves and facilities for moisture tests, shall be

provided at the plant by the Contractor. All testing apparatus and equipment shall be of standard and approved type. The Contractor shall provide and maintain at the plant the following:

An enclosed laboratory and all facilities necessary to inspect, sample and test all materials and to check all measurements and measuring devices.

The laboratory shall be not less than 150 square feet in area, with approved electric lighting, adequate heating and suitable lavatory and toilet facilities.

The following laboratory equipment shall be provided and maintained in good order:

1 – Work bench, approximately 2-1/2 feet wide by 10 feet long.
1 – Sink with running water.
1 – Electric heating connection.
1 – Electric hot plate, approximately 8” diameter.
3 – Drying pans, 10” x 10” x 2”, or approved equivalent.

	Asphalt Paving Mixture Plants	Truck Mix Concrete Plants	Central Plant Mix Concrete Plants
An automatic recording thermometer for each tank	X	---------	---------
An electric pyrometer at the discharge chute of the “aggregate” drier	X	---------	---------
An electric pyrometer to register the temperature of each aggregate inside of and near the discharge chute of the hot aggregate storage bin	X	---------	---------
3 inspector’s armored thermometers or equal	X	---------	X
1 set of standard sieves Nos. 200, 100, 50, 30, 16, 8, 4; 3/8”, 1/2”, 3/4”, 1”, 1-1/2”, 2”, and 2-1/2”	X	X	X
1 laboratory stone scale, 5 kilogram capacity	X	---------	---------
1 laboratory stone scale, 10 kilogram capacity	--------	X	X
1 laboratory sand scale, 50 gram or 100 gram capacity	X	X	X
Manila paper and wood block for making pat tests	X	---------	---------
2 slump tests molds with rods	--------	---------	X

Pails, shovels, scoops and approved oil cloth for mixing samples.

5.01.4. TREATED WOOD. Timber and lumber to be treated shall be inspected and tested before and after treatment at the plant. No shipment of treated material shall be made unless it has been accepted by the Resident Engineer as satisfactory under the Inspector's report. The Inspector shall seal or stamp accepted treated material prior to shipment.

5.01.5. APPROVAL OF MATERIALS AND MANUFACTURERS. The names of proposed manufacturers, materialmen and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted as early as possible to the Director of QACS for approval, to afford proper investigation and checking.

Approval of the material suppliers to the job should be obtained from the Department of Design and Construction far enough in advance to avoid delaying the shop drawing approval process.

5.01.6. LOCAL LAWS. All materials, appliances and types or methods of construction shall be in accordance with the Contract Documents and shall in no event be less than that necessary to conform to the requirements of the Administrative Code and Charter of the City of New York.

5.01.7. REPUTE OF MANUFACTURER. No manufacturer will be approved for any materials to be furnished under the Contract unless he shall be of good reputation, shall have a plant of ample capacity and shall have successfully produced similar products.

5.01.8. TRANSACTIONS WITH MANUFACTURERS AND SUB-CONTRACTORS. All transactions with manufacturers and sub-contractors shall be through the Contractor unless the Contractor shall request, in writing to the Commissioner, that the manufacturer or subcontractor deal directly with the Commissioner. Any such transactions shall not in any way release the Contractor from his full responsibility under the Contract.

5.01.9. MATERIALS. All materials, products and equipment furnished under the Contract, unless otherwise specifically called for herein, shall be new and unused, of standard first-grade quality and of the best workmanship and design. No inferior or low grade articles will be either approved or accepted, and all Work of assembling and construction must be done in a neat, first-class and workmanlike manner.

5.01.10. DOCUMENTARY EVIDENCE OF TESTS. For any materials which may not be inspected, at the sole discretion of the City or its designated representatives, satisfactory documentary evidence that the materials have passed the required inspection and testing must be furnished to the Commissioner prior to their incorporation into the Work.

5.01.11. INFORMATION TO SUPPLIERS. In asking for prices on materials under any item of the Contract, the Contractor shall provide the manufacturer or dealer with such complete information from the Specifications and Drawings as may in any case be necessary, and in every case he shall inform the manufacturer or dealer of all the General Conditions and requirements herein contained.

5.01.12. COMMISSIONER TO SELECT INSPECTORS. Except as specifically provided in the Contract Documents, the Commissioner will select or approve all persons, firms, or corporations to make or witness each and every inspection, test or analysis, with or without reports.

5.01.13. ACCESS TO MANUFACTURING PLANTS. The Commissioner shall have free access at all times to the works, factories, laboratories and refineries where the materials are prepared, and shall be permitted to take such samples therefrom as he may deem necessary.

5.01.14. SAMPLES OF MATERIALS. The Contractor shall submit to the Commissioner for approval, as and when required, samples of all materials specified to be used in the Project, as follows:

(A) Unless otherwise specified, samples shall be in triplicate, and sufficient to show the quality, type, range of color, finish and texture of materials.

(B) Each of the samples shall be labeled, bearing the name and quality of the material, the Contractor's name, date, Contract and Project, and the related Specification or Drawing reference to the samples submitted.

(C) A letter of transmittal, from the Contractor requesting approval must accompany all such samples. The Contractor shall provide, with the transmittal, written certification that the Contractor has inspected the samples being transmitted and that the samples conform with the Contract Drawings and Specifications.

(D) Transportation charges to the Commissioner's office must be prepaid on all samples forwarded.

(E) Samples for testing purposes shall be in accordance with the requirements of the Specifications.

5.01.15. SAMPLES ON DISPLAY. When samples are specified to be equal to samples in the Office of the Commissioner, they shall be carefully examined by the bidders and by those whom the bidder expects to employ for the furnishing of such materials.

5.01.16. TIMELY SUBMISSIONS OF SHOP DRAWINGS AND MATERIAL SAMPLES. Samples shall be submitted in due time and in accordance with the approved shop drawing and material samples schedule so as to permit proper consideration without delaying any operation under the Project. Materials should not be ordered until approval is received in writing from the Commissioner. All materials shall be furnished equal in every respect to the approved samples.

5.01.17. APPROVAL OF SAMPLES. The approval of any samples will be given as promptly as possible, and shall be only for the characteristic color, texture, strength, or other feature of the material named in such approval, and no other. When this approval is issued by the Commissioner, it is done with the distinct understanding that the materials to be furnished will fully and completely comply with the Specifications, the determination of which may be made at some later date by a laboratory test or by other procedure. Use of materials will be permitted only so long as the quality remains equal to the approved samples and complies in every respect with the Specifications, and the colors and textures of the samples on file in the Office of the Commissioner, for the Project.

The Commissioner will be the final judge as to acceptability of laboratory test data and performance in service of materials submitted.

5.01.18. VALUABLE SAMPLES. Valuable samples such as hardware, plumbing and electrical fixtures, etc., not destroyed by inspection or test, will be returned to the Contractor and may be incorporated into the Work after all questions of acceptability have been settled, provided suitable permanent records are made as to location of the samples, their properties, etc.

5.01.19. EQUIVALENT QUALITY OF MATERIALS. All materials and equipment which are designated in the Specifications by a number in the catalog of any manufacturer or by a manufacturer's grade or trade name are designated for the purpose of describing the article and fixing the standard or the quality and finish. Materials and equipment which are, in the opinion of the Commissioner, the equivalent to that specified, will be acceptable. Accordingly, unless otherwise provided for in the Contract, where a manufacturer's or brand name is specified, the words "or approved equivalent" are intended to be and shall be understood to follow said manufacturer's or brand name.

The submission of any material, or article, as the equal of the materials or articles set forth in the Specifications as a standard shall be accompanied by illustrations, drawings, descriptions, catalogs,

records of tests, samples and any and all other information essential for judging the equality to the materials, finish and durability of that specified as standard, as well as information indicating satisfactory use under similar operating conditions. Samples taken from various deliveries during the progress of the Work and during the maintenance period, when tested and analyzed, shall exhibit qualities equal or superior to those of the sample submitted with or described in the Bid, and no change of materials shall be made without written permission of the Commissioner.

5.01.20. MANUFACTURER'S DIRECTIONS. Where the Specifications provide that the manufacturer's directions are to be used, such printed directions shall be submitted to the Commissioner.

5.01.21. NOTICE TO COMMISSIONER PRIOR TO MANUFACTURE. The Contractor shall give notice in writing to the Commissioner, sufficiently in advance of his intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the Commissioner will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials, or he will notify the Contractor that the inspection will be made at a point other than the point of manufacture, or he will notify the Contractor that inspection will be waived.

5.01.22. NO SHIPPING BEFORE INSPECTION. The Contractor shall comply with the foregoing requirements for approvals of materials, including submission of shop drawings, sampling, inspection, and testing, before shipping any material.

5.01.23. CERTIFICATE OF MANUFACTURE. The Contractor shall furnish the Commissioner with authoritative evidence, in the form of Certificates of Manufacture, that all the materials to be used in the Work have been manufactured and tested in conformity with the Specifications. These certificates shall include copies of the results of physical tests and chemical analyses where necessary, that have been made directly on the product, or on similar products being fabricated by the manufacturer.

When materials or manufactured products shall comprise such quantity that it is not practical to make physical tests or chemical analyses directly on the product furnished, a certificate stating the results of such tests or analyses of similar materials which were concurrently produced may, at the discretion of the Commissioner, be considered as the basis for the acceptance of such material or manufactured product.

5.01.24. TESTING COMPLIANCE. The testing personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Specifications, indicating thereon all analyses and/or test data and interpreted results thereof.

5.01.25. REPORTS. Six (6) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the Commissioner as prerequisite for the acceptance of any material or equipment.

5.01.26. REJECTIONS. If by making any test the Commissioner ascertains that the material or equipment does not comply with the Specifications, the Contractor will be notified thereof, and he will be directed to refrain from delivering said materials or equipment, or to promptly remove it from the Site or from the work and replace it with acceptable material without cost to the City.

Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the Contract Documents, the Contractor shall immediately proceed to furnish the designated material or equipment.

5.01.27. IDENTIFICATION. Each delivery shall be accompanied by the required number of delivery tickets, stating the name, type and grade of the material, quantity contained in the delivery, name of Contractor, and Contract Number.

Each bag of Portland cement shall be plainly marked with the name and brand of the manufacturer. The type shall be identified on each bag by name by a suitable mark, tag, ribbon or similar device which will permit positive identification with the delivery tickets.

Invoices for bulk shipments of Portland cement shall contain information which will permit positive identification of the material delivered.

5.01.28. NEW DELIVERIES. Whenever, during the course of the work, new deliveries of materials are received by the Contractor, their use will not be permitted until they have been examined and approved by the Resident Engineer. Mixed lots varying in origin, brands or trademarks will not be accepted on any contract unless specifically permitted by the Resident Engineer.

5.01.29. MATERIALS TO BE EQUAL TO SAMPLES. Samples taken from the various deliveries during the progress of the work, when tested and analyzed, shall conform to the requirements of the Specifications and shall have qualities equal to those of the approved samples submitted. No material other than that equal to the approved samples shall be used without the written permission of the Resident Engineer.

SECTION 5.02 - Sampling

5.02.1. SAMPLES AND CERTIFICATIONS. The Contractor shall furnish the Resident Engineer with facilities and laborers to assist in the inspection and sampling of the materials in use or to be used at any time before the start and during the course of the work.

The Contractor shall furnish and deliver as directed, without charge, samples, certifications, shop drawings and other information required of the materials intended to be used.

All material certifications shall be signed by an authorized representative of the manufacturer or supplier, must state that the material meets all applicable Contract Specifications, that the latest applicable ASTM and other required tests have been performed, and that the test results have met the required standards. The certification shall list the tests performed, the dates on which the tests were performed, and copies of all test results shall be attached to the certification.

Certificates of mill tests for chemical and physical properties of metals shall be furnished on all deliveries, unless otherwise permitted. The Contractor shall indicate in the shipping invoices the heat or melt numbers which will permit positive identification of the mill tests with the materials delivered.

Samples, certifications and tests required, are as follows:

(A) FINE AND COARSE AGGREGATES

A statement in writing of the specific sources of the fine and coarse aggregates he proposes to use.

(B) OTHER MATERIALS

Samples of adequate size and quantity of any of the other materials, in suitable containers, each properly labeled with the name or brand and specified source of the contents and name of the Contractor.

(C) ADDITIONAL SAMPLES

Additional samples as required.

5.02.2. METHODS.

(A) SAMPLING

Samples of all materials for tests shall be selected by the Resident Engineer. Except as herein otherwise specified, sampling of materials shall be in accordance with the methods prescribed in **Section 5.03**.

(B) COARSE AGGREGATE

1. BARGE LOAD – A gross sample shall be taken from at least four (4) points, at a depth of at least one (1') feet below the surface of the stone on the boat and at equal distance along a diagonal line from bulkhead to bulkhead. These samples shall be consolidated into one (1) sample for test purposes.

2. TRUCK LOAD PILE – A gross sample shall be taken from at least four (4) points, at a depth of at least one (1') feet below the surface of the pile, at equal distance between base and top. These samples shall be consolidated into one (1) sample for test purposes.

3. SIZE OF SAMPLE – The gross sample shall be not less than twice the weight of the laboratory sample, and it shall be quartered down to the size of a laboratory sample.

At least one (1) laboratory sample of the aggregate weighing not less than fifty (50) pounds shall be taken from each size as representing the delivery thereof.

(C) CONCRETE TEST CYLINDERS

The Contractor shall provide, with each concrete delivery, an adequate quantity of molds, caps, and tags for making concrete test cylinders. The molds shall conform to the requirements specified therefor under ASTM Designation C 31, and shall be of a non-metallic, discardable type, as approved by DDC's Director of Quality Assurance and Construction Safety (QACS). The quantities and dates of deliveries of the molds and caps to the various project sites shall be as directed by the Resident Engineer.

At least four (4) test cylinders will be taken for every fifty (50) cubic yards of concrete, or portion thereof, delivered to the site. Concrete test cylinders will be made by the Resident Engineer at the point of concrete delivery and shall be representative of the batch from which they are taken. The Contractor shall provide facilities for the proper care of these cylinders while on the site, and they shall be safeguarded against injury and protected from the elements. These facilities shall include, but not be limited to, curing boxes in sufficient size and quantities to satisfactorily cure all cylinders taken by the Resident Engineer. Curing boxes shall be furnished in good operating condition, capable of maintaining cylinders under water at a curing temperature of 72° F. $\pm$ 5° F. No separate payment will be made for the provision of molds, caps, tabs and curing boxes. The cost thereof shall be included in the prices bid for the respective items of work.

Cylinders are to be delivered by the Contractor to a designated area near 30-30 Thomson Ave, Long Island City, New York, or where otherwise directed, within the City of New York, within two (2) days after molding, where they will be properly stored and cured until the date of test, and tested, by others, upon removal from the curing room.

The cost of providing facilities for storing and protecting the cylinders on the site shall be deemed included in the prices bid for all the concrete items scheduled in the contract.

(D) CURBS AND HEADERS, GRANITE AND BLUESTONE

Test pieces of granite and bluestone curbs and headers shall be broken from sections of curb or header in such manner as to furnish approximately seventy-five (75) pounds of material.

(E) STEEL BARS FOR CONCRETE REINFORCEMENT

Three (3) pieces at least twenty-four (24”) inches in length shall be taken from each size and heat number delivered.

SECTION 5.03 - Methods of Sampling and Testing

5.03.1 METHODS. Except as herein otherwise specified, methods of sampling and testing that are to be used by the Contractor for his quality control program when furnishing any of the following materials shall be as prescribed by the following and other applicable Designations of the American Society for Testing Materials. In addition, The City reserves the right to test any materials to be furnished on a random basis, at its own discretion, for quality assurance.

No.	Material or Item	Reference	Contractor's Test Frequency	Sample	Manufacturer's Certificate	Manufacturer's Test Results	Contractor's QC Test
				Size	Required	Required	Required
1	Aggregate	ASTM C 136, D 546	1/Source	1 bag	Yes	Yes	No
2	Aggregate, Lightweight	ASTM C 330	Optional	1 bag	Yes	Yes	No
3	Aggregates for Concrete	ASTM C 33, C 87	Once/ 50CY/ Vendor*	1 bag	Yes	Yes	No
4	Asphalt	MS-2 (Asphalt Paving Manual) ASTM D 2041	2 loose bags/batch/ day	2 bags	Yes	Yes	Yes
5	Asphalt	ASTM D 2172	800 Tons	2 sets of Marshall Plugs	Yes	Yes	Yes
6	Asphalt	ASTM D 6, D 92	800 Tons	2 sets of Marshall Plugs	Yes	Yes	Yes
7	Asphalt	ASTM D 5, D 217, D 946	800 Tons	2 sets of Marshall Plugs	Yes	Yes	Yes
8	Asphalt	ASTM D 36	800 Tons	2 sets of Marshall Plugs	Yes	Yes	Yes
9	Asphalt	ASTM D 70, D 71, D 139, D 2041	800 Tons	2 sets of Marshall Plugs	Yes	Yes	Yes
10	Asphalt	ASTM D 88	800 Tons	2 sets of Marshall Plugs	Yes	Yes	Yes
11	Asphalt	ASTM D 95	800 Tons	2 sets of Marshall Plugs	Yes	Yes	Yes
12	Asphalt (Binder, Sheet Asphalt	ASTM C 42, D 2041	1/200'/pass, (min 4/block)	4 readings	Yes (Batch Report)	No	Yes
13	Asphalt Pavement, Sidewalk	ASTM D 2950, D 1188	1/200'/pass, (min 4/block)	4 Cores/block	Yes (Batch Report)	No	Yes
14	Asphalt Paving Block		Each Lot	12 Blocks	Yes	Yes	No
15	Asphalt, Emulsified (Tack Coat)	ASTM D 244, D 977	Per Truck	0.5 Gallon	Yes	No	No
16	Asphalt, Liquid (Tack Coat)	ASTM D 2028, D 2027	Per Truck	0.5 Gallon	Yes	No	No
17	Brick – Type 1 Manhole Brick	ASTM C 32-Grade MS, C 279	Each Delivery	12 Bricks	Yes	Yes	No
18	Brick – Type 2 Sewer and Liner Brick	ASTM C 32-Grade SS, C 279	Each Delivery	12 Bricks	Yes	Yes	No
19	Brick Pavers	ASTM C 67, C 902	Each Delivery	1 percent	Yes	Yes	No
20	Cement Mortar	ASTM C 109	Every Day	4- 2 inch cubes	Yes	No	No
21	Cement, Portland	ASTM C 114, C 115, C 150, C 151. C 183, C 187, C 188, C 191, C 204	Each Delivery	As Required	Yes	Yes	No
22	Concrete	ASTM C 231, DDC Materials Method 9.2	1 per truck	As Required	Yes (Batch Report)	No	No

No.	Material or Item	Reference	Contractor's Test Frequency	Sample	Manufacturer's Certificate	Manufacturer's Test Results	Contractor's QC Test
				Size	Required	Required	Required
23	Concrete (Pigmented)	ASTM C 94	1 per truck	As Required	Yes	Yes	Yes
24	Concrete	ASTM C 403	3/Block	As Required	Yes	Yes	Yes
25	Concrete, Air entraining Agent	ASTMC 260, DDC Materials Method 9.2	1/Lot	1 Quart	Yes	Yes	No
26	Concrete	ASTM C 31, C 42, C 39, C 873, E 4	Per 50 C.Y.	4 Cylinders	Yes (Batch Report)	No	No
27	Concrete (Pavements)	ASTM C 42, C 39	1/700 S.Y., 3 minimum	Cores	Yes (Batch Report)	No	No
28	Concrete Expansion Joint - Filler Hot Poured	ASTM D 5329, D 6690	1/block	0.5 Gallon	Yes	No	No
29	Concrete Expansion Joint - Type I	ASTM D 1752-Type I	1/ Block	3 FT.	Yes	No	No
30	Concrete Expansion Joint - Type II	ASTM D 1752-Type II	1/ Block	3 FT.	Yes	No	No
31	Concrete Expansion Joint - Type III	ASTM D 1752-Type III	1/ Block	3 FT.	Yes	No	No
32	Concrete Expansion Joint - Type IV	ASTM D 1751	1/ Block	3 FT.	Yes	No	No
33	Concrete Masonry Units	ASTM C 90	Optional	As Required	Yes	Yes	No
34	Concrete, Accelerator	ASTM D 98	Optional	As Required	Yes	Yes	No
35	Concrete	ASTM C 143, DDC Materials Method 9.2	1/Truck	As Required	No	No	No
36	Concrete, Pigment	ASTM C 979	1/color/Project	4'x4'x4"	Yes	Yes	Yes
37	Concrete, Water-reducing and retarding	ASTM C 494	1/Lot	1 Quart	Yes	Yes	No
38	Curing Materials- Type 1-D	ASTM C 309-Type 1	1/Lot	0.5 Gallon	Yes	Yes	No
39	Curing Materials- Type 2	ASTM C 309-Type 2	1/Lot	0.5 Gallon	Yes		
40	Curing Materials- Type 3	ASTM C 309-Type 3	1/Lot	0.5 Gallon	Yes	Yes	No
41	Curing Materials- Type 4 (Sidewalk & Curbs)	ASTM D 977, D 2028	1/Lot	0.5 Gallon	Yes	Yes	No
42	Fill Materials	AASHTO T-99, AASHTO T-191, T-205, ASTM D 698	In-place Density Tests at every 100 Ft. for Each Layer. Proctor Tests for each new source of fill material – 2 to 3, as directed.				Yes
43	Filter Fabric	ASTM D 4632, D 4533, D 3787	1/Lot	3'X3'	Yes	Yes	No
44	Fly Ash	AASHTO M 302.	1/Lot	As Required	Yes	Yes	No

No.	Material or Item	Reference	Contractor's Test Frequency	Sample	Manufacturer's Certificate	Manufacturer's Test Results	Contractor's QC Test
				Size	Required	Required	Required
45	Geogrid	ASTM D 4632, D 4595, D 3776, D 1777	1/Lot	3'X3'	Yes	Yes	No
46	Granite Blocks	Los Angeles Machine Test	Each Delivery	1 percent	Yes	Yes	No
47	Hydrated Lime	ASTM C 207	Each Delivery	As Required	Yes	Yes	No
48	Iron Castings Gray	ASTM A 48	1/Lot	1	Yes	Yes	No
49	Iron Castings Malleable	ASTM A 47	1/Lot	1	Yes	Yes	No
50	Iron, Wrought	ASTM E 350	1/Lot	1	Yes	Yes	No
51	Mortar (Test for impurities in fine aggregates)	ASTM C 87	1/Lot	1 Bag	Yes	Yes	No
52	Mortar and Grout –Portland Cement	ASTM C 109	1/Batch	2" Cubes	Yes	No	No
53	Paint	ASTM D 822, G 53	Optional	0.5 Gallon	Yes	Yes	No
54	Paint, Reflectorized	ASTM B 589	Optional	0.5 Gallon	Yes	Yes	No
55	Paint-Curbs	Fed. Spec. TTP86, TTP115	Optional	0.5 Gallon	Yes	Yes	No
56	Rip Rap	ASTM D 75	Each Delivery	N/A	Yes	No	No
57	Sealer-Conc. Expansion Joint Type 1	ASTM D 6690	Each Delivery	0.5 Gallon	Yes	Yes	No
58	Sealer-Conc. Expansion Joint Type 2	Fed. Spe. TTS001543A / 00230C	Each Delivery	0.5 Gallon	Yes	Yes	No
59	Sealers for Concrete Pavements	ASTM D 2628, D 5329	None	N/A	Yes	Yes	No
60	Slag, Ground Granulated Blast-Furnace Slag	AASHTO M 302	Each Delivery	As Required	Yes	Yes	No
61	Soil	AASHTO T 191,T 205	Per 100' of each layer	Test	No	No	Yes
62	Soil	ASTM D 698, AASHTO T 99	Per 1000 C.Y.	Test	No	No	Yes
63	Soil	ASTM D 4318	Optional	1 bag	Yes	No	Yes
64	Soil – Clean Backfill	ASTM D 422	Minimum of 3	1 bag	Yes	No	No
65	Steel Bars	ASTM A 108	Each Delivery	N/A	Yes	Yes	No
66	Steel Bars and Shapes	ASTM A 499	Each Delivery	N/A	Yes	Yes	No
67	Steel for Plates	ASTM A 36, ASTM A 135, ASTM A 139, ASTM A 283, ASTM A 572			Yes	Yes	
68	Steel Fasteners	ASTM A 502	Each Delivery	N/A	Yes	Yes	No
69	Steel Reinforcement Bars	ASTM A 615 Grade 60	Three/size/heat	2 Feet	Yes	Yes	Yes

No.	Material or Item	Reference	Contractor's Test Frequency	Sample	Manufacturer's Certificate	Manufacturer's Test Results	Contractor's QC Test
				Size	Required	Required	Required
70	Steel Reinforcement Bars Type I	ASTM A 615 Grade 40	Three/size/heat	2 Feet	Yes	Yes	No
71	Steel, Galvanizing	ASTM A 90, A 123, A 153, A 239	Each Delivery	N/A, QACS	Yes	Yes	No
72	Steel, Structural	ASTM A 36	Each Delivery	N/A	Yes	Yes	No
73	Steel, Welded Wire Fabric	ASTM A 185	Each Delivery	N/A	Yes	Yes	No
74	Stainless Steel Bolts, Studs	ASTM A 193	Each Heat		Yes	Yes	
75	Select Granular Fill	ASTM D 1073			Yes		
76	Stone Ballast	ASTM C 33	Each Delivery	1 bag	Yes	Yes	No
77	Stress Graded Timber and Lumber	ASTM D 245	Each Delivery	N/A	Yes	Yes	No
78	Thermoplastic Pavement markings	ASTM D 1535, D 1155, E 28, D 1214, AASHTO T-250	1/Project	0.5 Gallon*	Yes	No	No
79	Thermoplastic Primer – Type I	As above	1/Project	0.5 Gallon*	Yes	No	No
80	Thermoplastic Primer – Type II	As above	1/Project	0.5 Gallon*	Yes	No	No
81	Topsoil	ASTM C 117, D 2974, D 2976	Once/ 50 C.Y./Vendor	1 bag	Yes	No	No
82	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers	ASTM D 412	Visual	N/A	Yes	No	No
83	Welding Rods, Electrodes, Filler Metals	ASME Section II			Yes	Yes	
84	Welded Wire Fabric	ASTM A 185, ASTM A 497			Yes	Yes	

5.03.2. ASPHALT PAVING BLOCKS.

ABSORPTION TEST

Four (4) asphalt paving blocks shall be dried at a temperature of 150° F., after which they shall be cleaned of loose particles, weighed to within one (1) gram and placed in water at a temperature of 65° F. to 80° F. for twenty-four (24) hours. The blocks shall then be removed from the vessel, all surface water shall be mopped off and the blocks reweighed to within one (1) gram. The increase in weight divided by the original dry weight and multiplied by one hundred (100) equals the percentage of absorption.

5.03.3. CONCRETE.

SAMPLING FROM REVOLVING DRUM MIXERS

The sample shall be taken during the discharge of the entire batch, except that samples shall not be taken at the beginning or end of discharge. Sampling shall be done by repeatedly taking shovels of concrete from the chute and placing in the concrete test molds in accordance with ASTM Designation C 31. The concrete may also be collected by the above method in a wheelbarrow and taken to the place where the filled cylinders are to be prepared and stored.

5.03.4. COMPRESSED BITUMINOUS MIXTURE.

DENSITY (BULK SPECIFIC GRAVITY METHOD)

The density of compressed bituminous mixtures shall be determined from cores drilled from completed wearing courses or pavements. When a wearing course or pavement consists of a surface course placed on a base course, the surface and base courses shall be separated and density determinations made of both the surface course and the base course.

A test specimen shall be weighed in air, after it has been air-dried to constant weight at a temperature not exceeding 80 degrees F., and its weight ‘A’, in grams, recorded.

The specimen shall be immersed in water for not less than five (5) minutes. The water shall be maintained at a temperature of 77 degrees F. (25 degrees C.) and the specimen, after the immersion period, shall be weighed while suspended in the water and its weight ‘C’, in grams, recorded.

The specimen shall then be removed from the water and surface-dried by patting with absorbent cloth until all visible films of water are removed. It shall then be weighed in air and its weight ‘B’, in grams, recorded.

The bulk specific gravity shall be calculated as follows:

$$\text{Bulk Specific Gravity} = \frac{\text{‘A’}}{\text{‘B’} - \text{‘C’}}$$

SECTION 5.04 - Deficiencies in Bituminous Pavements and Concrete

Under this section, deficiencies in the thickness and density of bituminous pavements, percentages of bitumen in bituminous mixtures, and deficiencies in the strength and thickness of concrete shall be determined and adjustments made to payments for pavements and concrete that are found to be deficient.

(A) DETERMINATION BY CORE BORINGS, CONCRETE CYLINDERS OR SAMPLES

1. The thickness and density of a wearing course consisting of a single-layer of a homogeneous bituminous mixture; the thickness and density of each course in a two-layer wearing course consisting of a specified compacted thickness of surface course placed upon a specified compacted thickness of bituminous base course; the thickness and density of each course in an asphalt macadam pavement which consists of specified compacted thickness of a bituminous surface course placed on a specified compacted thickness of either a plant mixed bituminous or penetrated stone base course; and the thickness of concrete sidewalks shall be determined from cores.

   The thickness of concrete pavements or concrete base for pavements shall be determined from cores or as directed by the Resident Engineer.

   Concrete in concrete pavements, concrete bases for pavements, concrete curbs, steel faced concrete curbs, and concrete sidewalks shall have its strength determined from cores or test cylinders, as directed by the Resident Engineer.

   All other concrete construction shall have strength determined from concrete test cylinders.

   The average percentage of bitumen in an asphaltic mixture and the sieve analysis thereof shall be determined from all cores taken for thickness and density.

2. All cores shall be taken by the Contractor in accordance with the provisions of ASTM Designation C 42; however, the City reserves the right to perform its own verification cores. Cores shall be delivered to a designated laboratory, for testing by the City, to determine compliance with the specifications for payment purposes. These cores shall be considered the Commissioner's Cores.

   Concrete test cylinders shall be taken and stored in the field in accordance with the provisions of ASTM Designation C 31.

3. At least three (3) cores shall be taken in each two thousand one hundred (2,100) square yards, approximately, of roadway surface and in each four thousand (4,000) square feet of concrete sidewalk at points located by the Resident Engineer, but not less than three (3) core borings shall be made on any contract. On resurfacing contracts, cores shall be of the asphalt pavement only.

   If a concrete core at any location breaks during drilling, additional core borings shall be made within ten (10') feet of the original core boring, but not more than three (3) core borings shall be taken at a given location.

4. When concrete cylinders are used to determine strength, they shall be taken by the Resident Engineer during the progress of the work from each class and type of concrete. Cylinders shall be tested for 28-day compressive strength.

5. A sample for the determination of percentage of bitumen in asphaltic mixtures shall be not less than ten (10) pounds in weight. Two (2) samples shall be taken from each day's delivery of each class or type of mixture laid but not less than three (3) samples of a mixture will be taken on any contract.

Samples will be taken from the spread mixture, prior to compaction by rolling, after approximately five (5) tons of mixture from a given truck load have been spread on the roadway. Material removed for samples shall be immediately replaced with new material and acceptably incorporated before rolling.

(B) THICKNESS TESTS, EXCESS DEPTH

Any measurement of a core which exceeds one hundred and ten (110) percent of the specified thickness of a course will be considered as being only one hundred and ten (110) percent of the specified thickness when used to determine the thickness of (1) a single-layer asphalt wearing course, (2) the surface course in a two-layer asphalt wearing course, (3) the base course in a two-layer asphalt wearing course, (4) the surface course in an asphalt macadam pavement, or (5) the base course in an asphalt macadam pavement.

Any concrete core having an average depth exceeding one hundred and five (105) percent of the thickness specified will be considered to have a depth of only one hundred and five (105) percent of the specified thickness in determining the average thickness of the concrete.

(C) PAYMENT, EXCESS THICKNESS

When the average thickness equals or exceeds the specified thickness, the specified thickness only will be paid for.

(D) PAYMENT, DEFICIENT THICKNESS

When the average thickness of (1) a single-layer asphalt wearing course, (2) the surface course in a two-layer asphalt wearing course, (3) the base course in a two-layer asphalt wearing course, (4) the surface course in an asphalt macadam pavement, or (5) the base course in an asphalt macadam pavement is less than the specified thickness, the area to be paid for will be the area of the course multiplied by the average thickness as indicated by measurement of cores and divided by the specified thickness. (Note: If the base course thickness is deficient but the overlying wearing course thickness is excessive by an amount at least equal to the base course deficiency, no adjustment in payment will be made for either course.)

The area of surface course in a two-layer asphalt wearing course, adjusted as provided above, will be paid for at a price per square yard equal to a percentage of the price bid per square yard for the complete wearing course. The area of base course in a two-layer asphalt wearing course, adjusted as provided above, will be paid for at a price per square yard equal to a percentage of the price bid per square yard for the complete wearing course. The percentages to be used shall be as given in the following tabulation.

Specified Thickness of Wearing Course (inches)	Specified Thickness of Surface Course (inches)	Specified Thickness of Base Course (inches)	Percentage Of Price Bid	
			Surface Course (%)	Base Course (%)
2-1/4	1	1-1/4	48.2	51.8
2-1/2	1-1/4	1-1/4	50.0	50.0
2-1/2	1	1-1/2	46.6	53.4
2-3/4	1-1/4	1-1/2	48.3	51.7
3	1-1/2	1-1/2	50.0	50.0

Percentages for untabulated combinations of wearing, surface and base course combinations shall be as specified.

The area of surface course in an asphalt macadam pavement, adjusted as provided above, will be paid for at a price per square yard equal to four-ninths (4/9) of the price bid per square yard for the complete asphalt macadam pavement. The area of base course in an asphalt macadam pavement, adjusted as provided above, will be paid for at a price per square yard equal to five-ninths (5/9) of the price bid per square yard for the complete asphalt macadam pavement.

When the average thickness of concrete pavement or base for pavement is deficient by one-half (1/2") inch or less than the specified thickness, the volume of concrete to be paid for will be the product of the area of the pavement or base multiplied by its average depth as indicated by measurement of the cores.

When the average thickness of concrete base or pavement (d) is deficient by more than one-half (1/2") inch from the specified thickness (D), the volume of concrete to be paid for will be the product of the area of the base or pavement and the specified thickness multiplied by the ratio $(d)^2 / (D)^2$.

When the average thickness of concrete sidewalk is deficient by three-tenths (0.3) of an inch or less than the specified thickness, the area of sidewalk to be paid for will be the product of the area of the sidewalk multiplied by the ratio of the average depth, as indicated by measurement of the cores, over the specified depth.

When the average thickness of concrete sidewalk (d), as determined by cores, is deficient by more than three-tenths (0.3) of an inch from the specified thickness (D), the area of concrete sidewalk to be paid for will be the area of the sidewalk multiplied by the ratio $(d)^2 / (D)^2$.

Where the deficiency in thickness of concrete sidewalk, base or pavement exceeds twenty-five (25) percent of the specified thickness, such sidewalk, base or pavement will be rejected and shall be completely removed and properly replaced. No payment will be made for rejected concrete sidewalk, base or pavement; nor for any wearing course required to be removed and replaced because of rejected concrete base; nor for the removal, disposal and replacement of any of the foregoing.

(E) TOLERANCE, THICKNESS

When the average thickness of an asphaltic wearing course, consisting of a single layer of a homogeneous bituminous mixture of specified compacted thickness, is not less than ninety-eight (98) per cent of the specified thickness, the specified thickness will be paid for.

The surface course in a two-layer asphaltic wearing course will be deemed non-deficient when the average thickness of the surface course is not less than ninety-eight (98) percent of the specified thickness, except as otherwise hereinafter provided.

The base course in a two layer asphaltic wearing course will be deemed non-deficient when the average thickness of the base course is not less than ninety-eight (98) percent of the specified thickness.

The surface course in an asphalt macadam pavement will be deemed non-deficient when the average thickness of the surface course is not less than ninety-eight (98) percent of the specified thickness, except as otherwise hereinafter provided.

The base course in an asphalt macadam pavement will be deemed non-deficient when the average thickness of the base course is not less than ninety-eight (98) percent of the specified thickness.

When a two-layer wearing course is placed on an existing pavement, an existing concrete base for pavement or a new concrete base for pavement, the surface course in such wearing course will be deemed non-deficient when the average thickness of the surface course is not less than ninety (90) percent of the specified thickness, provided that the average thickness of the completed wearing course equals or exceeds the specified thickness.

When the base course in an asphalt macadam pavement is a non-bituminous or a non-penetrated stone base course, the surface course in such asphalt macadam pavement will be deemed non-deficient when the average thickness of the surface course is not less than ninety (90) percent of the specified thickness, provided that the average thickness of the complete asphalt macadam pavement equals or exceeds the specified thickness.

(F) PAYMENT, DEFICIENT DENSITY

When, in each lot of asphaltic concrete placed each day, the average density of a compacted asphaltic wearing course or an asphaltic surface course in asphaltic macadam pavement is less than ninety-two (92) percent but more than ninety (90) percent of the theoretical maximum density obtained in the plant (calculated in accordance with ASTM Designation D 2041), the area to be measured for payment that day will be the area of the course multiplied by the average density as indicated by tests of the cores and divided by the above ninety-two (92) percent minimum density.

When, in each lot of asphaltic concrete placed each day, the average density of a compacted asphaltic wearing course or an asphaltic surface course in asphaltic macadam pavement is more than ninety-seven (97) percent or less than ninety (90) percent of the theoretical maximum density obtained in the plant (calculated in accordance with ASTM Designation D 2041), then that entire area of pavement shall be rejected and removed from the site.

The area of asphaltic surface course in asphalt macadam pavement, after adjustment as provided herein, will be paid for at the price specified in Provision (D), PAYMENT, DEFICIENT THICKNESS.

(G) STRENGTH TESTS, EQUATING RESULTS

In computing the compressive strength of each core, the height used in making such computation shall be the height of the core after capping and the test result shall be equated to a height-diameter ratio of two (2) to one (1).

(H) RECTIFYING OVERTIME TESTS

When strength tests of cores or cylinders are made after the specified standard twenty-eight (28) day period after placing of the concrete from which they are taken, the results will be rectified by the Resident Engineer into twenty-eight (28) day results in accordance with the Time Strength Table 3.05-IV in **Subsection 3.05.5**.

(I) STRENGTH REQUIREMENTS

The average of the compressive strengths, determined and computed as specified, shall equal or exceed the minimum requirements of **Section 3.05** for concrete of the class and type specified.

(J) EXCESS STRENGTH

Cores having strengths exceeding one hundred and twenty-five (125) percent of the minimum strength specified will be considered to have a strength of only one hundred and twenty-five (125) percent of the specified minimum strength in determining the average strength of the concrete.

Concrete test cylinders having strengths exceeding one hundred and fifteen (115) percent of the minimum strength specified will be considered to have a strength of only one hundred and fifteen (115) percent of the specified minimum strength in determining the average strength of concrete.

The strength of the concrete determined from concrete cylinders will be recorded as the average of the strengths of all cylinders tested. Results from obviously faulty, defective, or improperly cured specimens will be disregarded in determining the average.

(K) PAYMENT, EXCESS STRENGTH

When the average strength equals or exceeds the specified minimum strength, the concrete will be paid for at the contract price.

(L) PAYMENT, DEFICIENT STRENGTH

Concrete whose average compressive strength is less than the specified minimum strength will be paid for at the contract price less an amount which will bear the same proportion to the contract price that the deficiency in strength bears to the specified minimum strength.

When the cost of furnishing and incorporating concrete is included in the prices bid for the items listed below and a deficiency in strength after test (f) from specified strength (F) occurs in the concrete, the quantity to be paid for under the said items shall be the measured quantity reduced by an amount equal to the measured quantity multiplied by the corrective factor K(1-f/F). Values of K for each of the items are tabulated below:

Description	K
Curb	
Granite, New.....	0.16
Granite, Reset.....	0.22
Bluestone, New.....	0.18
Bluestone, Reset.....	0.25
Curb, Concrete, Steel Faced	
New, Furnished by Contractor.....	0.40
Reset or Furnished by City.....	0.50
Header	
Granite, New..... ...	0.24
Granite, Reset.....	0.32
Bluestone, New.....	0.28
Bluestone, Reset.....	0.36

(M) PERCENTAGE BITUMEN TESTS, METHOD

The bitumen content of all asphaltic mixtures will be determined from samples in accordance with the requirements of ASTM Designation D 2172, using chloroform as the solvent.

(N) PAYMENT, DESIGN PERCENTAGE OF BITUMEN

The minimum and maximum design percentage of bitumen in asphaltic mixture shall be the percentage contained in the approved Contractor's formulas with a tolerance of ± 7% of that bituminous percentage.

For each lot of asphalt placed each day, when the average percentage of all samples of a given mixture, determined from test results, is equal to or greater than the minimum design percentage or is equal to or less than the maximum design percentage, the mixture will be paid for at the contract price.

(O) PAYMENT, EXCESS OR DEFICIENT PERCENTAGES

When the average percentage of bitumen in asphaltic mixtures is less than the minimum or exceeds the maximum design percentage, payment will be made at the contract price less an amount which will bear the same proportion to the contract price that the deviation of average bitumen percentage bears below minimum or above maximum design percentage.

(P) TIME OF MAKING CONTRACTOR'S CORE BORINGS OR CONCRETE CYLINDERS

The Contractor, to confirm the results obtained from the Commissioner's borings or cylinders, will be permitted to make core borings or cylinders at his own cost and expense under the following conditions:

1. He may make core borings at the same time or cylinders from the same batches that the Commissioner makes core borings or cylinders.

2. He may make core borings at any time subsequent to the determination of the results of the tests of the Commissioner's cores (of which results he will be notified by mail) provided that he files with the Resident Engineer, within ten (10) days of the date of notification of the results of the tests of the Commissioner's cores, a statement in writing of his desire to make core borings.

3. The Contractor will be granted a period of thirty (30) days following the date of notice to him of the results of the Commissioner's cores in which he may make his own core borings, should he so elect, and submit results of the same. No submission of the Contractor's cores will be considered beyond the thirty (30) day period hereinbefore stipulated, unless otherwise approved by the Commissioner. Upon the failure of the Contractor to recore as provided above within the thirty (30) day period, the Commissioner's cores, only, will be used in determination of payment.

(Q) CONDITIONS OF MAKING CONTRACTOR'S CORE BORINGS OR CONCRETE CYLINDERS

Not more than one (1) Contractor's cylinder shall be made for any one (1) Commissioner's cylinder.

The Contractor, when he elects to recore, shall make two (2) core borings for each Commissioner's core boring which is deficient in thickness, strength and/or density.

The first Contractor's core boring shall be made within seven (7') feet of the Commissioner's core boring which is deficient. The second Contractor's core boring shall be made not less than seven (7') feet nor more than ten (10') feet from the Commissioner's core boring (1) which equals or is closest to 105% of the specified thickness when deficient thickness is the reason for recoring, (2) which equals or is closest to 125% of the specified strength when deficient strength is the reason for recoring, or (3) which is closest to the theoretical maximum density when deficient density is the reason for the recoring.

When the Contractor elects to make more than one (1) recore, the above requirements of closeness to specified thickness, specified strength and theoretical maximum density shall be applied in descending order to each subsequent second Contractor's core boring.

In the event that the core borings which the Contractor elects to make equals or exceeds 40% of the total number of the Commissioner's core borings, the Contractor shall make one (1) core boring for each of the Commissioner's core borings. In such case, Contractor's core borings shall be made within seven (7') feet of the Commissioner's core borings which are deficient, and not less than seven (7') feet nor more than ten (10') feet from Commissioner's non-deficient core borings.

Contractor's core borings shall:

1. be taken in the presence of, and marked for identification by a representative of the Commissioner;

2. be tested for thickness, density and/or strength in a recognized and approved testing laboratory after service of sufficient notice upon the Commissioner, who reserves the right of having a representative present when tests are being made; and

3. be completely tested for thickness, density and/or strength as if they were Commissioner's cores and have results computed in compliance with the methods used on the Commissioner's cores, and such results averaged in with the results of the Commissioner's cores.

(R) TESTS, CERTIFICATION OF RESULTS, AVERAGING RESULTS

The results of the tests of each Contractor's core or concrete cylinder shall be certified by the approved testing laboratory of the Contractor to the Commissioner and the dates on which tests are made shall appear in such certificate.

Acceptable test results (as defined in **Subsection 4.02.4.(S) Verification Testing of Plant Mix**) of the day's production will be averaged. If this average deviates from the limits specified in Table 3.01-II under **Subsection 3.01.3.(D)**, the Contractor agrees that payments for the entire day's production represented by the failed tests will be reduced as follows:

Marshall Stability, Flow, and Air Voids

MARSHALL STABILITY TYPE 3 RA & 6F RA	REDUCTION
1499 - 1400	1%
1399 - 1300	3%
1299 - 1200	5%
1199 - 1100	8%
1099 - 1000	30%
Below 1000	Rejected
FLOW 0.01 INCH	
Between 8 and 6 or between 12 and 14	2%
Between 6 and 4 or between 14 and 16	10%
4 and below or 16 and above	Rejected
AIR VOIDS %	
below 3.0 or above 5.0	5%

(S) REPLACING REMOVED RESULTS

All materials removed by the Contractor's core borings shall be replaced by him at his own cost and expense immediately after making each core boring. Upon his failure to comply with the foregoing, the Commissioner's forces will make the necessary replacements.

All materials removed by the Commissioner's core borings will be replaced by the Commissioner's forces.

The cost of replacement of the Contractor's or the Commissioner's core borings by the Commissioner's forces will be deducted from any money due the Contractor under this contract before the issuance of the Final Certificate at the following rates:

For the first 10 core holes.....$100.00 each
Succeeding core holes..... $80.00 each

(T) CERTIFICATES OF COMPLETION DEFERRED

When the Contractor elects to make core borings, the issuance of the Final Certificate of completion will be deferred until the results of all core tests shall have been certified to and determined and recorded by the Commissioner and all materials removed by all core borings shall have been satisfactorily replaced.

(U) CORE BORINGS BY THE CONTRACTOR, WHEN PERMITTED UPON REQUEST

The Contractor may request permission to make core borings and, if permitted, shall make core borings in sidewalks and pavements at locations to be designated by the Resident Engineer; deliver such borings to a designated laboratory for testing; and replace materials removed immediately after making each core boring; all, at his own cost and expense.

Core borings made under the above provision will be deemed as having been made by the Commissioner; will be used for the same purposes as the Commissioner's core borings; and will be subject to the provisions of **Subsections 5.04.(P); 5.04.(Q).1.; 5.04.(Q).3.; 5.04.(S) and 5.04.(T)**.

SECTION 5.05 - Maintenance

(A) CONTRACTOR TO KEEP HIMSELF INFORMED OF CONDITIONS OF PAVEMENT

The Contractor must keep himself informed of the condition of the curbs, sidewalks, roadway pavement, gutters, headers, trees and other structures which are under maintenance, and will be required to keep the same in repair or make replacements without notice from the Commissioner. In case of failure or neglect on his part to do so, then the Commissioner shall have the right to purchase such material as he shall deem necessary, and to employ such person or persons as he shall deem proper, and to undertake and complete said repairs or make said replacements by contract or otherwise and to charge the expense thereof against the Performance Bond or any sum of money retained by The City, as herein provided, and the excess cost to the Contractor, and the Contractor shall pay all such expense to which The City may have been put by reason of the neglect of the Contractor to make such repairs or replacements as aforesaid.

(B) CONTRACTOR TO MAKE REPAIRS OR REPLACEMENTS

1. The Contractor shall immediately repair or make good to the satisfaction of the Engineer all disintegration, cracks, bunches, waves, deteriorations and defects of every nature, or settlements or depressions in the pavement, pavement base, subgrade material, headers, curb, sidewalk, gutters and other structures, which shall occur at any time during the maintenance period. The City will repair all defects for which, in the opinion of the Engineer, the Contractor is not responsible.

2. Where a settlement, depression, or defect in the pavement, pavement base, subgrade material, headers, curb, sidewalk or other structure is a result of backfilling not placed under this contract, as certified by the Engineer; or is caused by settlement of the backfill which is not due to the failure of the Contractor to comply with the requirements of the specifications but is due to the unstable condition of the soil underneath the backfill, as certified by the Engineer; the Contractor shall not be responsible for the restoration of such settled pavement, pavement base, subgrade material, headers, curb, sidewalk or other structure over such settled area to the original grade. The Contractor shall, however, repair all other defects to the satisfaction of the Engineer.

3. The Contractor shall remove and replace all trees under maintenance which die or, in the opinion of the Engineer, seem unhealthy, stunted or unable to flourish, within the period of maintenance, except as otherwise provided, and replace said trees with new trees of the same size and species as originally planted, except when such death, unhealthiness, stunting or inability to flourish is due to vandalism or damage resulting from causes over which the Contractor has no control, as certified by the Engineer. However, the Engineer may, at his discretion, direct a substitution of species.

(C) PERIOD OF MAINTENANCE

The period of maintenance, except for trees planted or transplanted and otherwise provided, shall be for a period of eighteen (18) months after the date of substantial completion as certified by the Engineer. The period of maintenance for each individual tree planted or transplanted shall begin upon planting or transplanting and shall end twenty-four (24) months thereafter. The Contractor shall obtain the said certificate from the Department of Parks and Recreation, in writing, and file such certificate with the Engineer.

(D) MAINTENANCE NOT TO TERMINATE IN WINTER MONTHS

When the period of maintenance for the work, other than the work of planting or transplanting trees, shall terminate within the months of December, January, February and March, the said months, or such part thereof as the Commissioner may determine, shall not be included in the computation of the period of maintenance during which the said work is to be kept in repair by the Contractor, and also, in that case, the payment to be made under the provisions of this contract shall not be made before the first of April next thereafter, unless otherwise specifically permitted by the Commissioner.

When the termination date of the period of maintenance for planted or transplanted trees shall fall outside the planting periods specified in **Section 4.16**, hereof, the interval between the said termination date and next planting period thereafter, or such part as the Commissioner may determine, shall not be included in the computation of the period of maintenance during which the replacement of defective trees is to be made by the Contractor, and also, in that case, the payment to be made under the provisions of this contract shall not be made until after the date appearing on the Certificate of Acceptance which the Contractor shall obtain from the Department of Parks and Recreation, and file with the Engineer, for trees planted as replacements for defective trees within the said next planting period thereafter, unless otherwise specifically permitted by the Commissioner.

If, in the opinion of the Engineer, the weather is unsuitable for making repairs or replacements at the time of such termination, the Contractor shall make the required repairs or replacements when permitted by the Engineer.

(E) EXPIRATION OF MAINTENANCE

The Contractor shall make all of the repairs required to produce a pavement, pavement base, subgrade material, headers, curb and sidewalk, etc., free from defects and substantially conforming in thickness, contour, surface and condition of the pavement, pavement base, headers, curb and sidewalks, etc., as originally laid, ten (10) days prior to the expiration of the maintenance period.

Unless otherwise permitted or directed, defective trees, as determined by the Commissioner, shall be replaced with new trees by the Contractor.

The furnishing and planting of trees as replacements for defective trees shall comply, in all respects, with the contract requirements.

In the event that The City incurs any expense in pursuance of this section of the contract, the certificate of the Commissioner as to the condition of the pavement, pavement base, headers, curb and sidewalk, other structures and trees, the nature and extent of the repairs and replacements made, and expense incurred for such repairs or replacements shall be binding and conclusive on the Contractor.

(F) COMPLETE REPAIRS PREVIOUS TO EXPIRATION OF GUARANTEE

Just previous to the expiration of the guarantee period, the entire work shall be inspected, and any defect or failure in the pavement, pavement base, subgrade material, headers, curbs or sidewalks, shall be immediately repaired by the Contractor in a manner acceptable to the Engineer. When required by the Engineer, such defective portions shall be taken up and relaid in accordance with the requirements of the contract and the specifications; provided, however, that when more than fifty (50) percent of the pavement surface of any one block requires repairing according to the above conditions, the Engineer may require the entire block to be taken up and relaid.

(G) CONTRACTOR TO NOTIFY COMMISSIONER BEFORE MAKING REPAIRS

The Contractor shall notify the Commissioner, at least two (2) days before making any repairs or replacements of the time and place of beginning such work and shall at all times keep the Commissioner or his representatives informed of the proposed prosecution of the work from day to day.

(H) TEMPORARY REPAIRS IN WINTER

When weather conditions are such that permanent repairs or replacements are inadvisable, the Contractor shall make, at its own expense, temporary repairs satisfactory to the Engineer.

(I) PERIOD OF MAINTENANCE TO BE IN FULL FORCE REGARDLESS OF CHANGES TO STREET

The periods of maintenance shall be in force throughout their respective terms irrespective of any changes that may occur in traffic conditions, on or across said streets, whether due to the widening of said roadway or to the construction, reconstruction or arrangement of new or existing surface or subsurface structures thereon, or to any other cause.

(J) PAVEMENT OPENINGS

During the periods of maintenance, The City will restore or permit others to restore and The City will thereafter maintain the roadway pavement and base, over all openings made by the corporations or plumbers for making new service connections, or repairing, renewing or removing the same, and over all trenches made for carrying sewers, water or gas pipes, or any other subsurface pipes or conduits, for the building or laying of which permits may be issued by the Commissioner, including the cutting out of any adjoining pavement and base and such adjustment of the earth under the base, and resetting of headers, as may be necessary for the restoration to the proper grade of the pavement surface, and The City will repair defects of the pavement, for which in the opinion of the Engineer, the Contractor is not responsible.

(K) MAINTENANCE OF RAILROAD TRACKS

In case there are railroad tracks in any street or public place within the limits of this contract, then this section shall not apply to those portions of the street or public place between such tracks, between the rails of the track and for two (2') feet in width outside the tracks.

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