# TABLE OF CONTENTS

**STREET CONSTRUCTION SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Specifications</td>
<td>1-18</td>
</tr>
<tr>
<td>Proposal and Bids</td>
<td>1-2</td>
</tr>
<tr>
<td>Contractor Qualifications</td>
<td>3-9</td>
</tr>
<tr>
<td>Construction Requirements</td>
<td>9-15</td>
</tr>
<tr>
<td>Extra Work</td>
<td>15-18</td>
</tr>
<tr>
<td>Material Specifications</td>
<td>18-21</td>
</tr>
<tr>
<td>Detailed Specifications</td>
<td>21-66</td>
</tr>
</tbody>
</table>
<pre><code>| Mobilization                                        | 21      |
| Grading (Clearing and Grubbing), Undercutting and   |         |
| Overhaul                                           | 22      |
| Borrow Excavation                                   | 24      |
| Seeding and Mulching                                | 25      |
| Protection of Environment                           | 27      |
| Concrete Pipe Culverts                              | 31      |
| Rock Excavation                                     | 33      |
| Stone Stabilization for Ditches                     | 34      |
| Unsuitable Material                                 | 34      |
| Handrails                                           | 34      |
| Brick Laying                                        | 35      |
| Catch Basins &amp; Manholes                             | 35      |
| Concrete                                           | 36      |
| Combined Concrete Curb and Gutter                   | 38      |
| Wheelchair Ramps                                    | 39      |
| Underdrains                                         | 40      |
| Removing Curbs                                      | 41      |
| Concrete Sidewalks                                  | 41      |
| Traffic Island                                      | 43      |
| Concrete Base                                       | 44      |
| Concrete Paving (Alleys)                            | 45      |
| Coarse Aggregate Base Course                        | 46      |
| Replacing Drives                                    | 48      |
| Manhole Adjustment                                  | 48      |
| Concrete Valley Gutter                              | 49      |
| Asphalt Pavements                                   | 49      |
| Removing Existing Drainage Pipe                     | 63      |
| Pipeline Through Concrete Structures                 | 63      |
| Encasement of Pipelines                             | 63      |
| Free-Fall Tamp                                      | 63      |
| Replacement of Existing Pavement                    | 64      |
| Sawing Existing Concrete                            | 64      |
| Concrete Block Retaining Wall                       | 64      |
</code></pre>
Excavating Drainage Ditches...................... 65
Concrete Slab........................................ 65
Reinforcing Steel................................. 65
Removing Existing Concrete Sidewalk or Driveways 65
Reinforced Concrete Headwalls.................... 65
Removal of Existing Catch Basin.................. 65
Silt Fence........................................... 65
Converting Existing Catch Basins to Manholes.... 66
Steel Flumes......................................... 66
Excelsior Matting.................................. 67

STANDARD DETAILS AS SHOWN
GENERAL SPECIFICATIONS
Proposal and Bids

1. "An Act to Regulate the practice of General Contracting" provides that a bidder on a contract in North Carolina to construct buildings, highways or other structures to cost in excess of forty five thousand dollars ($45,000.00) shall be licensed before his bid is considered. All bidders are required by the City of Durham to be licensed under this act.

2. Bidders must present satisfactory evidence that they have been regularly engaged in the business of constructing such work, and that they are fully prepared with the necessary capital, equipment, etc. to begin the work promptly and complete the same in accordance with specifications.

3. The bidder to whom the award may be made will be required to furnish work crews of adequate number, size, and experience to properly perform the work. The interpretation of the number of crews, size, and experience will be determined by the City of Durham as to their adequacy.

4. The successful bidder is required to commence work within ten (10) days after notice from the City Engineer. Termination of work will also be controlled by the Engineer.

5. In the event that any bidder shall fail to enter into a contract, his check or the amount of his check or deposit of cash shall be and become the property of the City of Durham, North Carolina, and the bidder hereby agrees that the amount of said check or deposit of cash shall be actual liquidated damages incurred by the City of Durham by reason of his default. In the event a bid bond is filed in lieu of the cash deposit or check, the full penalty of said bond shall be paid to the City of Durham as liquidated damages for such failure or delay.

6. The successful bidder is hereby notified that the Engineer will at all times control the number of projects on which construction is under way at any one time. The successful bidder will not be permitted to initiate construction work that will interfere with traffic on the street, if in the opinion of the Engineer the work cannot be conducted at that time with sufficient forces in order to minimize the inconvenience to the adjacent property owners.

7. The successful bidder will be required to maintain traffic at all times on any street which in the opinion of the Traffic Engineer cannot be closed to through traffic. All other streets may be closed to through traffic when required by the construction operations. The successful bidder shall, however, be required to maintain ingress and egress at all times to property adjacent to the construction except when precipitation renders the street impassable. When such a condition exists, the successful bidder
will, at his own expense, provide assistance to each resident in moving their vehicles out of the construction area. This assistance, however, shall only be required one time on each occasion when the street becomes impassible.

8. The Engineer will furnish the Contractor all grades, lines and other necessary information so that he may construct the work according to the Plans and Specifications. The placement is due to negligence of the Contractor or sub-contractor.

9. Should any obstructions or conditions which are not covered by the standard specifications be encountered, "Special Specifications" shall govern.

10. When controversies arise as to the interpretation of Plans and/or Specifications, the decision rendered by the City Engineer shall be final. The Contractor shall notify the Engineer of errors, omissions, or discrepancies between the Plans and Specifications. In such cases, the Engineer shall make corrections and interpretations as may be deemed necessary by him to fulfill the intent of the Plans and/or Specifications.

11. The Contractor will be responsible forremedying all undiscovered defects in materials and workmanship on this project for a period of one year after final acceptance by the City of Durham.

12. The Contractor shall perform any extra work not covered in the Proposal which the Engineer deems necessary to carry the work forward to completion and acceptance in accordance with applicable specifications. However, no work shall be done or materials furnished other than those included in the contract for which unit prices are stated, except upon written order of the Engineer given prior to the beginning of performance of such labor or furnishing of such materials. Without such written order in advance, the Contractor shall not be entitled to payment for such work, either on the principle or quantum meruit, or unjust enrichment, extra work, or any other legal or equitable theory. Bills covering extra work shall be filed with the Engineer within ten days after the work is completed.

13. The successful bidder will be required to submit to the City Engineer for the Engineer's approval, a proposed construction schedule, showing both the sequence in which the work is to be performed and the approximate start and completion date for each project in the contract. It will be further required by the Engineer that this construction schedule be updated periodically as necessary by the Contractor in order to keep it current based on the actual progress of the construction.

14. The Engineer shall furnish the Contractor with two copies of Plans and Specifications which shall be available on the work site.
at all times during the prosecution of the work to facilitate the progress thereof.

15. Inspectors, employed by the City, shall be authorized to inspect all work done and materials furnished. Such inspection may extend to all or any part of the work and the preparation or manufacturer of materials to be used. An inspector shall be stationed at the work site to report to the Engineer as to the progress of the work and as to the number in which it is being performed. He shall also report whenever it appears that the materials furnished and the work by the Contractor fails to fulfill the requirements of the Specifications and the contract and to call to the attention of the Contractor any such failures or other defaults. Such inspection, however, shall not relieve the Contractor from any obligation to perform all the work strictly in accordance with the requirements of the Specifications and Plan. In case of any dispute of the manner of performing the work or interpretation of the Specifications, the inspector shall have the authority to reject materials and/or suspend the work until the question at issue can be referred to and decided by the Engineer. The inspector may perform additional duties as may be specifically assigned by the Engineer. He shall not be authorized to revoke, alter, or to issue instructions contrary to the Plans and Specifications unless authorized by the Engineer.

16. The Contractor shall undertake no less than 50% of the work with its own forces, and the aggregate amount of work performed by subcontractors shall not exceed 50% of the total project cost unless approved by the Engineer.

CONTRACTOR QUALIFICATIONS AND REQUIREMENTS

1. Application

The application of these specifications apply to any person, firm, or corporation who may perform grading work and in constructing or reconstructing sidewalks, curb and gutter, water and sewer construction, storm drains and basins, paving and resurfacing or any other work as set forth in contract documents, on any and all existing public or future public streets in the City of Durham, North Carolina. Whenever in these specifications the word Engineer is used, it shall be interpreted to mean the City Engineer of the City of Durham, or his authorized assistants.

2. Contractors

All persons, firms or corporations performing work in City streets must be licensed as a General Contractor in the State of North Carolina under an "act to regulate the practice of general contracting." All contractors who wish to perform work are required to be licensed.
The Contractor shall keep a competent, experienced and reliable superintendent and/or foreman in charge of the work at all times. He shall not be removed until the job is completed and accepted by the City. The Contractor's superintendent or foreman in charge of the work shall be familiar with the Plans and Specifications and the Engineer reserves the right to verify his knowledge of same. The Contractor's superintendent and/or foreman in charge of the work shall receive and execute instructions from the Engineer. Any superintendent and/or foreman who may refuse to carry out instructions from the Engineer may be considered incompetent and disorderly and shall be immediately dismissed upon the request of the City Engineer. In such cases, the work shall be discontinued until a competent representative is placed on the job in charge of the work. Employees on the job site shall be competent, reliable and experienced in the performance of their duties. The Engineer may instruct the superintendent and/or foreman to immediately dismiss any employee not considered competent, reliable or experienced.

Consideration will be given only to proposals of contractors who are experienced in the class of work proposed and who can refer to projects of similar magnitude and character that have been completed by them. Contractors performing work for private parties must also meet these standards.

3. Sub-contractors

Any person, firm or corporation performing work in streets in the City of Durham either for independent parties or for the City, by contract, must furnish to the City Engineer a written list of sub-contractors for approval by the Engineer stating briefly their experience and qualifications. A "Letter of Intent to Perform as a Subcontractor" must be completed within five (5) days after the bid opening.

All sub-contractors performing work under these specifications shall be licensed both for the nature of the work to be undertaken and the amount of work to be undertaken. This requirement is in addition to any other rules and regulations.

4. Laws to be Observed

The Contractor shall keep himself fully informed of all Federal, State and Local laws, ordinances, regulations, orders and decrees of bodies or tribunals having any jurisdiction or authority which may in any manner affect those engaged or employed in the work, or which in any way affect the conduct of the work. He shall at all times observe and comply with all such laws, ordinances, regulations, orders and decrees; and shall protect and indemnify the City of Durham and its representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself or his
employee.

The Contractor shall secure all permits and encroachments, pay all charges and give adequate notice to parties concerned and incident to the due and lawful prosecution of the work. Copies of the written permits and encroachments shall be furnished the Engineer before the work may be started. Specifications of agencies such as the North Carolina State Department of Transportation and Highway Safety and railroads, etc., shall also apply. When the work is completed where these agencies are involved, written notice of acceptance shall be furnished by the Engineer.

5. Equal Employment Opportunity

During the performance of this contract, the Contractor agrees as follows:

a. The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to race, color, religion, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of the nondiscrimination clause.

b. The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

c. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided, advising the labor union or workers' representative of the Contractor's commitments under the Equal Employment Opportunity Section of this contract, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

d. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further City contracts.

e. The Contractor will include the provisions of this section in every subcontract or purchase order unless exempted by rules,
regulations, or orders of the City Council of the City of Durham, North Carolina so that such provisions will be binding upon each subcontractor or vendor.

6. Obstructions

The Contractor shall at all times conduct the work in such a manner as to insure the least obstruction practicable. The convenience of the general public, traffic, and the residents along and adjacent to the work shall be kept accessible to fire apparatus at all times and no objection shall be placed within twenty feet of a hydrant. Footways and portions of streets or highways adjoining the work under construction, shall not be constructed more than is absolutely necessary. All gutter and sewer inlets shall be kept unobstructed at all times. The Contractor, where necessary, shall provide crosswalks for pedestrian traffic and shall backfill driveway areas where excavation has occurred after approval of the work has been given by the Engineer.

7. Sanitary Provisions

The Contractor shall provide and maintain in a neat and sanitary condition such accommodations for the use of his employees, as may be necessary to comply with the requirements and regulations of the Department of Health or of other bodies of tribunals having jurisdiction thereof. Commitment of public nuisances will not be permitted. The Engineer may approve proposed sanitary sites. The collection of waste shall be removed and disposed of in a manner satisfactory to the Engineer and the local Health Department, and at no time shall manholes on a sewer line be used for this purpose.

8. Storage and Location of Materials

Materials shall be stored so as insure the preservation of their quality and fitness for the work. Lawns, grass plots, or other private property shall not be used for storage purposes without the permission of the owners and/or lessees involved. When the work has been completed in one particular block area, etc., all materials remaining shall immediately be removed to such locations approved by the Engineer.

All materials or structures removed from the street and not required for the new construction, but which the City may desire to reserve, shall be delivered and neatly piled up at a place provided by the City. Such reserved materials shall be considered in the custody of the Contractor until delivered at the place designated, and he will be held responsible for this care and protection, and must make good any losses due to negligence on his part. Material taken from the street which is to be used in new construction shall be compactly piled where it will least obstruct the sidewalk or adjoining sections of the street, and properly protected by the Contractor until it is required for use.
All old material removed from the work and reserved by the City to be used again in the work shall belong to the Contractor and must be removed by him from the street as promptly as possible. It must not be placed on the sidewalks or adjacent streets, nor on the property of private owners without the written consent of the Engineer and/or the owner of the property.

New materials for construction, when brought upon the street, shall be piled so as to cause as little obstruction to travel as possible and so that it may be conveniently inspected. When material is piled in the gutters, suitable drains of sufficient size to carry all the storm water flowing in the gutters shall first be laid. No materials shall be piled within twenty feet of a fire hydrant.

9. Sampling And Testing Of Materials and Construction The Contractor will be required to furnish complete statements of the origin, composition and manufacture of any and all materials to be used on the project, together with samples. He may also be required to furnish such information and samples to a qualified testing laboratory selected by the Engineer for determination of their quality and fitness for the work. The City may also place personnel at plant sites to inspect and report concerning the quality of materials and mixes of proper proportions. The expense of testing materials on projects awarded by contract by the City shall be borne by the City.

The Engineer may require certified copies of tests of materials from the manufacturer. In addition, he may require the Contractor to furnish materials to designated testing laboratories for certification. Testing laboratories shall be employed by the City to make such tests as the City may require. The costs of materials tested on projects performed for private individuals, firms or corporations shall not be paid by the City.

10. Clean Up

The Contractor shall, at his own expense, keep the sites of his operation clean during construction and remove all rubbish, including broken materials, as it accumulates. Upon failure of the Contractor to keep the sites of his operations clean to the satisfaction of the Engineer, the City will, upon four hours notice to the Contractor, remove any rubbish, materials, earth, etc., which the Engineer may deem necessary, charging the cost thereof to the Contractor and deducting the amount from any money that may be due him in the next monthly estimate. On, or before, the completion of work, the Contractor shall without charge, tear down and remove all buildings and other structures built by him, remove rubbish of all kinds from grounds which he has occupied and shall leave the sites of the work in an acceptable condition. All manholes, catch basins, and storm drain lines shall be cleaned upon completion of all the work; said manholes, catch basin and drain lines be left in a condition acceptable to the Engineer. Final
grading and dressing in sidewalk areas will be completed no later than two weeks after completion of paving.

11. Use of a Section of the Work

Whenever in the opinion of the Engineer, any portion of the work is completed or is in an acceptable condition for use, it may be used for the purpose it was intended, and such use shall not be held to be in any way acceptance of that portion of the work, or as a waiver of any of the provisions of the Specifications, Plans and contract.

12. Safety

The Contractor shall provide, erect, and maintain the necessary adequately worded signs, barricades, and sufficient red lights, flambeaus, and danger signals, in substantial conformance with the Manual on Uniform Control Devices for Streets and Highways, as published by the Federal Highway Administration, and provide, if necessary a sufficient number of watchmen to take all necessary precautions for the protection of the work and the safety of the public. Streets and/or highways closed to traffic shall be protected with effective barricades. The Engineer reserves the right to request additional barricades. The Engineer reserves the right to request additional signs, lights, etc. The Contractor shall protect, indemnify and save harmless the City of Durham from any and all claims, expenses and damages which might be incurred as a result of accident.

13. Water Supply: Availability

When water is needed on street construction projects, such water will be made available at the nearest City of Durham fire hydrant by Fire Department personnel. The Contractor shall make arrangements with the Billing Division of the Finance Department. Water used will be billed to the Contractor monthly at rates in effect at time of use. Only those personnel of the Water and Sewer Maintenance Division and Fire Department have authority to operate fire hydrants.

14. Accident Prevention

a. The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on, or off the site, which occur as a result of his prosecution of the work. The safety provisions of applicable laws and building and construction codes shall be observed and the Contractor shall take or cause to be taken such additional safety and health measures the Engineer may determine to be reasonably necessary. Machinery, equipment and all hazards shall be guarded in accordance with the safety provisions of the "Manual of Accident Prevention in Construction" published by
the Associated General Contractors of America, Inc., to the extent that such provisions are not in conflict with applicable local laws.

b. The Contractor shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of or in the course of employment on work under the contract. The Contractor shall promptly furnish the Engineer with reports concerning these matters.

c. The Contractor shall indemnify and save harmless the Engineer from any claims for damages resulting from personal injury and/or death suffered or alleged to have been suffered by any person as a result of any work conducted under this contract.

15. Acceptance of Work

Whenever, in the opinion of the Engineer, the Contractor shall have completed the work in an acceptable manner in accordance with the terms of the contract, specifications, plans, etc., the Engineer shall make final inspection of the entire work, and upon completion of all necessary repairs, renewals, etc., he shall notify the Contractor such work is being recommended for acceptance. No portion of work will be accepted until the entire project is completed.

CONSTRUCTION REQUIREMENTS

1. Scope of Work

Work to be performed in the City shall be in accordance with the specifications, plans, and general description given in Supplemental information for Bidders or as directed by the City Engineer. The Contractor shall furnish all materials, equipment, tools, labor, machinery, etc., necessary to carry the work forward in an orderly manner to completion and acceptance unless otherwise provided in the proposal. Work to be performed under this contract shall be commenced by the Contractor within ten days after receiving notice from the Engineer to proceed. The work shall be prosecuted from as many different points or locations, in such part or parts and at such time as may be directed and shall be conducted in such a manner, with sufficient materials, equipment, and labor as considered necessary to insure the completion within the period set forth in the contract. Should the prosecution of the work, for any reason, be discontinued by the Contractor, with or without the consent of the Engineer, he shall notify the Engineer in writing at least twenty-four hours before resuming operations. The Contractor shall diligently prosecute all work to completion without interruption. The Engineer reserves the right to make such alterations in the plans or in the character of the work as may be considered necessary to fully complete and perfect the construction of the
work, provided that such alterations shall not be considered as a waiver or any conditions of the contract, or to invalidate any of the provisions thereof. Any additional work incurred as a result of alterations shall be paid for on an extra work basis provided such work is not included in the items listed in the Proposal. Work performed not in accordance with the Specifications may be the cause for immediate discontinuance of any and all work until substandard work is corrected. All work which is affected by weather shall be suspended during unfavorable conditions as directed. No extensions of time will be granted for winter months (December 15 - March 15; however, extensions of time will be granted for inclement or wet weather days as determined by the City Engineer.

Until acceptance of the work by the Engineer, the street shall be the Contractor's responsibility and he shall take every precaution to prevent injury and/or damage to the work or to any part thereof by the action of the elements or from any other cause. Any expense incurred for the above shall be the responsibility of the Contractor.

It shall be deemed to be unauthorized work unless the Contractor shall give a twenty-four hour notice to the City Engineer before beginning work on any street and/or project.

2. Rejection of Materials

The Engineer shall inspect all materials prior to their use, on the job site to determine if they comply with Material Specifications. When materials are found not in conformity therewith, they shall be clearly marked and immediately removed from the job site. The refusal to immediately remove rejected materials shall be just cause for the Engineer to notify the Contractor to discontinue all work until such materials are removed. Failure to condemn materials on preliminary inspections shall not be grounds for acceptance if additional defects are found after installation. Any defective work whether the result of poor workmanship, materials, damage through carelessness or any other cause, found to exist prior to acceptance of work, shall be removed immediately so as to conform to the specifications.


Grading, drainage, water and sewer construction curb, gutter, paving and sidewalks shall be in accordance with lines and elevations established by the Engineer.

For complete data, see "Detailed Specifications".

4. Turfing
When directed, existing turf shall be removed, protected, and placed on property from which it was cut. The Contractor shall place the turf after improvements are made as directed by the Engineer.

5. Existing Utilities

The Contractor shall locate at his own cost and expense, with the City's assistance, ahead of the proposed work all existing gas mains and connections, water mains and connections, sewer mains and connections, steam pipes, electrical and telephone conduits, storm drains, fire hydrant lines, manholes, and all other structures. The locations as found shall be carefully marked for their full protection.

The Contractor shall protect all utilities from damage and if broken or impaired, he shall immediately report same to the utility concerned and work out a satisfactory solution to facilitate repairs and replacements of the damages incurred. When damage occurs to water mains, sewer mains, manholes, and connections, not in the limits of grades, the Contractor shall contact the Water and Sewer Maintenance Division, City of Durham, North Carolina to make such repairs, the cost of which will be paid by the Contractor. All damages to underground or overhead facilities shall be the responsibility of the Contractor.

Should proposed excavation extend below water lines, sewer lines or other structures, the Contractor shall carefully support and protect them against injury. The cost of protection, replacement and repairs of any and all lines or structures damaged or destroyed, shall be at the expense of the Contractor. When water and sewer lines are found to be within the limits of the grade of construction, the utility will make repairs without cost to the Contractor.

When utilities are found to be in conflict with grades of proposed construction, the Engineer shall notify the proper party requesting immediate attention. Delays on projects due to utility conflicts and/or breaks are not considered adequate reasons for claims because of such delays.

A minimum of clearance of six (6) inches shall be maintained between proposed pipelines and all other existing utilities or structures.

6. Preservation and Restoration of Property

The Contractor shall not enter upon private property for any purpose without obtaining permission from the property owner. He shall use suitable precautions to prevent damage to land monuments and property marker until an authorized agent has referenced their location and he shall not remove them until directed to do so.
When direct or indirect damage or injury is done to private or public property by or on account of any acts, omissions, neglect or misconduct in the execution of the work, or in consequence of the nonexecution thereof, on the part of the Contractor, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damages or injuries were committed, by repairing, rebuilding, or restoring as may be required and directed.

The Contractor, at this own expense, shall be responsible for the removal, preservation, and resetting of all mailboxes and their supports. The mailboxes and supporting structures, when reset, shall be left in as good a condition as before being disturbed. During construction, mailboxes will be maintained upright, useful and accessible position, at no additional cost.

When during the course of construction, a street name sign, or stop sign, or any other type sign the City may have caused to be erected on the street under construction, have to be displaced, it will the responsibility of the Contractor, at no additional compensation, to place the signs in a safe and convenient space, and to notify the Traffic Engineering Division of the Engineering Department of the City of Durham so arrangements can be made for pickup, preservation, and replacement at such time the Contractor feels that this could be done.

7. Explosives

When the use of explosives is necessary for the prosecution of the work, blasting operations and storage shall be conducted in strict accordance with existing ordinances and reputations. The Contractor shall secure a permit from the Chief of the Fire Department when the use of explosives is desired. The Contractor shall observe the utmost care so as not to endanger life or property, and whenever directed, the number and size of the charges shall be reduced. Damages and/or injuries resulting from blasting operations shall be the responsibility of the Contractor, and he shall save harmless the City of Durham from any and all claims resulting from the use of explosives.

Rope or wire mats are required when blasting operations are conducted. The Engineer has the right to waive this requirement when surroundings are such that a decision of this kind is warranted.

Loud and sufficient warnings shall be given to all persons in the vicinity of the blasting operations. Such operations are to be conducted only by experienced personnel in accordance with standard procedures.

The use of explosives shall be limited to a minimum distance of twenty-five (25) feet from any and all utilities or structures.
The Engineer reserves the right to increase the limits set forth.

8. Sheet and Bracing

The Contractor shall furnish, install, and maintain such sheeting, bracing, etc., as may be required to support the sides and/or roof of any excavation to prevent any movement which might injure persons, damage property, or structures, and injure or delay the work. Materials which, in the opinion of the Engineer are not adequate for bracing, sheeting, etc., will be removed and replaced immediately by the Contractor at this own expense with proper materials. Should the Contractor fail to furnish and place additional materials or to replace rejected materials after being instructed, the Engineer will have just cause to stop all or any part of the work until such sheeting, sheet piling, bracing or shoring, etc., has been furnished and placed according to the Engineer's instructions. The compliance with such instructions shall not relieve the Contractor of his responsibility of providing adequate supports. Sheet, sheet piling, shoring and bracing will be left in place only when instructed by the Engineer and at no time shall such materials be removed except when and as instructed by the Engineer.

9. Wells

During the process of excavation, if any unfilled wells are found or uncovered, they shall be filled in layers with suitable material and mechanically tamped. If mechanical tamping is unsafe or impractical, the well may be filled with sand and settled with water up to the point where earth fill and mechanical tamping is practical.

10. Graves

During the process of excavation, if any evidence of the ground having previously been used as a cemetery should be noticed, all excavation work shall immediately stop and shall not start again until clearance has been given the Contractor, in writing, by the Engineer. Any violation of this order shall make the Contractor liable for any and all law suits, financial reimbursements, or any other trouble the Contractor may become involved because of such violation.

11. Paving

When, in the course of constructing a street, it is found necessary to cut through existing street or alternate pavement design approved by the Engineer, and shall be paid for at the price bid by the Contractor for that type of paving and base. If there is no bid price made for the particular type of paving, the cost of replacement of pavement and base shall be on a force account basis. All existing pavement and unpaved streets adjoining or abutting the
new pavement, with their curb and gutters and sidewalks, shall be adjusted or taken up and relaid to conform to, and connect with, the new pavement to such an extent as that described in the asphalt section of "Detailed Specifications."

12. Rock

Any hard impervious material in place which, in the opinion of the Engineer cannot be excavated and classified as earth excavation. All rock excavated will be classified as either: 1. sand rock; 2. trap, granite or gneiss rock.

Sand rock is classified as that rock consisting of sand, firmly united by a cementing material, such as silica iron oxide, calcium carbonate, etc. Sand rock varies in color being commonly red, yellow, brown, gray or white. When excavated, it tends to break into sand granules. Sand rock will be classified as such when, in the opinion of the Engineer, it becomes necessary to drill or blast.

Trap, granite or gneiss rock is classified as only hard, distinct, solid rock formations which have a closegrained, highly-crystalline content composed mainly of feldspar, quartz, mica or hornblende. Boulders over 1/4 cubic yard in volume shall be included in this classification. Trap, granite, or gneiss rock shall be classified as such when, in the opinion of the Engineer it becomes necessary to drill, blast, wedge or bar.

The Engineer's classification of material excavated as either earth excavation or rock excavation shall be final. The Engineer's classification of excavated rock as either sand rock or as trap, granite, or gneiss rock as set forth in the previous paragraphs, shall be final. The Engineer's classification of excavated rock as either sand rock or as trap, granite, gneiss rock as set forth in the previous paragraphs, shall be final.

When rock is encountered, excavation in the trench shall be carried six inches below the outside bottom of the pipe and replaced with fine selected earth material and completely compacted with approved mechanical tamps. The width of trenches in rock excavation shall be of such widths as established in trenching in pipe laying specifications. Rock excavated and remaining on the job site after backfilling shall be removed and disposed of at the by Contractor at his expense.

Rock excavation, as classified, shall only be compensated for when encountered in pipelines, manhole, or catch basin construction. There will be no extra compensation for rock of any classification during grading operations.

13. Material Purchase
The City of Durham will reimburse the Contractor for certain materials either placed on the job or at the contractor's storage yard upon receipt from the Contractor the invoice showing the actual cost of the materials. This reimbursement will be made on the following materials.

a. Reinforced concrete pipe
b. Cast iron pipe
c. Ductile iron pipe
d. Clay pipe
e. Fittings
f. Catch basin and manhole frames and casting
g. Water valves and cast iron valve boxes
h. Fire hydrants
i. Reinforcing Steel
j. PVC Pipe

14. Backfilling Pipe Construction

In the event that the material excavated for water, sewer, or storm drainage pipe construction is not suitable for backfill material, or acceptable material is not available and borrow material is required by the Engineer, then payment will be as specified "Borrow Excavation." If after the excavation of suitable backfill material the contractor fails to protect the material and it becomes unsuitable for use as trench backfill, then no payment will be made for its replacement.

EXTRA WORK

15. All work done on an extra work basis will be considered force account and shall be performed as directed by the Engineer including the numbers and types of equipment and the numbers and classifications of personnel needed to perform the work. It will be paid in the following manner.

A. Labor

For all labor, including equipment operators and foremen in direct charge of the specific operation as foreman, the Contractor shall receive the current local rate of wage, to be agreed upon in writing, for each and every hour or portion of thereof that said laborer, foreman or equipment operator who are actually engaged in such work, to which shall be added an amount of forty percent (40%) in the sum thereof for use of small tools, general superintendence, administration, accounting, insurance, taxes, profit, and other incidental expenses.

B. Materials

For all materials used, the Contractor shall receive the actual cost of such materials, including freight charges, as shown by
original receipted bills, plus twenty percent (20%) for overhead and profit.

C. Equipment

For any machinery and for special equipment (other than small tools) including fuels, lubricants, needed attachments, necessary repairs, maintenance and any other incidentals deemed necessary or desirable to use, the Engineer shall allow the Contractor a reasonable rental price, for each and every hour or portion thereof that said tools, machinery, etc., are in use in such work, and to which sum no percentage shall be added.

The Contractor shall submit to the Engineer a list containing a detailed description of the equipment or machinery anticipated being used in conjunction with any forthcoming contract at least two weeks prior to any actual construction. Description of the equipment should include the manufacturer, type, model or serial number, or any other specification pertaining to any particular piece of equipment or machinery. Specifications should include details such as type of motor, horse power, bucket capacities, tonnages, sizes, attachments or any other identification aides. The said detailed equipment description shall be used by the Engineer along with "Rental Rate Blue Book", published by the Equipment Guidebook Company or any subsequent revision thereof to determine the hourly rate to be paid for each item of machinery or special equipment. The hourly rental rate suggested by the Blue Book shall be adjusted by the suggested area adjustment factor to determine the actual hourly rental rate. The rate so derived shall be complete and final and shall include compensation for all repairs, fuel, lubricants, attachments, freight charges, overtime, taxes, insurance, or any other incidental expenses.

Special attachments shall be paid for only when said special attachments are in actual use on any particular phase of construction and are required for the performance of the work. Otherwise, there shall be no additional compensation for said special attachments even through they may be affixed to the only reasonable available item of equipment which can most efficiently and economically perform the work. The amount of time for which compensation shall be made shall include transportation from the Contractor's plant or home base to the construction site or from construction site for "Extra Work" purposes, but no additional compensation shall be made when said equipment is already in the job site area. Equipment operators will be paid separately and will not be included in the equipment rental rates.

D. Method of Payment

The compensation as herein provided shall be received by the Contractor as payment in full for extra work on an "Extra Work" basis. The Contractor's representative and the inspector shall
compare records of extra work done on an "Extra Work" basis at the end of each day. Copies of these records shall be done in duplicate upon the City's "Extra Work Forms", provided for this purpose by the inspector and signed by both the inspector and the Contractor's representative. One copy to be forwarded to the Engineer and one to the Contractor. All extra work items shall be approved by the Engineer before payment will be made. All bills for extra work done on an "Extra Work" basis shall be submitted to the Engineer by the Contractor, upon certified triplicate statements not later than the (10) days after the work is completed. Should the contractor refuse or fail to prosecute the work or to submit his extra work sheets as required, then the Engineer may withhold payment of all current estimates until the Contractor's refusal or failure is eliminated; or after giving the Contractor due notice, the Engineer may make payment for said work on the basis of reasonable estimates of the percentage of the work performed. No additional allowance shall be made for general superintendence or other overhead costs.

No time extension will be awarded for "Extra Work" since this work will be considered incidental to the completion of the Contract. However, time extensions will be allowed for the addition of any projects not listed in the Proposal. The additional calendar days allowed for completion shall be in the same ratio to the original calendar days stipulated for completion as the actual ratio of the cost of the additional work to the original construction dollar amount of the Contract.

16. Class I Rip Rap

Plain rip rap shall be placed in accordance with the plans and specifications at the locations designated on the plans or directed by the Engineer.

Plain rip rap shall consist of quarry stone or field stone, or broken concrete, and shall be classified by size as Class I according to Section 942-1 of the NCDOT "Standard Specifications for Roads and Structures" dated July 1, 1978.

Stone for plain rip rap shall consist of field stone or rough unhewn quarry stone. The stone shall be sound tough, dense, resistant to the action of air and water, and suitable in all other respects for the purpose intended. Where broken concrete from demolished structures or pavement is available, it may be used in place of stone provided that such use meets with the approval of the Engineer. However, the use of broken concrete which contains reinforcing steel will not be permitted.

The stone or broken concrete shall be graded to meet the following requirements: Stone shall vary in weight from 5 to 200 pounds. At least 30 percent of the total weight of the rip rap shall be in individual pieces weighing a minimum of 60 pounds each. Not more
than 10 percent of the total weight of the rip rap may be in individual pieces weighing less than 15 pounds each.

Unless otherwise directed by the Engineer, the stone shall be placed on a slope as indicated on the plans. The stone shall be graded so that the smaller stones are uniformly distributed throughout the mass.

The Contractor may place the stone by mechanical methods, augmented by hand placing where necessary, provided that when the rip rap is completed it forms a properly graded, dense, neat layer of stone. The completed rip rap shall be at least "18 thick.

MATERIAL SPECIFICATIONS

1. General

Materials shall be delivered to the job and so stored as to insure the preservation of their quality and fitness for the work.

Unless otherwise specified on the plans or in special provisions, all materials shall conform to the Material Specifications of the North Carolina State Department of Transportation and Highway Safety and shall be tested in accordance with the standard methods of A.A.S.H.O. and subsequent revisions thereof. Should no A.A.S.H.O. methods exist for a material, the standard methods of the A.S.T.M. will be used.

All material not conforming to the requirements of these specifications shall be considered as defective and such materials, whether in place or not, shall be rejected and shall be removed immediately from the site of the work unless otherwise directed by the Engineer.

2. Reinforced Concrete Pipe Culverts

All sizes of concrete pipe culverts and flared end sections shall comply with the North Carolina State Department of Transportation and Highway Safety Specifications, Section 310, or any subsequent revision preceding the date of this contract.

3. Cement

The cement shall be a high grade Portland cement of a brand acceptable to the Engineer. It shall comply with the North Carolina State Department of Transportation and Highway Safety Specifications, Section 924, or any subsequent revision preceding the date of this contract. The cement shall at all times be protected against exposure and any cement that has been injured by age or exposure shall not be used on the work.

4. Mortar
All mortar must be mixed in a proper box made for that purpose. When large quantities are needed, machine mixing is required as may be directed. Cement and sand shall be measured loose in a bucket or some other suitable measuring device, mixed thoroughly and uniformly while dry and then clean water added to make a stiff mix which shall be pliable under the trowel.

All mixtures may be varied to increase workability only by reducing the amount of sand or by blending one or more sands.

All mortar shall be used before it begins to set, and no mortar that has been placed for more than one hour will not be used.

When the air temperature is below 40 deg. F., no mortar will be used in any structure without special permission of the Engineer.

a. For Underground Structures:

Mortar shall be of two classes known as Class "A" and Class "B". Class "A" mortar will consist of Portland cement and sand mixed in the proportion of one part cement to two parts sand with not more than 6 1/2 gallons of water per bag of cement. Class "B" mortar will consist of Portland cement and sand mixed in the proportion of one part cement to three parts sand with not more than 7 1/2 gallons of water per bag of cement.

b. For Masonry Walls:

Mortar to be used above ground shall be lime and cement mortar composed of one part Portland cement to two parts well aged lime paste or hydrated lime to four parts sand, the proportions to be by measure in boxes. With the approval of the Engineer, commercial mortar compounds may be substituted for the lime and cement mortar in masonry above ground.

5. Water

The water shall be clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious substance. Arrangement for water supply shall be made by the Contractor direct with the Billing Division of the Department of Finance of the City.

6. Concrete Masonry Unit (Brick)

All brick shall be hard, tough, sound brick, made from clay or shale and uniformly burned through and especially suitable for this class of work and shall meet N.C.D.O.T. Specifications, Section 830, or any subsequent revision prior to the date of this contract, grade M.W. or higher. Overburned brittle brick, soft brick, bench brick, checked or laminated brick will not be accepted. Concrete brick may be used in lieu of clay brick when so designated by the Engineer. Concrete brick shall meet the requirements of N.C.D.O.T.
Specifications, Section 830.

7. Concrete

The proportions by weight of cement, fine aggregate, coarse aggregate, and the quantity of water will be designated by the Engineer so as to meet the requirements specified for each class of concrete.

Classes of concrete to be used in pours shall be as designated in the Proposal and/or as may be directed by the Engineer. All concrete shall be air-entrained concrete unless otherwise directed by the Engineer. Air-entraining admixtures shall meet the requirements of the N.C.D.O.T. Specifications, Section 924, or any subsequent revisions prior to the date of this contract.

a. Class "A" Concrete

Class "A" concrete shall have a minimum compressive strength of 3,000 pounds per square inch based on an ultimate compressive strength when twenty-eight days old.

b. Class "B" Concrete

Class "B" concrete shall have a minimum compressive strength of 2,500 pounds per square inch based on an ultimate compressive strength when twenty-eight days old.

c. Class "C" Concrete

Class "C" concrete shall have a minimum strength of 2,000 pounds per square inch based on an ultimate compressive strength when twenty-eight days old.

8. Forms for Concrete Structures

All lumber used in forms shall be a minimum 3/4 inches thick when dressed of either tongue and groove or plywood material. The lumber used in forms shall be sound, straight, free from crooks or cross grains, rotten or loose knots, red heart, holes and other defects which would impair its strength or durability.

9. Fine Aggregate

Fine aggregate shall consist of sand or other approved inert materials with similar characteristics, or a combination thereof, having clear, hard, strong, durable, uncoated grains and free from injurious amounts of dust lumps, or flaky particles, shale, alkali, organic matter, loam, or other deleterious substances. The sizes and grading shall be approved by the Engineer and shall conform to Section 910, N.C.D.O.T. Specifications Section 910.
Fine aggregate which does not conform to the above requirements for grading, mortar strength of color, may be used only when approved by the Engineer, and then in such proportions as he may require.

10. Coarse Aggregate Base Course

Coarse aggregate shall consist of crushed stone, gravel or other approved inert materials having clean, hard, strong, durable, uncoated pieces free from injurious amounts of soft, friable, thin elongated or laminated pieces, alkali, organic or other deleterious matter. The sizes and grading shall be approved by the Engineer and shall conform to Section 910, N.C.D.O.T. Specifications or any subsequent revision.

11. Reinforcing Steel

Reinforcing steel shall fulfill the "Standard Specification" for billet steel, concrete reinforcing bars, designated Section 970 of the N.C.D.O.T. Specifications or any subsequent revisions preceding the date of this contract.

All reinforcing steel shall be free from dust, scale or other coatings, which would reduce or destroy the bond and the contractor will provide such protection as is necessary to insure that the steel will not be injured during the construction period.

12. Seeding and Mulching

All fertilizer, limestone, grass seed, mulch and any other material used in connection with the seeding and mulching operation shall comply with Section 880, N.C.D.O.T. Specifications.

13. Drain Pipes

a. Cast iron soil pipe and fittings shall conform to ASTM A74-42 or any subsequent revision prior to the date of this contract.

b. Homogeneous bituminized fiber drain pipe and couplings shall be composed of a bituminous material compounded and reinforced with an accepted fibrous structure completely interwoven and shall comply with ASTM D1861-61T or any subsequent revision.

c. Plastic composition (PVC) pipe, fittings, and connections shall be uniform in texture and composition and conform to ASTM D1785-60T or any subsequent revision prior to the date of this contract.

DETAILED SPECIFICATIONS
MOBILIZATION

The work covered by this section consists of preparatory work and operations, including but not limited to those necessary for the
movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of all offices, buildings, and other facilities necessary for work on the project; and for all other work and operations which must be performed or costs incurred prior to beginning work on the various items on the project site.

GRADING

The streets shall be graded in accordance with the lines and grade of the Engineer and before rolling, the street shall be shaped as shown on the crown sheets or as directed by the Engineer. All parking strips and sidewalk spaces shall be neatly shaped and dressed as directed by the Engineer. Prior to the placing of curb and gutter, all existing driveways shall be graded to provide acceptable ingress and egress to and from property fronting the street on which grading is being performed. Payment for driveway grading shall be made by the unit price bid for grading, as measured. Where grading or filling is done in roadways outside the paving, the same shall be properly shaped with a road machine without additional compensation. Places that are found to be loose, or soft, or composed of unsuitable material, below subgrade, must be dug out and refilled with suitable materials. All trees, stumps, and roots shall be grubbed and hauled away. All embankments or fills shall be made in one-foot horizontal lifts and no perishable material shall be deposited in the fill. The fill shall be rolled with a sheepfoot roller after each layer or lift is deposited, and followed by a wheel roller, each weighing not less than eight (8) tons.

Grading shall also include excavation or filling on slopes of 2:1 in cuts and 1 1/2:1 in fills or as directed by the Engineer and/or Inspector. All grading is to be performed as directed by the Engineer on streets and sidewalk areas.

Upon encountering pipes or any subgrade structures belonging to a Public Utility or the City that will interfere with the proposed work, the Contractor shall give notice to the proper party sufficiently in advance to permit the removal or adjustment of the pipe or structure.

All blasting operations shall be conducted in strict accordance with existing ordinances and regulations relative to the storage and use of explosives. The utmost care and precautions shall be used by the Contractor in blasting near any service pipes, mains, or drains. The side of the blast shall be covered with heavy timbers or other devices to prevent damage by flying rock. Sufficient warning shall be given to all persons in the vicinity of the blasting. Blasting shall be done only by experienced men.

The whole area to be occupied by the pavement and its foundation shall be excavated or filled to a subgrade at such an elevation that after being compacted by the roller, the surface will be the
required depth below the pavement datum and parallel thereto, using suitable guides for this purpose. In excavating, care shall be exercised not to disturb the earth below the subgrade. A heavy type sheepsfoot tampering roller shall be used and followed by a wheel type roller weighing not less than eight tons. Any spongy or soft places encountered shall be removed and replaced with suitable material and thoroughly rolled. Rolling shall in all cases be sufficient to thoroughly and uniformly compact the subgrade and to maintain compaction of 95% of the density obtained by compacting a sample of the material with the equipment and in the manner prescribed by AASHO T99-57. The Engineer may require that the Contractor furnish results of an approved test method to insure that the required compaction has been obtained. Portions of the subgrade inaccessible to the roller shall be mechanically tamped until thoroughly compacted. When the subgrade is too dry, just enough water shall be added to obtain the maximum compaction when rolled. In case the subgrade is disturbed by rain or frost or hauling, or otherwise, it shall be reshaped and rolled again before the base course is laid. The subgrade shall be prepared at least 200 feet in advance of the laying of the base course. Any dry subgrade shall be sprinkled before any concrete base course is laid.

Measurement and Payment

1. Mobilization. All work covered by this section will be paid for at the contract lump sum price for "Mobilization."

Partial payment for the item of "Mobilization" will be made with the first and second partial pay estimates paid on the contract and will be made at the rate of 50 percent of the lump sum price for "Mobilization" on each of these partial pay estimates, less the retainage provided for in the contract provided the amount bid for "Mobilization" does not exceed 5 percent of the total amount bid for the contract. Where the amount bid for the item of "Mobilization" exceeds 5 percent of the total amount bid for the contract, 2 1/2 percent of the total amount bid will be paid on each of the first two partial pay estimates, and that portion exceeding 5 percent will be paid on the last partial pay estimate. All such payments will be made less the retainage provided for in the contract.

2. Grading. Grading shall be measured to include everything removed between the original surface and the subgrade. Old pavement that has been removed by the Contractor will be measured and paid as grading. The price per cubic yard for excavation or grading shall include clearing and grubbing, stripping underbrush and/or unsuitable material as directed, removal of driveway pipe, removal of all trees four (4) inches and less in diameter, as measured at a point four feet above the ground, all stumps, rubbish, old pavements, and the trimming of branches of trees which overhang the roadway or obstruct sight distances and which are less
than sixteen (16) feet above the elevation of the finished grade making embankments (cut and/or fill), and the shaping and rolling of the roadway, preparation of the subgrade, and dressing and shaping between the property lines. These items shall be included in the bid price for grading and shall be performed by the Contractor with no additional compensation. The removal of all trees larger than four inches in diameter as measured at a point four feet above the ground, including the tree stump, shall be paid for at the unit price bid for tree removal, as outlined in the Clearing and Grubbing Specifications.

3. Clearing and Grubbing. Clearing and grubbing shall consist of the removal of all obstructions and other objectionable material, vegetation and growth from the lands within the limits of construction and from areas required for inlet and outlet ditches and channel changes.

The lands shall be cleared and grubbed of all trees, stumps, roots, bush, vines, hedgerows, and other obstructions except where fills of more than ten (10) feet occur. In no case shall any stump be left standing, the top of which is more than twelve (12) inches above the existing ground surface.

Branches of trees which overhang the roadway or obstruct sight distances and which are less than sixteen (16) feet above the elevation of the finished grade shall be trimmed or cut in a manner that will not endanger the health of the tree.

The removal of fences, hedges, structures or other obstructions shall be included in clearing and grubbing unless otherwise shown on plans. All brush, laps, stumps, and all debris shall be disposed of in an approved manner.

4. Undercutting. When it is found necessary to replace unsuitable material in the subgrade or where existing sewer, water or existing utility trenches have been improperly backfilled, the cost of this portion of the preparation of the subgrade shall be paid by Force Account (See General Specifications - Extra Work.)

5. Overhaul. Overhaul will be paid when "grading" excavation is hauled more than 2,500 feet between projects, provided the same is authorized by the Engineer and hauled via the shortest route. The price paid for overhaul shall be determined by multiplying the cubic yards of excavation by the number of 100-foot units of overhaul distance in excess of 2,500 feet by one-half (1/2) cent. Overhaul payment will be in addition to the price set forth in this contract for grading excavation.

It is the Contractor's responsibility to balance the earthwork or volumes of all projects in this contract and shift materials to projects where additional materials will be needed. Surplus materials will be hauled to disposal sites designated by the City.
through its Engineer. Overhaul will be paid only if the City designates the disposal site; otherwise, it is the contractor's responsibility to dispose of surplus material at no additional cost.

BORROW EXCAVATION

Borrow excavation shall consist of material required to complete the embankments when the material excavated under Grading is insufficient. Borrow excavation shall include furnishing the borrow pit or borrow area, excavating suitable material, hauling, and placing this material on the construction site. Borrow excavation shall be placed on the job site in accordance with Detailed Grading Specifications.

Payment for borrow excavation will be made by the cubic yard as measured and as per bid item and shall be complete, in place, and ready for the next phase of construction. Payment of the contract unit price bid per cubic yard shall include furnishing, hauling, and placing all materials, including tools, labor, and incidentals necessary to complete in place, as specified. No extra payment shall be made for any undercutting of material placed on the job as borrow excavation.

Measurement and Payment

Clearing and grubbing shall be considered as part of the item "Grading" and no compensation will be paid for this item in addition to that of the contract unit price paid for Grading, except that the removal of all trees larger than four (4) inches in diameter as measured at a point four feet above the ground, including the tree stump shall be paid for at the contract unit price bid per each "Tree Removal".

All undesirable, unsuitable, or otherwise unusable material obtained as a result of stripping, grubbing, excavating or by any other means, while in the process of street construction, will be the responsibility of the Contractor to dispose of as he desires at no additional compensation.

Tree Removal. The price bid for tree removal as appears in the proposal shall include removing trees above four (4) inches in diameter measured at a point four (4) feet above the ground. The hauling and disposing of trees shall be included in the unit price bid for tree removal. The disposal of all trees and stumps shall be the Contractor's responsibility. The removal of all trees four (4) inches and under in diameter and all stumps shall be included in unclassified excavation.

SEEDING AND MULCHING

Seeding and mulching is to be performed according to North Carolina State Highway requirements, Section 880, with the following special
provisions.

Seeding and mulching work shall be done on all earth areas disturbed by construction or as designed by the Engineer. In order to prevent excessive soil erosion and siltation by establishing a grass cover as soon as possible, the Contractor shall complete grading to the proper cross section and perform seeding and mulching work within 30 working days after curb and gutter construction is completed, street by street, as the grading progresses unless the Engineer approved a specific permissible length of delay due to circumstances beyond the control of the Engineer.

Special attention is called to the portion of Section 880-4 of the North Carolina State Highway Specifications dealing with seed bed preparation on steep slopes. Superficial scratching of the slope surface will not be sufficient seed bed preparation. On 2:1 or 1 1/2:1 slopes, a seed bed preparation will be required approaching the degree of preparation required on flatter areas as far as depth is concerned although the same degree of smoothness of seed bed will not be required.

The kind of seed, the rate of application of seed, fertilizer, and limestone, and the seasonal limitations shall be as follows: All rates are in pounds per 100 square yards.

<table>
<thead>
<tr>
<th>Period</th>
<th>Seed</th>
<th>Fertilizer</th>
<th>Limestone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 15 - Oct. 30</td>
<td>2 lbs.</td>
<td>23 lbs.</td>
<td>90 lbs.</td>
</tr>
<tr>
<td>Feb. 15 - June 15</td>
<td>Fescue</td>
<td>Fertilizer</td>
<td>Limestone</td>
</tr>
<tr>
<td>Nov. - Feb. 15</td>
<td>2 lbs.</td>
<td>1 lb.</td>
<td>23 lbs.</td>
</tr>
<tr>
<td></td>
<td>Fescue</td>
<td>Rye</td>
<td>Fertilizer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>90 lbs.</td>
</tr>
</tbody>
</table>

Limestone shall contain not less than 85% of calcium and magnesium carbonates and shall conform to the following minimum screening standards. One hundred percent must pass through U.S. standard 10 mesh screen, and forty percent must pass through U.S. standard 100 mesh screen.

Equipment to be used for the application, covering, and compaction of limestone, fertilizer, and seed shall be approved by the Engineer before being used on the project. Application of seed and fertilizer in water suspension or by air blast methods will not be permitted on slopes flatter than 2:1. Should a hydraulic seeder be used for application of seed and fertilizer, the seed shall not remain in water containing fertilizer for more than thirty minutes prior to the application.

Mulching: Mulch shall be spread uniformly over the area by hand or by means of appropriate mechanical spreaders or blowers to obtain an application satisfactory to the Engineer. It is the intent of
this specification that satisfactory application shall allow some sunlight to penetrate and air to circulate, but also partially shade the ground, reduce erosion, and conserve soil moisture. Care shall be exercised to prevent displacement of soil or seed or other damage to the seeded area during mulching operations. No seeded areas shall be allowed to remain for more than twenty-four hours without mulching having been completed.

The Contractor will be required to take sufficient precautions to prevent mulch entering catch basins or pipe lines through displacement by wind, water or other causes. The Contractor shall apply a sufficient amount of asphalt to insure that the mulch is properly held in place. Mulch application rate should insure a minimum of 75% ground cover and the emulsified asphalt tack rate should be a minimum of 150 gallons per acre.

In the application of fertilizer in seeding operations, or in the application of asphalt materials during mulching operations, adequate precautions shall be taken to prevent damage to traffic, traffic signs, curb and gutter, or any other concrete or metal structures. Such structures shall be adequately covered or application method changed so as to avoid damage. Where any damage occurs as a result of the Contractor's failure to take adequate precautions, the contractor will be required to repair such damage including any cleaning that may be necessary before final acceptance of the work will be made.

Once an area has been seeded and mulched, the Contractor is required to take adequate precautions to insure that all future construction operations do not damage these areas. No payment will be made for repairs of any kind that are due to negligence of the Contractor.

Measurement and Payment: The area of seeding and mulching to be paid for shall be the number of the square yards completed and accepted measured on the surface of the ground.

The area measured shall be paid for at the contract unit price bid per square yard for seeding and mulching. The price and payment shall be in full compensation for furnishing all materials, labor, tools, equipment, and incidentals necessary to complete the work.

PROTECTION OF ENVIRONMENT

Clean Air and Water Acts

In compliance with Federal Clean Air and Water Acts:

1. It is assured by the contractor or subcontractor that any facility to be utilized in the performance of any non-exempt contract or subcontract is not listed on the List of Violating Facilities issued by the Environmental Protection Agency (EPA)
pursuant to 30 CFR 15.20.

2. The contractor agrees to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857 C-8), and Section 308 of the Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports, and information, as well as all of the requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.

3. It is stipulated that as a condition for the award of the contract prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized or to be utilized for the contract is under consideration to be listed on the EPA List of Violating Facilities.

4. The contractor agrees that he will include or cause to be included the criteria and requirements in paragraphs (1) through (4) of this section in every non-exempt subcontract and require that the contractor will take such action as the Government may direct as a means of enforcing such provisions.

Control of Erosion, Siltation, and Pollution

A. General

The Contractor shall take whatever measures are necessary to minimize soil erosion and siltation, water pollution, and air pollution caused by his operations. The contractor shall also comply with the applicable regulations of all legally constituted authorities relating to pollution prevention and control. The Contractor shall keep himself fully informed of all such regulations which in any way affect the conduct of the work, and shall at all times observe and comply with all such regulations. In the event of conflict between such regulations and the requirements of the specifications, the more restrictive requirements shall apply.

The Engineer will limit the area over which clearing and grubbing, excavation, borrow, and embankment operations are performed whenever the Contractor's operations do not make effective use of construction practices and temporary measures which will minimize erosion, or whenever construction operations have not been coordinated to effectively minimize erosion, or whenever permanent erosion control features are not being completed as soon as permitted by construction operation.

B. Erosion and Siltation Control

The Contractor shall exercise every reasonable precaution throughout the life of the project to prevent the eroding of soil
and the silting of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces, or other property.

Prior to suspension of operations on the project or any portion thereof, the Contractor shall take all necessary measures to protect the construction area from erosion during the period of suspension.

Unless otherwise approved in writing by the Engineer, construction operations in rivers, streams, and water impoundments shall be restricted to those areas where channel changes are shown on the plans and to those areas which must be entered for the construction or removal of temporary or permanent structures.

Excavated materials shall not be deposited, nor shall earth dikes or other temporary earth structures be constructed, in rivers, streams, or impoundments or so near to such waters that they will be carried into any river, stream, or impoundment by stream flow or surface runoff. As an exception to the above, confined earth materials will be permitted when approved in writing by the Engineer.

Frequent fording of live streams with construction equipment will not be permitted; therefore, temporary bridges or other structures shall be used whenever frequent stream crossings are necessary. Unless otherwise approved in writing by the Engineer, mechanized equipment shall not be operated in live streams except as may be necessary to construct channel changes and to construct or remove temporary or permanent structures.

C. Coordination of Erosion Control Operations

Temporary and permanent erosion control measures shall be provided as shown on the plans or as directed by the Engineer. All permanent erosion control work shall be incorporated into the project at the earliest practicable time. Temporary erosion control measures shall be coordinated with permanent erosion control measures and all other work on the project to assure economical, effective, and continuous erosion control throughout the construction and post construction period and to minimize siltation of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces, or other property.

Temporary erosion control measures shall include but not be limited to the use of temporary berms, dikes, dams, drainage ditches, silt basins, silt ditches, slope drains, structures, vegetation, mulches, mats, netting, gravel, or any other methods or devices that are necessary. Temporary erosion control measures may include work outside the right of way or construction limits where such work is necessary as a result of construction such as borrow or material pit operations, haul roads, plant sites, equipment storage sites, and disposal of waste or debris.
Materials for temporary erosion control measures shall have been approved by the Engineer before being used or shall be as directed by the Engineer.

Erosion control measures installed by the Contractor shall be acceptably maintained by the Contractor.

D. Coordination of Grading Operations

All clearing and grubbing, excavation, borrow, embankment, ditch construction, and other grading operations shall be so coordinated and performed as to cause a minimum of soil erosion.

Grading operations shall be so scheduled and performed that permanent erosion control structures and features can follow immediately thereafter if project conditions permit. The Contractor may be required to perform temporary erosion control measures between successive construction stages.

Failure on the part of the Contractor to perform the required erosion control measures will be just cause for the Engineer to direct the suspension of operations. The suspension will be in effect until such time as the Contractor has satisfactorily performed the required erosion control work.

The Contractor shall perform excavation, borrow, and embankment operations in such a manner that cut and fill slopes will be completed to final slopes and grades in a continuous operation. The operation of removing excavation material from any cut and the placement of embankment in any fill shall be a continuous operation to completion unless otherwise permitted by the Engineer.

If grading operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion control operations shall be performed.

During construction and until final acceptance the Contractor shall maintain the work by shaping to provide for the drainage of surface runoff along and throughout the length of the project, by constructing temporary ditches, and by using any other methods necessary to maintain the work covered by this article so that the work will not contribute to excessive soil erosion. Maintenance of sediment devices will be required when entrapped sediment has reached 50% of the capacity of the device.

E. Water and Air Pollution

The Contractor shall exercise every reasonable precaution throughout the life of the project to prevent pollution of rivers, streams, and water impoundments. Pollutants such as chemicals, fuels, lubricants, bitumens, raw sewage, and other harmful waste
shall not be discharged into or alongside of rivers, streams, or impoundments or into natural or man-made channels leading thereto.

The Contractor shall comply with all State or local air pollution regulations throughout the life of the project.

F. Dust Control

The Contractor shall control dust throughout the life of the project within the project areas and at all other areas affected by the construction of the project, including, but not specifically limited to, unpaved secondary roads access roads, disposal sites, borrow and material pits, and production sites. Dust control shall not be considered effective where the amount of dust creates a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property.

G. Application of Specifications

The provisions of this article shall apply to all construction operations. Further references and detailed requirements concerning erosion, siltation, and pollution prevention and control are given in the plans and/or special provisions as supplements to the general requirements of this article.

H. Payment

Payment for erosion control measures shall be made as provided for by the various contract items or as provided in the Standard Specifications for extra work.

Payment will not be made for the construction of erosion control measures which have been made necessary because of the Contractor's negligence, carelessness, or failure to efficiently schedule and coordinate the work, or which have been constructed solely for the Contractor's convenience. Unless otherwise provided by a pay item, maintaining the work in a manner which will minimize soil erosion and siltation, and maintaining temporary and permanent erosion control measures, will be considered to be incidental work. This includes the installation and maintenance of suitable filtering devices at the discharge end of sediment basins. Payment will not be made for the construction of erosion control measures beyond the right of way or construction limits, whichever is further, except for seeding and mulching of borrow or material pits and of waste or disposal areas. No direct payment will be made for the control of dust but the cost of same shall be included in the unit prices bid on the various items in the contract.

CONCRETE PIPE CULVERTS

The pipe lines, including flared end sections, shall be constructed of pipes of such sizes and laid on a firm foundation to such lines
and grades as specified and directed by the Engineer. The pipe shall be laid to line and grade by means of a grade rod and a cord suspended above the center of the pipeline and parallel to the established grade of the pipe.

All concrete pipe and flared end sections shall comply with the North Carolina State Highway Commission specifications, Section 310. The manufacturer may be required to submit samples of materials and plans of design, reinforcement and methods of construction. The pipe must be manufactured by an established manufacturer of reinforced concrete pipe. Each pipe must be marked with the manufacturer's trademark and date of manufacture. Pipe with defects indicating imperfect mixing and molding or cracked pipe shall be rejected. The materials used and the manufacture of the pipe shall be subject to inspection.

Previous to being lowered into the trench, each joint of pipe shall be carefully inspected and all rejected pipe removed from the work. The width of the trench shall not be greater than necessary to permit satisfactory jointing and tamping of the approved backfill material under and around the pipe. Proper bell holes shall be dug to give the barrel of the pipe an even bearing throughout. Where rock is encountered, the trench shall be excavated six inches below the bottom of the pipe and this depth shall be refilled with suitable material and thoroughly tamped.

All pipe shall be carefully laid bell or groove end upgrade, spigot or tongue end fully into the adjacent hub. Joints of concrete pipe shall be thoroughly wet before making the mortar joint consisting of one part cement and three parts sand. Before succeeding sections of pipe are laid, the lower half of the bell or groove shall be filled with cement mortar to bring the inner surface of the abutting pipes flush and even. After the pipe is laid, the remainder of the joints shall be solidly filled with mortar and a bead or ring formed on the outside of the joint. The joint inside the pipe shall be completely filled with mortar and finished smooth. Immediately after the initial set, the outside mortar joint shall be protected against the air and sun with wet dirt or burlap, and in cold weather against freezing.

As the pipe is laid, it shall be firmly bedded with suitable dry material on each side, and as the pipe laying progresses, the pipeline shall be covered and thoroughly tamped down on each side. The trench shall be backfilled with select material in six-inch horizontal layers and thoroughly tamped using acceptable tamping equipment.

The pipeline shall be protected against blasts and no pipe shall be laid within thirty feet of a blast. No walking on a completed pipeline shall be permitted. The Contractor shall be responsible for any damage to the pipe until the final acceptance of same. The entire length of the pipeline and flared end sections shall be
thoroughly cleaned and no obstruction from protruding mortar joints or anything interfering with the free flow of water will be permitted.

Flared end sections or head walls shall be used at the beginning and end of all pipelines from 12" size to 36" size inclusive, except at catch basins and/or as directed by the Engineer. Flared end sections shall be of a design approved by the Engineer and of size as shown on the plans. Payment for flared end sections shall as described in paragraph below. Head walls shall be built as directed by the Engineer and/or inspector on pipelines above 36' in size. Payment for head walls shall be contract unit prices bid for concrete and steel respectively.

Backfilling must be completed immediately after pipe is laid.

Measurement and Payment

The price paid for concrete pipe culverts shall include the furnishing and laying of the pipe and flared end sections, excavating, and backfilling the trench, disposing of any unsuitable excavated material, shoring and bracing the furnishing of the materials and all other work and materials necessary for a complete and satisfactory job.

Payments on the contract unit price bid, will be the measurements of the length of the invert lines of the sewers, from end of storm sewer to end of storm sewer, excluding all flared end sections, the line being measured into the center of the basin at face of curb, or manhole. Depth payment shall be made at the contract unit bid price per foot from zero (0) feet to six (6) feet and at the contract unit bid price in two (2) foot increments thereafter, to be measured from the bottom of the storm sewer ditch to the existing ground at the top of the ditch at the time of construction. No additional payment is permitted when laying a new pipeline into an existing basin. Payment for flared end sections shall be paid at the unit price bid per flared end section.

ROCK EXCAVATION

When rock is encountered while laying storm or sanitary sewer, the trench shall be excavated six inches below the bottom of the pipe, backfilled with a suitable material, and properly mechanically tamped.

Measurement for rock excavation shall be based on the outside diameter of the pipe plus sixteen (16) and six (6) inches below the pipe.

Rock excavation for manholes shall be the inside diameter of the manhole plus thirty (30) inches, and for catch basins, the inside length and width plus thirty (30) inches. All rock excavation
shall be measured and reported by the Inspector with a copy furnished to the Contractor.

Payment for rock excavation will be made by the unit price bid per cubic yard of rock excavation, either sand or trap, and shall include all machinery, labor, and any incidentals necessary to complete the job.

The rock excavation clause shall apply only to water and sewer or drainage construction, including manholes and catch basins. In no way shall the rock clause be misconstrued to include the grading construction.

STONE STABILIZATION FOR DITCHES

Where needed, and as directed, a layer of #57 stone shall be placed in ditches as a means of establishing a stabilized grade for laying pipe. Depth of the layer may vary, but if there is cause to use six (6) inches or over, the layers shall be well mechanically tamped in layers not to exceed six (6) inches and then true graded to the correct pipe grade.

Payment shall be made at the unit price bid per ton in place, complete, as specified.

UNSUITABLE MATERIAL

As directed, and where unsuitable bedding material is encountered during pipe construction, the Contractor will be required to excavate below pipe grade a sufficient depth to provide for backfilling with a suitable material to assure a uniform bedding for the entire length of pipe. Unsuitable material shall be defined as material not classified as rock, but still too firm to permit proper bedding. Unsuitable material shall also be defined as that type of material that is too soft or spongy to adequately support the pipe or any material that has been excavated from the ditch and in the opinion of the Engineer or Inspector is not suitable to be used as backfill for bedding.

Payment for excavation and backfilling bedding material shall be at the unit price bid per cubic yard for "Unsuitable Material," complete, including hauling off of bad material. Payment for unsuitable material in storm sewer, water, and sanitary sewer ditch excavation and backfill for bedding shall be made at the unit price bid per cubic yard complete. In the event that borrow is required from some place other than a project in the contract, it will be paid at the unit price bid for "Borrow," in place, including furnishing and hauling. If in the opinion of the Engineer or Inspector stone should be used to assure a firm bedding for support of pipe, payment shall be made for this phase of construction by the unit price per ton of "Stone Stabilization for Ditches."

If in the opinion of the Engineer, this work is being performed at
a time that is not conducive for construction, but is for the benefit of the Contractor, then the Contractor will be required to furnish backfill at no compensation for "Borrow."

HANDRAILS
(Type I and/or Type II)

The one and one-half inch inside diameter, steel pipe handrails shall conform to the standard details as shown on plans. The quantity of handrails to be paid will be the number of linear feet of handrails, as measured along the top rail, complete in place and accepted. The quantity measured will be paid for at the contract unit price per linear foot "Handrail", complete in place, which price and payment will be full compensation for fabricating, transporting, erecting, painting, and furnishing all materials necessary to complete and install the handrails.

The Contractor will be required to paint all handrails with one (1) coat of rustoleum and one (1) coat of aluminum paint. No additional compensation will be made for this work, but the cost of same shall be included in the unit price bid for "Handrails". Handrails will be required on single pipe culverts 42" in diameter or larger, box culverts and multiple pipe culverts where one or more of the pipes is 30" in diameter or larger.

BRICK LAYING

Concrete, clay or shale brick shall meet N.C.D.O.T. Specifications, Section 830 or any subsequent revision prior to the date of this contract.

Brick shall be laid with full shoved joints. Mortar joints shall be 3/8" in thickness and neatly pointed. Joints shall be struck or marked as directed by the Engineer. When high temperatures are encountered, the Engineer may require the brick used to be wet down prior to laying. All exposed brick work shall be thoroughly cleaned by the use of a burlap bag immediately after the mortar has taken its initial set. Steel or equal shall be placed on alternating courses as directed by the Engineer.

When brick masonry is used for collars, the angular space between the brick and the outside of the pipe shall be thoroughly filled with mortar. Use of brick collars will be permitted only when approved by the Engineer.

CATCH BASINS AND MANHOLES
(WATER AND STORM SEWER)

All type basins and manholes shall be built where designated and in accordance with the plans for same. The materials entering into the construction shall comply with the respective specifications covering the same. The brick shall be laid on a full bed of
mortar. All joints shall be neatly pointed and the entire basin or manhole brushed and cleaned out upon completion. The basins and manholes shall have poured concrete inverts as shown on plans and/or as directed. Cast iron steps will be required in manholes and basins as directed by the Engineer. Where shown on plans and as specified by the Engineer, a reinforced concrete slab may be used as a cover for catch basins instead of standard castings and grates and shall be included in the price for the basin.

Measurement for depth of basins or manholes shall be from invert of pipe to the top of casting when set to final grade.

The contract unit price bid shall include all necessary excavation, backfilling and all labor, tools and materials needed to construct the same complete as specified up to four (4) feet, and with Type II basins, shall include the finished two (2) feet concrete gutter laid through the basin. Payment for each additional foot over four (4) feet in depth shall be made at the contract unit price bid per six (6) inch increment as set forth in the Proposal and specified "Extra Depth." Payment for sanitary sewer manhole shall be made as described in sewer main construction section.

CONCRETE

Concrete shall be delivered to the job site in approved revolving mechanical mixers of the mixes of the mixes required, and shall meet the requirements of the N.C.D.O.T. Specifications, Section 924, or any subsequent revisions prior to the date of this contract. Machine mixing or hand mixing on the job site will be permitted only when approved by the Engineer.

The mixing of concrete shall be done in a batch mixed or approved type which will insure a uniform distribution of the drum, the concrete shall be mixed so long (not less than two minutes) that the mixture is uniform in color and homogenous. The mixer shall be equipped with suitable charging hopper and water storage. The entire contents of the drum shall be discharged before recharging. The volume of the mixing materials per batch shall not exceed the manufacturer's rated capacity of the mixer. When hand mixing is authorized by the Engineer, it shall be done on a water-tight platform. The cement and fine aggregate shall then be added and the entire mass turned at least three times, or until a homogenous mixture of the required consistency is obtained. No retempering of concrete shall be allowed. Concrete shall be mixed only in such quantities as are required for immediate use and all concrete shall be used before initial set has taken place.

The quantity of water used shall be the minimum necessary to produce concrete of workability required by the Engineer. The consistency of the concrete shall be measured by the slump test as specified by the American Society for Testing Materials, which data is on file in the office of the Engineer. Every batch of concrete
must be of uniform consistency as required by the Engineer and
determined by the slump test.

Before depositing concrete, debris and/or water shall be removed
from the space to be occupied by the concrete; forms shall be
wetted or oiled as directed by the Engineer. Reinforcement shall
be thoroughly secured in position and place of final deposit
without loss of ingredients or their separation. As nearly as
practicable it shall not be rehandled and so deposited as to
maintain a plastic surface approximately horizontal. Rakes or hoes
shall not be used for handling concrete. None but fresh concrete
shall be deposited in the work. While depositing and immediately
thereafter, the concrete shall be thoroughly compacted by tools
suitable to the Engineer.

The concrete shall be thoroughly worked around the reinforcement
and imbedded fixtures and into the corners. Before depositing new
crude on or against concrete which has been set, the forms shall
be straightened and tightened, the surface of the set concrete
shall be roughened as required by the Engineer thoroughly cleaned
with water. The old surface shall be washed with cement grout just
in advance of the newly deposited concrete. Joints as specified by
the Engineer shall be made when and where directed by him. All
concrete work shall be done by daylight.

Concrete shall not be dropped a distance greater than two feet
unless funnels are provided to prevent segregation. Amount,
height, and width of one continuous pouring shall be as directed by
the Engineer. All concrete poured shall be properly vibrated or
rammed to insure a homogeneous pour. However, such vibration or
ramming shall not be done to the extent to cause the stone
aggregate to settle or separate from the mix. All concrete of poor
workmanship shall be replaced at the contractor's expense. All
forms shall be properly braced and anchored to insure correct
alignment and grade.

Forms shall be removed, based on temperature, to insure proper
finishing, rubbing and dressing. On occasions, the Engineer may
direct specific times for removal of forms.

Concrete shall be rubbed, from the ground line up, to a pleasing
appearance satisfactory to the Engineer. Other types of finishes
may be required as directed by the Engineer. Curb and gutter or
sidewalk or any type of concrete used for pedestrian or vehicular
traffic shall be broom finished.

Newly laid concrete shall be cured by covering with burlap that is
kept wet, by flooding, by sprinkling, or by the mixture with the
concrete of acceptable chemicals that accomplishes the required
results. If water curing is used, the same shall be continued for
seven days. No concrete shall be laid in freezing temperature.
When freezing weather is expected within a 72-hour period after
placing the concrete, the necessary materials shall be kept convenient for protecting the concrete against damage by freezing. Chemicals for shortening the hardening period of the concrete may be used when approved by the Engineer. Protection against freezing shall be maintained for a period to be determined by the Engineer, but will in general not exceed four days. The Contractor accepts all responsibility for the quality and strength of the concrete laid.

Concreting operations shall not be undertaken or continued when any of the following conditions exist:

1. When atmospheric temperature during the preceding 24 hours has not risen above 40 deg. F.

2. When atmospheric temperature has not reached 40 deg. F. by 10:00 A.M.

3. When the subgrade is frozen.

4. When aggregate, either coarse or fine, contains frozen particles.

5. When atmospheric temperature is falling and reaches 40 deg. F.

6. When local weather reports or conditions indicate the possibility of temperatures of 32 deg. F. or lower within the ensuing 24 hours. Concrete less than 24 hours old that may be subjected to temperatures of less than 32 deg. F. shall be protected by the customary curing method and in addition a layer of not less than 12 inches of loose, dry hay or straw, or other acceptable thermal insulation, shall be placed on concrete and retained in place until the required curing period is completed.

COMBINED CONCRETE CURB AND GUTTER AND CONCRETE DRIVEWAY TURNOUTS

The combined curb and gutter, and concrete driveway turnout shall be constructed according to the plans and the lines and grades of the Engineer in compliance with these specifications upon the prepared subgrade as specified under "Grading".

The concrete shall be class "A" concrete and shall meet the North Carolina Department of Transportation, Section 900.

The forms shall be set true to line and grade and held rigidly in position. They shall be of metal, straight and free from warp. The forms must be so constructed as to be free of kinks or irregularities especially around curves, at both the back of the
curb and the edge of the gutter.

The concrete shall be placed in the forms in a manner to prevent segregation and tamped or vibrated sufficiently to bring the mortar to the surface and prevent honeycombs. The concrete shall be finished smooth and even by means or rollers, floats, or as directed by the engineer. However, no concrete shall be placed until driveway grading is complete.

The curb and gutter shall be constructed in place in sections of from 10-30 foot lengths. Steel templates conforming to the cross sections of the combined curb and gutter shall be used. Expansion joints one-half inch thick, filled with premolded expansion material shall be provided every thirty feet, at each end of each arc and at each side of every catch basin. Expansion joint material shall be of the preformed non-extruded, resilient bituminous type, conforming to NCDOT specifications, Section 928, or any subsequent revision prior to the date of this contract.

All joints and edges shall be straight and neatly finished. Forms shall remain in place until they can be removed without injury to the curb and gutter. When the forms are removed, the concrete shall be rubbed down to a smooth and uniform finish. All construction joints shall be filled with a liquid asphalt filler such as NCDOT AP-5. This requirement is separate and shall in no way be used as a substitute for the aforementioned expansion joint material.

Curing and protection shall be as specified elsewhere.

Both back and front forms are to be removed at the same time. Backfilling will be performed, as directed by the Engineer, immediately after forms are removed. Backfill materials will be thoroughly tamped mechanically and where there may be areas inaccessible to mechanical tamps, hand tamps of an acceptable type shall be used. Proper backfilling shall be included in the unit price bid for combined concrete curb and gutter and/or concrete driveways and gutter.

A self-contained power propelled combination curb and gutter machine, which has been approved by the Engineer may be used for constructing combination curb and gutter. This construction procedure must meet the same standards and compliance with the specifications as the method of using forms.

Further construction on any street must not start until a lapse of a minimum period of seven (7) days occurs. The contractor must maintain such streets for traffic and protect the curb and gutter.

Measurement and Payment

Payment will be made by the lineal foot measured along the face of
the curb, at the contract unit price bid which shall include furnishing, hauling, and placing all materials, all equipment, forms, tools, labor, and incidentals necessary to complete the combined curb and gutter. Concrete curb returns at driveway will be included in driveway yardage as stated in the Proposal for concrete driveways and gutter.

WHEELCHAIR RAMPS

On the radii, at the intersection of the streets in this contract, and on any subsequent contract, there shall be built wheelchair ramps as shown in the standard details enclosed, or as specified by the Engineer. Payment for the depressed curb section will be made as described in the aforementioned paragraph (Curb Payment). Payment for the wheelchair ramp will be made by the square yard as described in the sidewalk section.

UNDERDRAINS

Underdrains shall be provided where specified.

The pipe shall be perforate galvanized pipe in the street between the curbs or perforated plastic pipe behind the curbs, as specified by the Engineer, and complying with North Carolina Department of Transportation Specifications, Sec. 815.

The aggregate shall conform in quality and size to N.C. Department of Transportation Specifications, Sec. 910, old #3 Washed Coarse Aggregate, or new #57 Washed Coarse Aggregate.

The trench shall be excavated one foot wide and a minimum of twenty inches below the top of the curb and true to line and grade as directed by the Engineer. A two-inch bed of coarse aggregate shall be spread in the bottom of the trench throughout its length and leveled to a uniform grade. The pipe shall be laid to a line and grade and firmly embedded in the bottom course of the aggregate. The coarse aggregate shall extend to within four inches of the top of the curb. The backfilling above the aggregate shall consist of suitable earth.

Payment for underdrains shall be by Force Account according to General Specifications.

REMOVING CONCRETE CURB AND GUTTER
OR GRANITE CURB AND GUTTER

Removing concrete curb and Gutter. the unit price shall include furnishing all equipment, tools, labor, and incidentals necessary to remove and dispose of the concrete curb and gutter and to remove granite curb and haul and dump into the City stockpile on the north side of the 1000 block of Juniper Street. Payment will be made by
the lineal foot of curb and gutter removed as measured along the face of the curb at the unit price bid. This item also includes removal of any driveway approaches that happen to be in the removal construction limits and shall be paid at the same unit price per lineal foot as concrete curb and gutter or granite curb and concrete gutter removal.

CONCRETE SIDEWALKS

Subgrade

The subgrade shall be excavated to a sufficient depth parallel to the surface of the proposed finished sidewalk grade to allow the placing of the specified concrete. All unsuitable materials shall be removed and any such places and depressions caused by this removal shall be filled with acceptable materials and the entire subgrade mechanically tamped in layers not to exceed six inches. Removal and replacement of all unsuitable materials below subgrade shall be paid on Force Account basis as stated in General Specifications. If borrow is required, Force Account payment will be only for the removal of unsuitable material. In fill areas, there shall be a shoulder of at least eighteen (18) inches beyond the outside edge of the proposed concrete sidewalk.

Forms

Substantial and suitable metal or wooden forms, straight and clean, shall be furnished and used by the contractor. The forms shall be firmly staked to the lines and grades as specified by the Engineer, with the upper edges conforming to the finished grade of the sidewalk.

Concrete

The concrete shall be one course Class "A" and shall conform to specifications as set forth in Article B, titled "Concrete", Material Specifications. The concrete having been mixed as specified shall be immediately deposited on the foundation, compacted, and struck off with a template. The surface shall be evenly finished with wooden and/or metal floats. After the concrete has set to a workable state, a metal edging tool shall be carefully worked around all edges of each block in such a manner as to form neat and straight edges. Before the concrete has set complete, a brush or broom finish shall be obtained, brushing from side to side, parallel with the construction joints. The finished concrete sidewalk shall be six inches within all driveway limits and four inches thick on the remainder.

Blocks and Joints

Unless otherwise directed, the sidewalk shall be constructed five foot square sections or blocks. Where new sidewalk joints existing sidewalk or existing concrete driveways, and where the ends or
sides of the sidewalk abut curbing expansion joints, one-half inch in thickness filled with premolded expansion material shall be provided. Expansion joints shall also be provided across the sidewalk at intervals not more than every thirty feet. Expansion joint material shall conform to NCDOT Specifications, Sec. 928, or any subsequent revision prior to the date of this contract.

Backfilling shall be performed, as directed by the Engineer and/or Inspector, immediately after the forms are removed. Both side forms shall be removed at the same time.

Grades

The finished grade for sidewalks shall be on a rise from top of curb at a rate of one-half inch per foot across the planting strip width and at a rate of one-fourth of an inch per foot across the concrete sidewalk width.

Driveways

At driveways, the surface shall be of such contour as to provide easy ingress and egress to adjoining properties and not interfere with the sidewalk grade. When existing concrete driveways are encountered, and the grades of the driveways are such that little change in sidewalk grades are necessary, the grades of the sidewalk shall be adjusted and merged with the driveway grades, so the existing driveways can be utilized.

PVC Drain Pipe

Where specified, four inch PVC pipe, for conveying storm water, shall be laid by the contractor, under the direction of the inspector. This work shall be done at the contract unit price bid "4-Inch PVC Pipe". The item bid shall include labor, materials, excavation, furnishing, placing fitting to curb, backfilling and all incidentals necessary to complete the job as directed, including any necessary fittings. All existing drain pipes of acceptable size and materials shall be relaid or adjusted, when necessary.

If no unit price is bid, then payment will be by Force Account.

Final Cleaning and Dressing

Immediately after a City block of sidewalk construction has been completed and the forms have been removed, all surplus materials and debris shall be removed by the contractor and the planting strip shall be neatly dressed to grade as directed by the Engineer and/or Inspector.

Measurement and Payment
Grading shall be paid in accordance with paragraph titled "Grading" in the Detailed Grading Specifications section. Payment for concrete sidewalk shall be made by the square yard as measured, either in four or six inch sections, at the contract unit price bids, which shall include furnishing, hauling, and placing all materials, all equipment, forms, tools, labor, and incidentals necessary to complete the concrete sidewalk.

Concrete Steps

As needed, and as directed by the Engineer, concrete steps shall be constructed in conformity with the details and specifications as shown on the detailed plan drawings. Class"A" concrete as described in the concrete section of "Detailed Specifications" shall be used for this construction.

Payment for concrete steps shall be made at the contract unit price bid per cubic yard as measured, and shall include all materials in place, labor, tools, equipment and any other incidentals necessary to complete the work.

TRAFFIC ISLAND

Concrete Curb

Traffic island concrete curb shall be constructed according to the plans and the liens and grades of the Engineer and in compliance with the specifications for concrete.

Asphalt Curb

Traffic island asphalt curb shall be constructed to the plans and the lines and grades of the Engineer and in compliance with the specifications for asphalt.

Concrete Island Paving

Concrete island paving shall be a one-course portland cement concrete island filler to be placed in accordance with the lines and grades as furnished by the Engineer. The island shall be filled with suitable subgrade material shaped to the section as shown on the plans and thoroughly compacted before placing any concrete. The concrete shall have a minimum compressive strength at the end of 28 days of 2500 psi and shall meet the North Carolina Department of Transportation requirements, Section 924 for Class "B" concrete.

Measurement and Payment

Payment for concrete and asphalt island curb will be by Force Account, titled Extra Work of the General Specifications. The price paid for traffic island curb shall include all labor,
hauling, and placing all materials, equipment, tools, forms, earth fill, and whatever is necessary to construct the curb as specified and put the premises in an acceptable condition.

Payment for traffic island concrete paving as stated in the General Specifications will be made by Force Account according to the Extra Work Section of General Specifications.

Five Inch Concrete Traffic Island

The concrete island shall be built in accordance with the design and as shown on the plans. The island will be Class "A" concrete as described in Material Specifications.

Payment for five-inch Concrete Traffic Island shall be made by the square yard as per bid item as measured and accepted. Payment shall include all materials, labor, equipment, and incidentals necessary to complete the job.

CONCRETE FOUNDATION (BASE)

After the sub-grade is prepared there shall be laid a concrete foundation course six inches thick.

The concrete shall be Class "C" concrete and shall meet the North Carolina DOT Specifications, Section 924.

The concrete foundation shall be a permanent structure and shall be constructed parallel to the contour of the finished pavement and reasonably smooth. Suitable guides shall be used by the contractor to insure the proper grade and contour of the foundation.

All materials used in the concrete shall comply with their respective specifications. They shall be measured in such manner and with such accuracy that the quantities used will not vary more than seven percent from the quantities required in the ratio named above for each batch of concrete. The concrete shall be mixed as specified under "Concrete". The rock shall be a mixture of sizes from 1/4 of an inch to 2 inches.

The concrete shall be placed on the sub-grade in such manner as to prevent the separation of the mortar from the stone. It shall be evenly distributed in a single layer of such depth that, after ramming, it will be of the required thickness. Immediately after being placed it shall be well rammed until a compact mass is produced of the correct elevation and contour. All depressions shall be immediately filled with concrete or small stone but not with cement grout or mortar. All voids shall be immediately filled with a thin grout of 1:3 mixture.

After the concrete is laid it shall not be disturbed and it shall be protected against heavy rains, frost, traffic or damage of any
kind. It shall be kept clean. All traffic and hauling shall be excluded from the foundation by suitable barricades until permitted by the Engineer.

In connecting new concrete to concrete already set, the edge shall be cut down square and the edge thoroughly cleaned. No concrete shall be laid on a frozen sub-grade, nor shall frozen materials be used on the concrete.

Measurement and Payment

Concrete foundation shall be measured by the square yard, and shall be paid for at the contract unit price bid which shall include furnishing, hauling, and placing all materials, all equipment, tools, labor, and incidentals necessary to complete the concrete foundation.

CONCRETE PAVING - ALLEYS

The concrete paving for alleys shall be six inches thick upon completion and constructed according to the plans and the lines and grades of the Engineer in compliance with these specifications upon the prepared sub-grade as specified under "Grading".

The concrete shall be Class "A" concrete and shall meet the North Carolina DOT Specifications, Section 924.

The forms shall be set true to line and grade and held rigidly in position. They shall be of metal or wood straight and free from warp. The forms must be so constructed as to be free of kinks or irregularities especially around curves.

The concrete shall be placed in the forms in a manner to prevent segregation and tamped or vibrated sufficiently to bring the mortar to the surface and prevent honeycombs. The concrete shall be finished smooth and even by means of rollers, floats, or as directed by the Engineer.

The concrete pavement shall be constructed in uniform 50-foot lengths. Wood or steel templates shall conform to the typical cross section as shown on the plan. Expansion joints one-half inch thick shall be provided every fifty feet. Expansion joint material shall be of the preformed non-extruded, resilient bituminous type, conforming to NCDOT Specifications, Section 928, or any subsequent revision prior to the date of this contract.

Measurement and Payment

Measurement shall be by the square yards of concrete pavement constructed and accepted by the Engineer. Payment shall be made by the unit price bid which shall include furnishing of all materials, tools, equipment, labor, and incidentals in connection with
constructing the pavement and cleaning up the area as specified by the Engineer.

COARSE AGGREGATE BASE COURSE

Preparation of Subgrade

The subgrade shall be prepared as specified under "Grading".

Materials

The aggregate shall consist of crushed stone, tough and durable which shall have a percent of wear not more than 60% when tested in accordance with AASHO Method T-96. The aggregate when analyzed, shall meet the grading requirements using AASHO Method T-88 as follows:

<table>
<thead>
<tr>
<th>Sieve Designation</th>
<th>Percentage by Weight Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1 1/2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>1&quot;</td>
<td>80-95</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>60-75</td>
</tr>
<tr>
<td>No. 4</td>
<td>40-55</td>
</tr>
<tr>
<td>No. 10</td>
<td>28-43</td>
</tr>
<tr>
<td>No. 40</td>
<td>15-27</td>
</tr>
<tr>
<td>No. 200</td>
<td>5-12</td>
</tr>
</tbody>
</table>

The material passing the No. 200 Sieve shall not be more than two-thirds the percentage passing the No. 40 Sieve. Binder material of a kind approved by the Engineer shall be added, if needed.

Base Course Construction

It is intended that these specifications shall provide for a base of advanced quality and in which initial aggregates of various sizes shall be arranged by mechanical means into a homogenous, blended mixture, and that the resulting mass, at proper moisture content, shall then be compacted by rolling into a dense water resistant structure having its component aggregate of all sizes mechanically interlocked and stably bonded.

The aggregate material shall be spread on the completed subgrade with an approved mechanical spreader capable of placing the material to a uniform loose depth and without segregation. In areas that are inaccessible to a mechanical spreader, the aggregate material may be placed by other methods approved by the Engineer. Care shall be taken in methods used in handling, hauling and placing the aggregate material which will prevent segregation and contamination.
Where the required compacted thickness of base is 8 inches or less, the base material may be spread and compacted in one layer. Where the required compacted thickness of base is more than 8 inches, the base material shall be spread and compacted in 2 or more approximately equal layers. The minimum compacted thickness of any one layer shall be approximately four inches. No base material shall be placed on frozen subgrade or base.

After the base course material has been spread, it shall be thoroughly blade mixed to the full depth of each layer by alternately blading the entire layer to the center and back to the edges of the street. Traveling mixers of a type approved by the Engineer may be used in lieu of blade mixing.

The mixture shall be watered during the mixing when necessary to obtain the proper moisture content as determined by the Engineer. When uniform, the mixture shall again be spread smoothly to the cross section shown on the plans.

Immediately following the spreading and smoothing, all material placed shall be compacted to the full width by rolling with a heavy pneumatic roller followed by a wheel roller, each weighing not less than eight tons. Rolling shall progress from the sides to the center, parallel with the curb and lapping uniformly each preceding rear wheel track by one-half the width of track, and shall continue until all the surface has been rolled by the rear wheels and compacted to a density equal to 100% of the maximum density determined by AASHO 5-180, Method D. A Moisture-Density Guage will be used by the City to obtain in-place density and moisture content. The Engineer may require that the contractor furnish results of an approved test method to insure that the required compaction has been obtained. Any irregularities or depressions that develop shall be corrected by loosening the material at these places and adding or removing material until the surface is smooth and uniform. Hauling shall be done over the base course during construction, and traffic shall be permitted afterwards. Blading, watering, and rolling shall be performed alternately as required or directed to maintain a smooth, even, uniformly compacted base until the asphalt surface is laid thereon. All places not accessible to the roller shall be tamped with mechanical tampers or with heavy hand tampers. The stone base course must be watered daily by the contractor and bladed and rolled, when necessary, and kept in proper condition for any period of delay regardless of the cause. A minimum period of 14 days is required between the date of final base preparation of laying the asphalt surface.

Measurement and Payment

Measurement shall be made by the amount of tons in place and accepted by the Engineer. Payment of the contract unit price bid per ton shall include furnishing, hauling, and placing all materials, tools, labor and incidentals necessary to complete the
stone base course as specified.

REPLACEMENT OF EXISTING DRIVEWAYS

Replacement will be with either concrete or asphalt and stone.

Replacement of concrete paving shall be with four-inch thick concrete where the existing driveway paving is four inches non-reinforced concrete or less. Where existing concrete paving is four inch reinforced concrete or more, or where existing concrete paving is five inch plain concrete paving, the replacement will be with six inch thick concrete paving. All driveway replacement within the graded portion of the street right of way will be with six inch concrete paving. Payment will be in accordance with unit prices for either six inch thick concrete paving for driveways or four inch thick concrete paving for sidewalks, whichever is applicable.

Replacement of asphalt paving will be with the same thickness of asphalt that exists on the present driveway, with payment at the unit price specified in the contract for 1-2 by the ton.

The base to be replaced under the asphalt will be with ABC stone of the same thickness that existed with the original driveway; however, in no case will the stone base be less than four inches thick. The thickness of stone to be replaced shall be increased by one inch over the amount measured in the field to allow for the amount of original stone that was embedded in the subgrade, and which cannot presently be measured. Payment for stone will be in accordance with the unit price for ABC stone in the contract by the ton.

Grading of the driveways shall be paid by the cubic yard as measured, and at the unit price bid for "Grading".

MANHOLE ADJUSTMENT

Manhole, sewer and water frames and covers, valve boxes and other permanent fixtures, shall be set exactly to the grade and contour of the new street surface in advance of laying of the pavement. Addition or deletion of brick work must conform to standards of Water and Sewer Engineering Division of the Engineering Department.

Payment for adjustment of castings, manholes, etc., shall be paid for at the contract unit price bid either for six inch increments or manhole rings for Resurfacing of "Adjustment of Manholes", which prices and payment will be full compensation for furnishing, hauling, and placing all materials, excavation, tools, labor, and incidentals necessary to complete the work.

When used in resurfacing, the City will insist that manhole rings of an approved standard such as those manufactured by Dewey
Brothers, Goldsboro, North Carolina, be used to raise the level of manholes to resurfacing grade.

CONCRETE VALLEY GUTTER

Concrete valley gutters shall be six inches thick and four feet wide. The width may be adjusted as directed. The valley gutters shall be constructed as shown on plans and/or as directed by the Engineer. A detail drawing is enclosed in the contract documents.

Measurement and payment. Measurement shall be by the square yard of valley gutter constructed and accepted by the Engineer. Payment shall be made by the unit price bid and shall include furnishing all materials, tools, labor and any other incidentals necessary to successfully complete the construction.

ASPHALT PAVEMENTS

Description

Five types of hot, plant mixed, asphalt pavements are included in these specifications. They are:

1. HB - Bituminous Concrete Base Course
2. Type H - Asphaltic Concrete Mix - Binder & Surface Course
3. Type I-2 - NCDOT Mix - Surface Course
4. Type F-2 - Sand Asphalt Mix - Surface Course
5. Type J - Sheet Asphalt Mix - Surface Course

Material specifications and job mix requirement sections inclusive shall apply to all types of pavement.

1. GRADATION. COMPOSITION OF MIXTURE. The mineral aggregate for the binder and surface courses shall be of such size that the percentage composition by weight, as determined by laboratory sieve test will conform to the following gradations.
TABLE 1 - Requirements for Composition of Mixture

INSERT TABLE HERE!
2. MATERIALS. ASPHALT PAVEMENTS

A. Aggregate

(1) Coarse Aggregate. Coarse aggregate shall consist of crushed stone having clean, hard, tough, uncoated, durable particles free from injurious amount of soft, friable, thin, elongated, or laminated pieces, soluble salts, organic or other deleterious matter. When tested in accordance with the Los Angeles Rattler abrasion test, after 500 revolutions, the coarse aggregate shall have a percent of wear of not more than fifty (50) according to AASHO Method T-96-60.

(2) Fine Aggregate. Fine aggregate shall consist of natural sand having clean hard durable uncoated grains or clean stone screenings produced from stone meeting abrasion requirements as shown above. (Los Angeles Rattler Abrasion Test).

(3) Filler. Mineral, if needed, in addition to that naturally present in the aggregate shall consist of limestone dust. It shall be thoroughly dry and free from lumps and meet the following grading requirements:

- Passing No. 30 Sieve - 100%
- Passing No. 80 Sieve - >95%
- Passing No. 200 Sieve >65%

B. Asphalt Cement. The asphalt cement shall concern to the following requirements: The asphalt cement shall be homogeneous, free from water, and shall not foam when heating to a temperature of 347 degrees Farenheit. A manufacturer's certification showing test results as applies to REQUIREMENTS of Asphalt Cement listed below in the section of TESTING shall be submitted by the Contractor to the City for each job mix.

3. Testing

A. Aggregate

(1) General Test: Prior to final acceptance of the proposed aggregate to be used, the inherent characteristics of said aggregate relative to stripping shall be determined. This shall be done by preparing a test sample of the paving mixture in conformity with the specifications contained herewith. After the mixture has been made, it shall be spread out in a loose thin layer and allowed to air season for 24 hours before testing. A suitable size sample (approximately one-half contents of container) shall be testing by placing it in a glass jar fitted with a tight screw cap and completely covered with distilled water. The jar and contents shall be vigorously shaken for a period of 14 minutes. The sample of mixture shall be examined for stripping. If stripping or sloughing of the bituminous coating occurs, it will be necessary to
treat said aggregate by a method which has proved successful in changing the material from a hydrophilic to a hydrophobic state.

(2) Special Test

a. Type H. Trial Mixes. Trial laboratory mixes using proposed aggregates and bitumen conforming to composition requirements shall have a minimum strength of 250 pounds per square inch (PSI) when tested in accordance with ASTM D-1074-52T "Compressive Strength of Bituminous Mixtures". When tested in accordance with ASTM D-1075-54T "Effect of Water on Cohesion of Compacted Bituminous Mixtures", laboratory prepared specimens shall show a strength retention of not less than 75%.

b. Type J Sheet Asphalt. (1) At least five percent (5%) of the material passing the 200 mesh sieve shall be added mineral filler. (2) The finished pavement shall have more than 2.7% but less than 5.5% voids (total mix).

c. Type HB. Base Course. At least fifty percent (50%) of the fraction passing the No. 200 sieve shall be mineral filler complying with Section 402-1.4 of the NCDOT Specifications or approved stone screening.

B. Asphalt Cement

(1) Requirements

Penetration at 77 degrees F., 100 g., 5 sec. .............. 85-100
Total Bitumen (Soluble in carbon disulphide not less than). 99.5% Proportion of bitumen soluble in carbon tetrachloride not less than .................................................. 99.0%
Ductility at 77 deg. F., not less than ............ 100 cm.
Flash point, deg. F., not less than ...................... 347 deg. F
Loss at 325 deg. F., 5 hrs. not more than ........ 1.0%
Penetration at residue at 77 deg. F., 100 g., 5 sec. as compared to penetration before heating not less than .......... 60.0%
Spot test with Standard Naptha......................... Negative

(2) Standards. Sampling and testing of asphalt cement shall be in accordance with the following standard methods of the American Association of Station Highway Officials (AASHO) or any subsequent applicable AASHO test:

a. Sampling ............................................. T-40-56
b. Penetration........................................... T-49-53
c. Total Bitumen........................................ T-44-60
d. Bitumen soluble in carbon tetrachloride........... T-45-56
e. Ductility .......................................... T-51-44
f. Flash Point......................................... T-48-60
g. Loss at 325 deg. F................................ T-47-42
h. Spot test with Standard Naptha.................... T-102-57
4. Job Mix Formula

A. City Contract. No work shall be started on projects nor any mixture accepted therefore until the contractor has submitted samples and tests of the materials intended for use. The contractor shall submit in writing a job mix formula to the engineer for approval. The approved job mix formula shall be furnished the contractor and representative of the approved testing laboratory. Such formula shall indicate the definite percentage for each sieve fraction of aggregate, bituminous cement and intended temperature of completed mixture at the time of discharge from the mixer. The material furnished shall conform to the approved job mix formula within the tolerances specified herein and shall be within the master range for the particular type of mix specified.

B. Private Jobs - City Streets. Mixes used on streets being paved by contractors for private persons, firms or corporations shall meet the required specifications. Each Durham contractor expecting to construct asphalt pavements shall submit a job mix formula for approval each January 1, which shall be good for a 12-month period. Out-of-town contractors shall submit a job mix formula on each and every specific project.

C. Gradation. The final gradation decided on within the limits designated for each type mix shall be uniformly graded from coarse to fine, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

D. Bituminous Material. The percentage of bituminous material, by weight, to be added to the aggregate shall be fixed by the engineer on the basis of preliminary laboratory tests and field sieve analysis on the aggregate furnished and shall be within the range as shown in the table.

5. Construction Methods

A. Weather and Seasonal Limitations. The surface course shall be constructed only when the surface is dry, when the atmospheric temperature is above 40 deg. F., and when the weather is not foggy or rainy. The temperature requirement may be waived, but only when so directed by the Engineer.

B. Equipment and Organization

(1) General. All methods employed in performing the work and all equipment, tools and other plans and machinery used for handling materials and executing any part of the work shall be subject to the approval of the engineer before the work is started and whenever found unsatisfactory shall be changed and improved as required. All equipment, tools, machinery and plans used must be maintained in a satisfactory working condition.
(2) Plant Inspection: Weights. For checking the adequacy of the equipment in use, inspecting the conditions and operation of the plant, for the verification of weights or proportions and character of materials and/or the determination and checking of temperatures being maintained in the preparation of the mixtures, the engineer or his authorized representative shall have access at any time to all parts of the paving plant.

(3) Mixing Plant. The paving plant used by the contractor in the preparation of the bituminous mixture shall comply with the following requirements:

The drier shall be suitable designed to heat and dry the aggregate to specifications requirements and to continuously agitate the aggregate during heating. The drier shall be capable of preparing aggregate to the full rated capacity of the paving plant to meet the specification requirement. A dial thermometer or other thermometric instrument shall be so placed in the boot of the hot elevator as to automatically register the temperature of the aggregate.

The plan screens shall be designed, constructed, and operated so as to screen all aggregate to appropriate fractions as established by the engineer and as necessary to meet the job mix tolerance.

The plant shall have storage bins, protected from the weather of sufficient capacity to furnish the necessary amounts of all aggregates when operating at the maximum rated capacity of the plant. The bins shall provide two or more compartments for hot aggregate so proportioned as to insure adequate storage of appropriate fractions of the aggregate and mineral filler. Each compartment shall be provided with an overflow pipe or other device which meets with the approval of the Engineer of such size and such locations as to prevent backing up of material into other compartments.

The plant shall be a pugmill batch plant. This equipment shall be constructed with devices that will permit easy readjustment of any working part such that it will function properly and accurately. The aggregate weighing device shall be constructed and operated so that the correct amount of each size aggregate is introduced into the mixer with an accuracy that will meet the job tolerance specified. The plant mixer shall have a capacity of at least 2,000 pounds and the plant shall have a capacity of at least 40 tons per hour.

The asphalt weighing device shall be so constructed and operated that the correct amount of asphalt is introduced into the mixer with an accuracy that will meet the job tolerances specified. The dial scales or other weighing devices shall be of an approved type.
The mixer shall be a twin pugmill of sufficient size to maintain thorough uniform mixing at the rated plant capacity. The mixer shall be steam jacketed.

The plant shall be equipped with positive means to govern the time mixing and to maintain it constant unless changed by order of the Engineer. The time of mixing shall be considered as the interval between the time the bituminous material is spread on the aggregate and the time the same aggregate leaves the mixing unit.

Equipment for heating bituminous material shall consist of a retort of steam coals so designed that steam will not be introduced into the material.

Asphalt storage and supply lines shall be insulated or steam jacketed in such a manner that there will be no appreciable drop in temperature of the asphalt between the heating unit and the mixing unit.

C. Placing Equipment. Equipment for spreading, shaping and finishing shall consist of an approved self-contained power machine operating in such a manner that no supplemental spreading, shaping or finishing will be required to provide a surface which will comply with the requirements for smoothness as contained herein.

D. Rolling Equipment. Rollers shall be suitable designed for the construction of bituminous surfaces. The rolling shall be done with self-propelled steel wheel tandem rollers weighing not less than ten (10) tons, and self-propelled tired rollers weighing not less than eight (8) tons with equal tire pressures of 60 to 90 PSI and not less than seven (7) smooth tires. The wheels on the rollers shall be equipped with adjustable scraper which shall be used when necessary to clean the wheel surface.

E. Preparation of Mineral Aggregate. The aggregate for the mixture shall be dried and heated at the paving plant before entering the mixer. The aggregate shall be heated to the temperature as designated by the Engineer. The maximum temperature and the rate of heating shall be such that no permanent damage occurs to the aggregate. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by heating. The aggregate shall be screened to specified sizes and conveyed into separate bins ready for mixing with bituminous material.

Additional filler, if necessary to meet the grading requirements, shall be proportioned and added to the mineral aggregate. Filler may be added to the aggregate at the mixing plant by premixing thoroughly with the other aggregates. Spreading filler over the tops of the aggregate pits or dumping it into the hoppers at crushing plants will not be permitted.
F. Preparation of Bituminous Mixture. Before being delivered to the street, the aggregate shall be mixed with the bituminous material at a central mixing plant. The mixture shall be prepared at a temperature as directed by the Engineer between 250 deg. F. to 350 deg. F. for asphalt mixtures.

The aggregate prepared as prescribed above shall be accurately measured and conveyed into the mixer in the proportionate amounts of each aggregate required to meet the specified grading. The bituminous material shall be melted in kettles or tanks designed to secure uniform heating of the entire contents.

Kettles for storage of bituminous cement shall have a total capacity sufficient for one day's run and shall be capable of heating the bituminous cement with an effective and positive control of heat at all times to a temperature of between 175 deg. F. and 350 deg. F. Heating of the cement by steam coils is preferred. Under no circumstances will a direct flame from oil or other fuel be permitted to come in direct contact with the heating kettles. The circulating system shall be constructed of adequate size to give the proper and continuous circulation of cement throughout the operating periods. All lines and fittings shall be steam jacketed.

The quantity of bituminous material for each batch shall be determined by the Engineer and shall be measured by weight and introduced into the mixer at the specified temperature, holding to the lowest range possible for adequate mixing and spreading. All mineral aggregate shall be in the mixer before the bituminous material is added. The exact temperature to be used on the work within the specified range shall be fixed by the Engineer. In no case shall aggregate be introduced into the mixture at a temperature more than 25 deg. F. above the temperature of the bituminous material. The mixing shall continue for at least thirty seconds and for such longer periods as may be necessary to coat all the particles.

A silicone additive such as Dow Corning 200 Fluid 1,000 C.S. shall be used, as directed by the Engineer.

G. Transportation and Delivery of the Mixture. The mixture shall be transported from the mixing plant to the point of use in pneumatic tired vehicles having right bodies previously cleaned of all foreign materials. Each load shall be covered with canvas or other suitable materials of sufficient size and thickness to protect it from the weather conditions.

The mixture shall be placed at a temperature between 225 deg. and 350 deg. F.

When the mixture is being placed during warm weather and the Engineer has determined that satisfactory results can be obtained
at lower temperatures, he may direct that the mixture be mixed and delivered at the lower temperature.

No loads shall be sent out so late in the day as to interfere with spreading and compacting the mixture during daylight, unless artificial light satisfactory to the Engineer is provided.

H. Spreading and Laying

(1) Preparation for Placing. Immediately before placing the bituminous mixture, the existing surface shall be cleaned of loose or deleterious material be sweeping with a power sweeper supplemented by hand brooms if necessary or as directed by the Engineer.

The mixture shall be laid only upon an approved underlaying course which is dry and only when weather conditions are suitable. No mixture shall be placed when the air temperature in the shade and away from artificial heat is 40 deg. F. or under, unless so directed by the Engineer. The Engineer may, however, permit work of this character to continue when overtaken by sudden rains, up to the amount which may be in transit from the plant at the time provided the mixture is within the temperature limits specified.

Placing shall commence at the point or points farthest from the mixing plant, and progress continuously toward the plant, unless otherwise ordered by the Engineer. Hauling over material already placed will not be permitted until material has been compacted thoroughly in the manner specified, and allowed to cool to atmospheric temperature.

(2) Machine Spreading. Upon arrival the mixture shall be dumped into an approved mechanical spreader and immediately spread thereby to the full width required. It shall be struck off in a uniform layer of such depth that when the work is completed, it will have the required thickness and will conform to the grade and surface contour required. The speed of the mechanical spreader shall be regulated to eliminate as far as possible the pulling and tearing of the bituminous material.

Placing and compaction of the bituminous mixture shall progress in sections. The bituminous mixture shall be spread, shaped and finished with the power machines specified. To insure proper drainage, the spreading shall begin along the center line of the street on a crowned section or on the high side of the pavement with a one-way slope. A 10-foot straight edge shall be used across the longitudinal joint to determine if the surface is to grade and contour.

In limited areas where, on account of irregularities or unavoidable obstacles, the use of mechanical spreading and finishing equipment is impractical, the mixture may be spread by use of hot asphalt
rakes.

When haul spreading is permitted, the mixture shall be dumped upon arrival on approved dump sheets outside of the area on which it is to be spread and shall be distributed into place immediately by means of hot shovels. It shall be spread with hot rakes in a uniformly loose layer to the full width required and of such depth that where the work is completed, it will have the required thickness and will conform to the grade and surface contour required.

Contact surfaces shall be painted with a thin uniform coat of hot asphalt cement or cut-back asphalt just before the mixture is placed.

When the pavement is laid alongside of gutters, or casting, it is required that the finished surface adjacent to them be left one-quarter (1/4) inch high in order to provide for subsequent compressions by traffic and to avoid depressions which would otherwise be liable to occur at these points.

I. Compaction of Mixture. After spreading, and as directed by the Engineer, the mixture shall be thoroughly and uniformly compressed by a power driven steel wheel tandem roller or rollers, weighing as specified under "Rolling Equipment". Rolling of the mixture shall begin as soon after spreading as it will bear the roller without undue picking up of the mixture on the roller wheels. On the first strip spread, rolling shall start in the center and continue toward either edge. On subsequent strips laid, rolling will start on the edge adjacent to previously laid material and continue toward the outer edge.

Initial rolling shall be done longitudinally with rollers overlapping on successive trips of the roller. Alternate trips of the roller shall be of slightly different lengths. The mixture shall be subjected to diagonal rolling crossing the lines of the first.

The speed of the roller shall at all times be slow enough to avoid displacement of the hot mixtures. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause, shall be corrected at once by the use of rakes, and of fresh mixture where required.

Sufficient rollers of the designated types shall be furnished to adequately handle the output of the plant. Where directed, the contractor shall provide additional rollers of the type specified as protection in the event of breakdown. When additional rollers are not required, the contractor shall insure that extra rollers are readily available within a time that the required density can be achieved in the event of breakdown. Rolling shall proceed at an average rate not to exceed 350 square yards per hour per roller.
Rolling shall continue until all roller marks are eliminated, until the surface is of uniform texture and true to grade and cross section. Each of the mixtures shown below shall be compacted to the density as indicated:

(a) Bituminous Concrete Base Course, Type H-B - 90% of maximum theoretical density.

(b) Bituminous Concrete Binder, Type H - 94% of laboratory density as determined by the Marshall Method of Test.

(c) Bituminous Concrete Surface Course, Type I-2 - 95% of laboratory density as determined by the Marshall Method of Test.

A Moisture-Density Gauge will be used by the City to obtain in-place density for the above mentioned asphalt mixes. Field density tests shall be made at least daily. Final rolling shall be done with rubber tired rollers weighing 8 tons or more.

To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but an excess of either water or oil will not be permitted. The rollers shall be kept in good condition and shall be operated by competent and experienced rollermen. The rollers shall be operated continuously as far as practicable and in such a manner that all parts of the pavement shall receive substantially equal compression.

When two or more streets in different locations are to be paved the same day, the rollers shall not be moved to the succeeding street until approved by the Engineer or his authorized representative. This provision shall, however, in no way relieve the contractor from his responsibility to achieve the required compaction.

At all places not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers. Hand tampers shall weigh not less than 25 pounds and shall have a tamping face area of not more than 50 square inches. The surface of the mixture after compaction shall be smooth and true to the established crown and grade.

Any mixture which becomes loose and broken, mixed with dirt, or in any way defective prior to the application of the finish coat shall be removed and replaced with fresh hot mixture, which shall be immediately compacted to conform with the surrounding area, all to be done at the expense of the contractor. Skin patching on an area that has been rolled shall not be allowed.

J. Joints

(1) General. Joints shall comply with the surface requirements and present the same uniformly of texture, density, smoothness, etc., as other sections of the course.
(2) Transverse. The placing of the course shall be as nearly continuous as possible. The roller shall pass over the unprotected end of the freshly laid mixture only when the laying of the course is to be discontinued.

(3) Longitudinal. The placing of the course shall be in the manner as specified and so that the joint is exposed for the shortest period possible. The joint shall be placed so that it will not coincide with that in the base or binder course and will break joints by at least one foot.

(4) In the formation of all joints, provision shall be made for proper bond with the new surface for the full specified depth of the course. Joints shall be formed by cutting back on the previous day's run so as to expose the full depth of the course, and the exposed edge shall be given a light paint coat of asphalt, if necessary. The fresh mixture shall be raked against the joint, thoroughly tamped with tampers and rolled. All joints must be true to line without variations or deviations.

K. Surface Tests. The finished surface shall not vary more than 1/4" for the wearing course when measured with a sixteen-foot straight edge applied parallel with or at right angles to the center line. Tests for conformity with the specified crown and grade shall be made by the contractor immediately after initial compression and any variation shall be corrected by removing or adding materials and continuing the rolling. After the completion of final rolling, the smoothness of the course shall again be checked, and the humps or depressions exceeding the specified tolerances or that retain water on the surface shall be corrected by removing the defective work and replacing with new material or by adding additional material as directed by the Engineer and at the expense of the contractor.

L. Sampling Pavement. Upon request by the Engineer, the contractor shall remove suitable size samples of the completed pavement. Samples for each day or fraction thereof when mixtures are placed shall be taken by the Engineer of his representative. The contractor shall replace the pavement where samples are removed, and these replacements shall be installed by the contractor fee of charge. After the samples have been removed from the completed pavement, they will be tested by the Engineer for density.

M. Measurement and Payment. Measurement shall be made by the tons of HB base course or of other asphalt pavement accepted by the Engineer. Payment shall be by the contract unit price bid and shall include furnishing all materials, tackcoating, asphalt cement, tools, equipment, labor, and incidentals necessary to complete the asphalt pavement and cleaning up the areas as specified by the Engineer.
6. Asphaltic Concrete Headers

A. Asphaltic concrete headers shall be placed across streets where designated by the Engineer. They shall be eight (8) inches wide and extend twelve (12) inches below the final surface of the stone base. The asphaltic concrete shall be laid in layers four (4) inches thick and each layer thoroughly tamped and thoroughly rolled before the header is covered with the pavement.

B. Measurement and Payment. Headers shall be measured along their length between the street gutters. The price paid shall include all necessary excavation, laying the asphalt mixture, removal of all surplus excavation and materials, tools, equipment, labor and incidentals.

7. Prime Coat

Unless otherwise specified by the Engineer, a prime coat shall be applied to the base course and the prime allowed to cure before the asphalt mix is placed. Rapid curing cutback asphalt, Grade RC-0, shall be used for the prime unless otherwise designated by the Engineer. The prime shall be applied uniformly over the entire area to be surfaced at a rate of 0.20 to 0.40 gallons per square yard, and at a temperature of 90 deg. F. to 130 deg. F. The prime coat shall be applied uniformly only when the base course is clean, dry, compact and bonded to the satisfaction of the Engineer and conforms to the typical crown sheets as shown in these specifications. Prime shall be applied only when the atmospheric temperature is above 60 deg. F. or as directed by the Engineer and/or inspector.

An approved pressure distributor shall be used to apply the priming material, and care shall be used to prevent spilling this material on finished work. The nozzles of the spreader bar shall be kept clean and should one or more of the nozzles become clogged during application of the prime material, the distributor shall be stopped and the nozzles cleaned before proceeding. The distributor shall be loaded with sufficient quantity of material to complete any proposed run prior to the time the applications begins to diminish or provide a non-uniform coverage. Should lean spots appear in the material as applied, additional material shall be applied by use of hand-pouring pots or hand hose equipped with nozzle. Any apparent accumulation of excess material shall be spread while still warm by hand brooms so that the material will cure uniformly over the entire area.

After the application of prime is complete, the street shall be closed to all traffic for a period of not less than 24 hours, and longer if necessary for the material to thoroughly penetrate the base, so it will not be picked up by the wheels of traffic.

If at the end of 24 hours after application, there remain pools or
spots of excess bitumen on the road surface, the Engineer may require such pools or spots to be hand broomed or blotted with aggregate to prevent the primer from being picked up. When the Engineer so directs, the primed base course shall be rolled until all loose material is thoroughly bonded. Primer shall be applied only when the road surface is dry and warm enough to obtain proper penetration.

If after 72 hours the primer still has not penetrated and picks up, the Engineer may order the application of a light cover of sand or cover aggregate at a rate of 8 to 15 pounds per square yard.

The contractor shall maintain the prime in a firm and intact condition until it shall have been covered by paving. The prime shall not be allowed to remain more than 10 days before the paving shall be applied unless prevented by unfavorable weather conditions. After the primer has been applied to any street, the contractor shall be required to prohibit traffic until after the paving has been applied.

Prime coat application shall be measured by the gallon and shall be paid for at the contract unit price, which shall include furnishing, hauling, and placing all materials, all equipment, tools, labor, and incidentals necessary to complete the prime coat application.

8. Asphalt Resurfacing

On the thoroughly dry and clean surface of old pavement to be resurfaced, a tackcoat of an asphalt cement of the same grade as used in the resurfacing mixture shall be uniformly applied at the rate of 0.06 to 0.12 gallons per square yard, or an asphalt emulsion NCDOT AE-1 special at a rate of 0.10 gallons per square yard.

The area shall not be resurfaced until the tackcoat has sufficiently cured. No more tackcoat shall be applied that can be covered with new surface on the following day. No tackcoat shall be applied when the temperature is so low that the asphalt will not properly adhere to the old pavement.

The tackcoated area shall be protected with barricades and signs to prevent any damage by traffic.

Prior to resurfacing, arrangements can be made with the City to clean the street with a motor pickup sweeper at no cost to the contractor. The contractor will be required to supplement this cleaning with labor and brooms without additional compensation.

The price paid per ton for asphalt resurfacing at the contract unit price bid shall include the furnishing and placing of all materials, tools, equipment, labor and incidentals in connection with cleaning, tackcoating and resurfacing the street except as
otherwise specified.

REMOVING EXISTING DRAINAGE PIPE

Removal of existing drainage shall include all pipe, either terra cotta, concrete, reinforced concrete, or corrugated metal that is twelve inches in diameter or larger which during the course of construction is to be replaced or abandoned.

At intersections, or other places in the street that pipe has been removed, the contractor will be responsible for hauling off and disposing of any removed and unwanted pipe. There will be no additional compensation for pipe removed less than 12 inches in diameter or pipe remove at driveways.

Payment shall be made by the number of lineal feet removed as per unit price bid and measured by the inspector. Price shall include all labor, equipment and incidentals needed to satisfactorily remove pipe and properly backfill.

PIPEINES THROUGH CONCRETE STRUCTURES

When pipelines are to be constructed through concrete structures, sleeves shall be provided in the walls. The inside diameter of the sleeve shall be of the size designated by the Engineer. The concrete in walls on structures will be cut and the sleeve formed of the proper diameter. The void space between the outside of the pipe and the inside diameter of the sleeve shall be caulked with lead wool.

ENCASEMENT OF PIPELINES

Should the encasement of pipelines be required, the Engineer will instruct the contractor, or others, as to the materials, sizes and methods to be used.

FREE-FALL TAMP

All backfilling of pipeline ditches where a drop hammer mechanical type tamp is used shall be in accordance with the appropriate standard specifications for backfilling. In addition, the following criteria shall also apply. This criteria is intended as an absolute minimum of compactive effort and shall in no way relieve the Contractor of the responsibility of securing the percent compaction called for in the standard specifications. In addition, the Engineer or Inspector may require additional compactive effort when in his opinion additional effort is needed in order to secure the desired degree of compaction.

The free-fall tamp to be used must be approved by the Engineer before beginning backfill operation.
After the water or sewer ditch has been properly backfilled with select material to a point four feet (4') below the surface of the ground, the remainder of the ditch may be backfilled with mechanical equipment such as a bulldozer or front-end loader operated parallel to the trench. The pushing in of material from a position normal to the ditch shall be kept free from rocks or boulders larger than eight inches (8") in size. Frozen lumps or large chunks of plastic clay will not be permitted. When, in the opinion of the Inspector, the unsuitable material is difficult to separate, the pushing in by mechanical equipment will not be permitted. Immediately after the trench has been backfilled to the proposed grade, it must be thoroughly tamped at least one time with an approved free-fall tamp. The ditch must receive a second compaction tamp no later than the day following the backfill.

The Contractor will be required to obtain ninety-five per cent (95%) compaction in the street area with the tamping equipment, and may be required to furnish results of any backfill that has been performed before the work is approved.

REPLACEMENT OF EXISTING PAVEMENT

If it becomes necessary to replace any existing pavement during sidewalk construction, curb and gutter replacement, or pavement replacement caused by water and/or sewer main construction, the depth and type of asphalt to be used for this replacement shall be five inches of H.B. base and one and one-half inches of I-2. This phase of construction will be paid for by the ton at the bid price governing these respective asphalt replacements.

SAWING EXISTING CONCRETE

This phase of construction is to be performed where it has been determined that a straight joint is preferred to tie on new construction. An acceptable concrete saw, either gasoline or electric powered and manned by qualified personnel will be used. Any debris, broken concrete, or any other undesirable material that is accumulated because of work will be removed, hauled off and disposed of by the contractor.

Payment shall be made by the number of lineal feet of sawed concrete measured by the inspector and at the unit price bid for "sawing existing concrete". Price shall include all labor, equipment, and incidentals needed to saw concrete, remove, haul, and dispose of any undesirable materials.

CONCRETE BLOCK OR BRICK RETAINING WALL

Concrete block or brick retaining walls shall be built as directed and as shown on the plans. All material used in this construction shall meet the specifications as set forth under their respective sections. The walls shall be paid for at the unit price bid per
cubic foot in place, as measured, and shall include all equipment, labor, material, and all other incidentals necessary to successfully complete the work.

EXCAVATING DRAINAGE DITCHES

Where directed, or as shown on the plans, head and/or tail ditches are to be excavated.

Payment for this item shall be the price bid per cubic yard and shall include all labor, equipment, and incidentals required for excavating, hauling and disposing of materials.

CONCRETE SLAB

This item will be used for any concrete structures not already covered by items. Any that are to be reinforced will be noted on the plans and reinforcing steel will be paid as a separate item. Concrete used will be Class "A" and will conform to Material and Detailed Specifications in those respective sections.

Payment shall be made at the price bid per "concrete slab", per cubic yard, and shall include all materials, labor, equipment and incidentals to complete this item in place as specified.

REINFORCING STEEL

Reinforcing steel shall be used as directed and as shown on the plans. The steel shall be #4 bars, Grade 40, and shall conform to standards set out in Material Specifications.

Payment shall be made at the price bid per pound, in place, complete as specified, including all materials.

REMOVING EXISTING CONCRETE SIDEWALK OR DRIVEWAY

This item is for any concrete sidewalk or concrete driveways that have to be removed. Price will include removal and disposal of materials including any necessary hauling. Any sawing of concrete to maintain a straight joint is covered under a separate provision.

Removal of existing concrete sidewalk or concrete driveway shall be paid at the price bid per square yard of concrete removed as measured and disposed of and shall include all labor, equipment and other incidentals to complete the job as specified.

REINFORCED CONCRETE HEADWALLS

As directed, on pipe sizes from 36 inch or larger, construction of reinforced concrete headwalls are to be built. The concrete to be used will be Class "A" concrete and shall meet all standards as set forth in Material Specifications. Forming and finishing shall be
done in conformance with those specifications as laid out in "concrete" section. Setting of reinforced steel shall be as shown in Detailed Specifications Drawing Section. Payment for steel is covered under "reinforcing steel" item.

Payment for concrete for headwall shall be made by the cubic yard of acceptable concrete headwall, in place, complete, as specified and directed. Price shall include any labor, materials, equipment and any other necessary incidentals to satisfactorily complete the job.

REMOVAL OF EXISTING CATCH BASIN

This item is to be used when it has been found necessary by the Engineer to abandon and remove an existing catch basin.

Payment for this item will be by the unit, and at the price bid per unit and shall include all equipment, labor, and materials to remove the basin and backfill the excavation with suitable material properly compacted.

SILT FENCE

Silt fencing shall be constructed at locations as shown on the plans and as directed. The silt fence construction shall conform to the details as enclosed in the contract documents.

Payment for this item shall be at the contract unit price bid per lineal foot, in place, complete, including all labor, materials, equipment, and incidentals to complete the job.

CONVERTING EXISTING CATCH BASINS TO MANHOLES

At locations where an existing basin can be utilized as part of the new drainage system, instead of being abandoned and removed, the basin shall be converted to a manhole. The basin is to be torn down to such a depth as determined by the engineer and rebuilt to the correct grade and furnished with a proper manhole casting complete with top. City of Durham Street Maintenance Division personnel shall be notified as to what location the existing catch basin casting and grates can be picked up.

This item shall be paid for at the unit price bid per converted catch basin complete, in place, as specified and shall include all labor, materials, and equipment to complete the job.

STEEL FLUMES FOR CONVEYING STORM DRAINAGE

This item includes furnishing and laying one quarter inch (1/4") steel flumes, twelve inches (12") wide, complete in place as specified and as approved and shall include all excavation,
materials, labor and any necessary incidentals to satisfactorily complete the job. Payment shall be made at the unit price bid per lineal foot, accepted and measured by the inspector.

These flumes can be obtained from Durham Brazing and Welding Company or an approved equal. The exposed surface portion of these flumes shall have an abrasive or a non-skid finish.

EXCELSIOR MATTING

This item includes furnishing, placing, and securing excelsior matting or other approved matting on previously shaped, seeded, limed, and fertilized areas at locations shown on the plans or as directed by the Engineer.

Payment shall be made at the unit price bid per square yard, accepted and measured by the Inspector. The above price and payment will be full compensation for all work covered by this item, including but not limited to furnishing all matting, staples, seed, lime, fertilizer, and other materials; and placing and securing the matting; and preparing the seedbed.