

# CITY OF CUYAHOGA FALLS

DEPARTMENT OF PUBLIC SERVICE  
DIVISION OF ENGINEERING AND CONSTRUCTION

CONSTRUCTION SPECIFICATIONS



1976 Edition  
No.

## TABLE OF CONTENTS

### SECTION 100 GENERAL CONDITIONS

|     |  |
|-----|--|
| 101 | Definitions and Terms                        |
| 102 | Bidding requirements and Conditions          |
| 103 | Award and Execution of Contract              |
| 104 | General Work Requirements                    |
| 105 | Control of Work                              |
| 106 | Control of Material                          |
| 107 | Legal Relations and Responsibility to Public |
| 108 | Prosecution and Progress                     |
| 109 | Acceptance, Measurement and Payment          |

### SECTION 200 EARTHWORK

|     |   |
|-----|---|
| 201 | Clearing and Grubbing   |
| 202 | Removal of Structures and obstructions                        |
| 203 | Roadway Excavation and Embankment                             |
| 207 | Temporary Water Pollution, Soil Erosion and Siltation Control |

### SECTION 300 BASES

|     |                               |
|-----|-------------------------------|
| 301 | Bituminous Aggregate Base     |
| 302 | Asphalt Concrete              |
| 303 | Waterbound Macadam Base       |
| 304 | Aggregate Base                |
| 305 | Portland Cement Concrete Base |
| 310 | Subbase                       |

### SECTION 400 FLEXIBLE PAVEMENT

|     |  |
|-----|--|
| 401 | Plant Mix Pavements – General          |
| 402 | Asphalt Concrete – Intermediate Course |
| 403 | Asphalt Concrete – Leveling Course     |
| 404 | Asphalt Concrete – Surface Course      |
| 405 | Bituminous Cold Mix                    |
| 406 | Bituminous Road Mix                    |
| 407 | Tack Coat                              |
| 408 | Prime Coat                             |
| 409 | Seal Coat                              |
| 410 | Traffic Compacted Surface              |
| 411 | Stabilized Crushed Aggregate           |
| 412 | Asphalt Concrete                       |

### SECTION 450 RIGID PAVEMENT

|     |  |
|-----|--|
| 451 | Reinforced Portland Cement Concrete Pavement |
| 452 | Plain Portland Cement Concrete Pavement      |
| 453 | Continuously Reinforced Concrete Pavement    |

454 Plain Portland Cement Concrete Pavement With Integral Curb  
499 Concrete – General

#### SECTION 500 STRUCTURES

501 Structures – General  
502 Temporary Bridge  
503 Excavation for Structures  
504 Sheet Piling Left in Place  
505 Test Pile  
506 Pile Test Load  
507 Bearing Piles  
508 Falsework and Forms  
509 Reinforcing Steel  
510 Dowell Holes  
511 Concrete for Structures  
512 Waterproofing  
513 Structural Steel  
514 Painting  
515 Prestressed Concrete Bridge Members  
516 Expansion and Contraction Joints, Joint Sealers and Bearing Devices  
517 Railings  
518 Drainage of Structures  
519 Patching Concrete Structures  
520 Pneumatically Placed Mortar  
521 Bridge Timber  
522 Sectional Corrugated Metal Arch Structures

#### SECTION 600 INCIDENTALS

601 Slope and Channel protection  
602 Masonry  
603 Pipe Culverts, Sewers and Drains  
604 Manholes, Catch Basins, and Inlets  
605 Underdrains  
606 Guard Rail  
607 Fence  
608 Walks and Steps  
609 Curbing  
610 Cellular Retaining Walls  
611 Approach Slabs  
612 Concrete Median and Traffic Island  
613 Traffic Dividers  
  
615 Temporary Roads and Pavements  
616 Dust Control  
617 Reconditioning Shoulders  
618 Guard Rail Painting

|     |                            |
|-----|----------------------------|
| 620 | Delineators                |
| 621 | Paint Marking              |
| 622 | Concrete Barrier           |
| 623 | Construction Layout Stakes |

|     |                      |
|-----|----------------------|
| 625 | Electrical Equipment |
|-----|----------------------|

|     |                     |
|-----|---------------------|
| 640 | Driveway Approaches |
|-----|---------------------|

#### SECTION 650 ROADSIDE

|     |                                     |
|-----|-------------------------------------|
| 651 | Topsoil Stockpiled                  |
| 652 | Placing Stockpiled Topsoil          |
| 653 | Topsoil Furnished and Placed        |
| 654 | Renovating Existing Soil            |
| 655 | Seeding and Renovating Existing Sod |
| 656 | Roadside Cleanup                    |
| 657 | Riprap for Tree Protection          |
| 658 | Tree Root Aeration                  |
| 659 | Seeding and Mulching                |
| 660 | Sodding                             |
| 661 | Planting Vines                      |
| 662 | Planting Shrubs                     |
| 663 | Planting Trees                      |
| 664 | Planting Salvaged Plants            |
| 665 | Large Trees Moved and Reset         |
| 666 | Pruning Existing Trees              |
| 667 | Seeding and Jute Matting            |
| 668 | Seeding and Excelsior Matting       |

#### TABLE OF CONTENTS

#### SECTION 700 MATERIAL DETAILS

|     |  |
|-----|--|
| 700 | Sampling Requirements                      |
| 701 | Hydraulic Cement                           |
| 702 | Bituminous Materials                       |
| 703 | Aggregate                                  |
| 704 | Masonry Units                              |
| 706 | Concrete and Clay Pipe                     |
| 707 | Steel Pipe                                 |
| 708 | Paint                                      |
| 709 | Reinforcing Steel                          |
| 710 | Fence and Guard Rail                       |
| 711 | Structural Steel and Structure Incidentals |

- 712 Miscellaneous
- 713 Lighting and Electrical Materials
- 720 Ductile Iron Pipe and Cast Iron Pipe
- 721 Reinforced Concrete Pressure Pipe
- 722 Asbestos Cement Pressure Pipe

#### SECTION 800 WATER PIPE AND ACCESSORIES

- 801 Water Pipe – General
- 802 Increased or Decreased Earth Excavation
- 803 Rock Excavation
- 804 Fittings
- 805 Valves and Valve Boxes for Water Mains
- 806 Stone Foundation
- 807 Sheeting and Bracing Left in Place
- 808 Tunnel
- 809 Tunnel – Jacked Liner
- 810 Concrete Encasement for Water Line
- 811 Compacted Backfill
- 812 Granular Backfill
- 813 Fire Hydrant Assembly
- 814 Special Assemblies and Structures
- 815 Water Services
- 816 Tapping Existing Water Mains
- 817 Repaving Provisions
- 818 Road Crossing with Casing
- 819 Road Crossing without Casing

#### SECTION 900 SEWERAGE WORK

- 901 Concrete, Clay, Asbestos Cement and A.B.S. Plastic Pipe Sewers Complete in Place
- 902 DELETED
- 903 Rock Excavation
- 904 Miscellaneous Concrete and Masonry Structures
- 905 Concrete
- 906 Stone Foundation
- 907 Sheeting and Bracing Left in Place
- 908 Tunnel
- 909 Tunnel – Jacked Liner
- 910 Concrete Encasement for Sewers
- 911 DELETED
- 912 Granular Backfill
- 913 Channel
- 914 Six-inch Diameter Piper Risers
- 915 Wye or Tee Branches, Curves, Lateral and Specials
- 916 Trench Topping
- 917 Repaving Provisions
- 918 Boring with Casing

|     |  |
|-----|--|
| 919 | Boring without Casing                            |
| 920 | Force Main                                       |
| 921 | Bends, Tees, and Special Fittings for Force Main |
| 922 | Special Assemblies for Force Main                |

## APPENDIX

NCPI Air Test Tables

## SECTION 100 – GENERAL CONDITIONS

### SECTION 101 – DEFINITIONS AND TERMS

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

101.01        Abbreviations. Wherever the following abbreviations are used in these specifications or on the plans, they are to be construed the same as the respective expressions represented:

|        |   |
|--------|---|
| AAN    | American Association of Nurserymen  |
| AASHTO | American Association of State Highway and Transportation Officials                |
| ACI    | American Concrete Institute   |
| AISC   | American Institute of Steel Construction  |
| AISI   | American Iron and Steel Institute   |
| ANSI   | American National Standards Institute   |
| AREA   | American Railway Engineering Association  |
| ASCE   | American Society of Civil Engineers   |
| ASME   | American Society of Mechanical Engineers  |
| ASTM   | American Society of Testing and Materials   |
| AWG    | American Wire Gauge   |
| AWS    | American Welding Society  |
| AWWA   | American Water Works Association  |
| CMS    | Construction and Material Specifications of the Ohio Department of Transportation |
| EEI    | Edison Electric Institute   |
| FHWA   | Federal Highway Administration, Department of Transportation                      |
| FSS    | Federal Specifications and Standards, General Services Administration             |
| IEEE   | Institute of Electrical and Electronic Engineers                                  |
| IES    | Illuminating Engineering Society  |
| IMSA   | International Municipal Signal Association  |
| IPCEA  | Insulated Power Cable Engineers Association                                       |
| ITE    | Institute of Transportation Engineers   |
| NEMA   | National Electrical Manufacturers Association                                     |
| ODOT   | Ohio Department of Transportation   |
| ORC    | Ohio Revised Code   |
| REA    | Rural Electrification Administration  |
| SSPC   | Steel Structures Painting Council   |
| UL     | Underwriters' Laboratories, Inc.  |

101.02        Advertisement. The public announcement, as required by law, inviting bids for work to be performed or materials and equipment to be furnished.

101.03        Award. The written acceptance by the Owner of a bid.

101.04        Bidder. Any individual, firm, partnership, or corporation submitting a Proposal for the advertised work, acting directly or through a duly authorized representative.

101.05 Bridge. A structure, including supports, erected over a depression or an obstruction, as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads and having a length measured along the center of roadway of more than 20 feet between undercopings on abutments or extreme limits of openings for multiple boxes.

Length. The length of a bridge structure is the overall length measured along the centerline of roadway on the surface of the roadway.

Roadway Width. The clear width measured at right angles to the longitudinal centerline of the bridge between the bottom of curbs or guard timbers or, in the case of multiple height of curbs, between the bottoms of the lower risers. For curb widths of one foot or less, the roadway width shall be measured between parapets or railings.

101.06 Calendar Day or Day. Every day shown on the calendar.

101.08 Changer Order. A written order issued by the Engineer to the Contractor, covering changes in the plans or quantities or both, within or beyond the scope of the contract and establishing the basis of payment and time adjustments for the work affected by the changes.

101.071 Completion Date. The date, as shown in the proposal, on which the work contemplated shall be completed.

101.073 Conduit. Any pipe or similar passageway for electricity, gas, water or other utility.

101.08 Contract. The written agreement between the Owner and the Contractor setting forth the obligations of the parties thereunder, including but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment.

The contract includes the invitation for bids, proposal, contract form and contract bond, specifications, supplemental specifications, special provisions, general and detailed plans, and notice to contractor, also any change orders and supplemental agreements that are required to complete the construction of the work in an acceptable manner, including authorized extensions of the completion date, all of which constitute one instrument.

101.09 Contract Bond. The approved form of security, executed by the Contractor and his surety or sureties, guaranteeing complete execution of the contract and all supplemental agreements pertaining thereto and the payment of all legal debts pertaining to the construction of the project.

101.10 Contract Item (Pay Item). A specifically described unit of work for which a price is provided in the contract.

101.14 Contractor. The individual, firm, partnership, or corporation contracting with the Owner for performance of prescribed work, acting directly or through a duly authorized representative.



101.15 City. City of Cuyahoga Falls, County of Summit, State of Ohio or its duly authorized agents.

101.16 Engineer. The City of Cuyahoga Falls Engineer, or the duly authorized agent.

101.17 Equipment. All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the work.

101.18 Extra Work. An item of work not provided for in the contract as awarded but found essential to the satisfactory completion of the contract within its intended scope.

101.19 Extra Work Contract. A contract concerning the performance of work or furnishing of materials involving extra work. Such extra work may be performed at agreed prices or on a force account basis.

101.20 Inspector. The Engineer's authorized representative assigned to make detailed inspections of contract performance.

101.21 Invitation for Bids. The invitation for proposals for all work or materials on which bids are required. Such proposal will indicate with reasonable accuracy the quantity and location of the work to be done or the character and quality of the material and/or equipment to be furnished and the time and place of the opening of proposals.

101.22 Laboratory. A reputable testing laboratory that is designated by or acceptable to the Owner for rendering testing and inspection services on a Contract where these specifications govern.

101.23 Materials. Any materials and/or equipment specified for use in the construction of the project and its appurtenances.

101.24 Owner. The City of Cuyahoga Falls, Ohio or its duly authorized agents.

101.241 Plans. The plans, profiles, typical cross-sections, work drawings and supplemental drawings, approved by the Engineer, or exact reproductions thereof, which show the location character dimensions and details of the work.

101.25 Profile Grade. The trace of a vertical plane intersecting the top of the curb or as indicated on plans. Profile grade means either elevation or gradient of such trace according to the context.

101.26 Project. The specific section of the work together with all appurtenances and construction to be performed thereon under the Contract.

101.27 Proposal. The offer of a bidder, on the prescribed form properly signed and guaranteed, to perform the work and to furnish the labor and materials at the prices quoted.

101.28        Proposal Form. The approved form on which the Owner requires bids to be prepared and submitted for the work.

101.29        Proposal Guaranty. The security furnished with a bid to guarantee that the bidder will enter into the contract if his bid accepted.

101.30        Questionnaire. The specified forms on which the Contractor shall furnish required information as to his ability to perform and finance the work required.

101.31        Right-of-way. A general term denoting land, property or interest therein, usually in a strip, acquired for or devoted to the project.

101.32        Road. A general term denoting a public way for purposes of vehicular travel, including the entire area with the right-of-way.

101.33        Roadbed. The graded portion of a highway within top and side slopes, prepared as a foundation for the pavement structure and shoulder.

101.34        Roadside. A general term denoting the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

101.35        Roadside Development. Those items necessary to the complete highway which provide for the preservation of landscape materials and features, the rehabilitation and protection against erosion of all areas disturbed by construction through seeding, sodding, mulching and the placing of other ground covers; such suitable planting and other improvements as may increase the effectiveness and enhance the appearance of the highway.

101.36        Roadway. The portion of a highway or street within limits of construction.

101.361       Sewer. Pipe or conduit intended for carrying storm drainage or sanitary drainage.

101.37        Shoulder. The portion of the roadway contiguous to the traveled way for accommodation of stopped vehicles, for emergency use, and for lateral support of base and surface courses.

101.38        Sidewalk. That portion of the roadway primarily constructed for the use of pedestrians.

101.39        Special Provisions. Additions and revisions to the standard and supplemental specifications covering conditions peculiar to an individual project.

101.40        Specifications. The directions, provisions and requirements contained herein as supplemented by the supplemental specifications and special provisions.

101.41        State. The State of Ohio acting through its authorized representative.

101.42 Street. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.

101.43 Structures. Bridges, culverts, catch basins, curb inlets, drop inlets, retaining walls, cribbing, manholes, endwalls, buildings, curbs, pavements, sewers, service pipes, underdrains, foundation drains and other features which may be encountered in the work and not otherwise classed herein.

101.44 Subcontractors. The individual, firm, partnership or corporation to whom the Contractor sublets part of the contract with the written approval of the Owner.

101.45 Subgrade. The surface upon which a project structure or work and appurtenances are to be constructed.

101.46 Substructure. All of that part of the structure below the bearing of simple and continuous spans, skewbacks of arches and tops of footings or rigid frames, together with backwalls and wings.

101.47 Superintendent. The Contractor's authorized representative in responsible charge of the work.

101.48 Superstructure. The entire structure except the substructure.

101.481 Supplemental Agreement. A written agreement executed by the Contractor and by the Owner covering necessary alterations to the prime contract.

101.49 Supplemental Specifications. Detailed specifications supplemental to or superseding these specifications.

101.50 Surety. The corporation, partnership or individual, other than the Contractor, executing a bond furnished by the Contractor.

101.51 Titles (or Headings). The titles or headings of the sections and subsections herein are intended for convenience of reference and shall not be considered as having any bearing on their interpretation.

101.52 Waterline. Conduit for carrying public water supply.

101.53 Work. The furnishing of all labor, materials, equipment, and other incidentals necessary or convenient to the successful completion of the project and the carrying out of all the duties and obligations imposed by the Contract and Supplemental Agreements thereto.

101.55 Working Drawings. Stress sheets, shop drawings, erection plans, false work plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data which the Contractor is required to submit for approval.

101.56 Interpretations. In order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever anything is, or is to be, done if, as, or when, or where “contemplated, required, determined, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, approval, approved, disapproved, acceptable, unacceptable, suitable, accepted, satisfactory, unsatisfactory, sufficient, insufficient, rejected, or condemned,” it shall be understood as if the expression were followed by “by the Engineer” or “to the Engineer.”

## SECTION 102 – BIDDING REQUIREMENTS AND CONDITIONS

|             |   |
|-------------|---|
| 102.02      | CONTENTS OF PROPOSAL FORMS                    |
| 102.03      | ISSUANCE OF PROPOSALS                         |
| 102.04      | INTERPRETATION OF QUANTITIES IN PROPOSAL      |
| 102.05      | EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL |
| PROVISIONS, |   |
|             | AND SITE OF WORK                              |
| 102.06      | PREPARATION OF PROPOSALS                      |
| 102.07      | IRREGULAR PROPOSALS                           |
| 102.08      | PROPOSAL GUARANTY                             |
| 102.09      | DELIVERY OF PROPOSALS                         |
| 102.10      | WITHDRAWAL OF PROPOSALS                       |
| 102.11      | COMBINATION OR CONDITIONAL PROPOSALS          |
| 102.12      | PUBLIC OPENING OF PROPOSALS                   |
| 102.13      | DISQUALIFICATION OF BIDDERS                   |
| 102.14      | MATERIAL GUARANTY                             |

102.02 Contents Of Proposal Forms. Upon request, the Owner will furnish the prospective bidder with a proposal form. This form will state the location and description of the contemplated construction and will show the approximate estimate of the various quantities and kinds of work to be performed or materials to be furnished, and will have a schedule of items for which unit bid prices are invited. The proposal form will state the date on which the work must be completed, the amount of the proposal guaranty, and the date, time and place of the opening of proposals. The form will also include any special provisions or requirements which vary from or are not contained in the plans and specifications.

The plans, specifications and other documents designed in the proposal form, will be considered a part of the proposal whether attached or not.

The prospective bidder will be required to pay the Owner the sum stated in the notice to contractors for each set of plans.

102.03 Issuance of Proposals. The Owner reserves the right to disqualify or refuse to consider a proposal if a bidder is in default for any of the following reasons:

- (a) Lack of competency and adequate machinery, plant and other equipment, as revealed by experience questionnaires required by the proposal.
- (b) Uncompleted work, which, in the judgment of the Engineer, might hinder or prevent the prompt completion of additional work if awarded.
- (c) Failure to comply with any qualification regulations of the Owner.
- (d) Default under previous contracts.

102.04 Interpretation of Quantities in Proposal. The quantities appearing in the proposal are approximate only and are prepared for the comparison of bids. Payment to the Contractor will be made only for the actual quantities of work performed and accepted or materials furnished and accepted in accordance with the Contract except for lump sum contracts, and except for lump sum items in unit price contracts. The scheduled quantities of work to be done and materials to be furnished may each be increased, decreased, or omitted as hereinafter provided.

102.05 Examination of Plans, Specifications, Special Provisions, and Site of Work. The bidder is expected to examine carefully the site of the proposed work, the proposal, plans, specifications, general conditions, special conditions, and contract forms, before submitting a proposal. The submission of a bid shall be considered evidence that the bidder has made such examination and is satisfied as to the conditions to be encountered in performing the work and as to the requirements of the plans, specifications, general conditions, special conditions and contract.

102.06 Preparation of Proposal. The bidder shall submit his proposal upon the forms furnished by the Owner. The bidder shall specify a unit price in figures for each pay item for which a quantity is given and shall also show the products of the respective unit prices and quantities written in figures in the column provided for that purpose and the total amount of the proposal obtained by adding the amounts of several items. The total unit price bid shall be written in words and figures in the columns provided. All the words and figures shall be in ink or typed.

When an item in the proposal contains a choice to be designated by the bidder, the bidder shall indicate his choice in accordance with the specifications for that particular item, and thereafter no further choice will be permitted.

The proposal shall include a properly executed non-collusion affidavit.

The bidder's proposal must be signed with ink by the individual, by one or more members of the partnership, by one or more members or officers of each firm representing a joint venture, or by one or more officers of a corporation, or by an agent of the Contractor legally qualified and acceptable to the Owner. If the proposal is made by an individual, his name and business address must be shown; by a partnership, the name and business address of each partnership member must be shown; as a joint venture, the name and business address of each member or officer of the firms represented by the joint venture must be shown; by a corporation, the name of the state under the laws of which the corporation is chartered and the name and title

of the officer or officers having authority under the bylaws to sign contracts, the name of the corporation and the business address of its corporate officials must be shown..

Anyone signing a proposal as agent must file with it legal evidence of his authority to do so.

Before a contract will be awarded to a foreign corporation or a person or partnership non-resident of the State of Ohio, a certificate from the Secretary of State will be required by the Owner that such corporation is authorized to do business in the State of Ohio or that such person or partnership has filed with the Secretary of state a power of attorney designating the Secretary of State of Ohio or that such person or partnership has filed with the Secretary of state a power of attorney designating the Secretary of State his or its agent for the purpose of accepting service of summons, in any action relating to the contract or brought under the provisions of the highway laws and under the provisions of the Workmen's Compensation Laws of this State.

102.07 Irregular Proposals. Proposals will be considered irregular and may be rejected for the following reasons:

- (a) If the proposal is on a form other than that furnished by the Owner; or if the form is altered or any thereof is detached.
- (b) If there are unauthorized additions, conditional or alternate bids, or irregularities of any kind which may tend to make the proposal incomplete, indefinite, or ambiguous as to its meaning.
- (c) If the bidder adds any provisions reserving the right to accept or reject an award, or to enter into a contract pursuant to an award. This does not exclude a bid limiting the maximum gross amount of awards acceptable to any one bidder at any one bid letting, provided that any selection of awards will be made by the Owner.
- (d) If the proposal does not contain a unit price, for each pay item listed except in the case of authorized alternate pay items or lump sum items.

102.08 Proposal Guaranty. No proposal will be considered unless accompanied by a bond or certified check drawn on a solvent bank made payable to The City of Cuyahoga Falls, Ohio in an amount not less than five percent of the Bidder's Proposal, conditioned upon execution of the contract and the furnishing of a performance and payment bond in the event the contract is awarded to the bidder.

102.09 Delivery of Proposals. The proposals for each project shall be placed, together with the proposal guaranty in a sealed envelope so marked as to indicate the identity of the project and the name and address of the bidder. If forwarded by mail, said envelope shall then be placed in another envelope, which shall be sealed and addressed as indicated in the proposal. Proposals will be received until the hour and date set for the opening thereof and must be in the hands of the official indicated by such time. Proposals received after the time for opening of bids will be returned to the bidder unopened.

102.10 Withdrawal of Proposals. A bidder may withdraw his proposal, provided the request in writing is in the hands of the official indicated in the proposal by the time set for opening proposals. When such proposal is reached it will be returned to the bidder unopened.

102.11            Combination or Conditional Proposals. If the Owner so elects, proposals may be issued for project in combination and/or separately, so that bids may be submitted either on the combination or on separate bids to the best advantage of the Owner. No combination bids, other than those specifically set upon the proposals by the Owner, will be considered. Separate contracts will be written for each individual project included in the combination.

102.12            Public Opening of Proposals. Proposals will be opened and read publicly at the time and place designated by the Owner, Bidders, their authorized agents, and other interested parties are invited to be present.

102.13            Disqualification of Bidders. Any of the following reasons may be considered as being sufficient for the disqualification of a bidder and the rejection of his proposal or proposals:

- (a)    More than one proposal for the same work from an individual, firm, or corporation under the same or different name.
- (b)    Evidence of collusion among bidders. Participants in such collusion will receive no recognition as bidders for any future work of the Owner until any such participant shall have been reinstated as a qualified bidder.
- (C)    Bid prices which obviously are unbalanced.

102.14            Material Guaranty. Before any contract is awarded, the bidder may be required to furnish a complete statement of the origin, composition, and manufacture of any or all materials to be used in construction of the work together with samples, which may be subjected to the tests provided for in these specifications to determine their quality and fitness for the work.

### SECTION 103 – AWARD AND EXECUTION OF CONTRACT

|        |                              |
|--------|------------------------------|
| 103.01 | CONSIDERATION OF PROPOSALS   |
| 103.02 | AWARD OF CONTRACT            |
| 103.04 | CANCELLATION OF AWARD        |
| 103.05 | REQUIREMENT OF CONTRACT BONG |
| 103.06 | EXECUTION OF CONTRACT        |
| 103.07 | FAILURE TO EXECUTE CONTRACT  |
| 103.08 | CONTRACTOR’S INSURANCE       |

103.01            Consideration of Proposals. After the proposals are opened and read, they will be compared on the basis of the summation of the products of the approximate quantities shown in the proposal by they unit bid prices. In the event of a discrepancy between until bid prices and extensions, the written unit price shall govern.

The right is reserved to reject any or all proposals, to waive technicalities or to advertise for new proposals, if in the judgment of the awarding authority the best interests of the Owner will be promoted thereby.

103.02 Award of Contract. The award of the contract, if it be awarded, will be made within 60 calendar days after the opening of proposals to the lowest or best bidder whose proposal complies with all necessary investigations are made as to the responsibility of the bidder to whom it is proposed to award the contract. The successful bidder will be notified, by letter to the address shown on his proposal, that his bid has been accepted and that he has been awarded the contract.

103.03 Cancellation of Award. The Owner reserves the right to rescind the award of any contract at any time before the execution of said contract by all parties without any liability against the Owner.

103.04 Return of Proposal Guaranty. All proposal guaranties, except those of the three lowest bidders, will be returned immediately following the opening and checking of the proposals. The retained proposal guaranties of the unsuccessful of the three lowest bidders will be returned within ten days following the award of contract.

103.05 Requirement of Contract Bonds. The successful bidder must within ten days after he has received notice of the award to him and before entering into contract, furnish a performance bond and a payment bond in the full amount of his proposal, which bond shall cover the entire contract including the guarantee period required under 109.09.

103.06 Execution of Contract. The contract shall be signed by the successful bidder and returned, together with the contract bond and other required contract documents, within ten days after the bidder has received notice that the contract has been awarded. No Proposal shall be considered binding upon the Owner until the execution of the contract. If the contract is not executed by the Owner with 20 days following receipt from the bidder of the required contract documents, the bidder will have the right to withdraw his bid without prejudice.

103.07 Failure to Execute Contract. Failure to execute the contract and file an acceptable bond shall be just cause for the cancellations of the award and the forfeiture of the proposal guaranty which shall become the property of the Owner not as a penalty, but in liquidation of damages sustained. Award may then be made to the next lowest responsible bidder, or the work may be readvertised as the Owner may decide.

103.08 Insurance Requirements. The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the City, nor shall the Contractor allow any subcontractor to commence work on his subcontract until the insurance required of the subcontractor has been so obtained and approved.

1. Compensation Insurance: The Contractor shall procure and shall maintain during the life of this contract Workmen's Compensation Insurance as required by the State of Ohio for all of his employees to be engaged in work at the site of the project under this contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case any class of employees engaged in hazardous



work on the project under this contract is not protected under the Workmen's Compensation Statute, the Contractor shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of his employees as are not otherwise protected.

2. Contractor's Comprehensive General Liability Insurance and Automobile Liability Insurance: The Contractor shall procure and shall maintain, during the life of the contract, (1) Comprehensive General Liability Insurance including all Premises/Operations; Products/Completed Operations: and Broad Form Property Damage and (2) Automobile Liability Insurance for all vehicles and equipment in the amount specified in subparagraph 6.

3. Subcontractor's Comprehensive General Liability Insurance and Automobile Liability Insurance: The Contractor shall either (1) require of his subcontractors to procure and to maintain during the life of his subcontract, Comprehensive General Liability Insurance and Automobile Liability Insurance of the type and in the amounts specified in subparagraph 2 and 6 hereof or, (2) insure the activities of his policy, specified in subparagraph 2 hereof.

4. Scope of Insurance and Special Hazards: The insurance required under subparagraphs 2 and 3 hereof shall provide adequate protection for the Contractor and his Subcontractors, respectively, against claims which may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him and, also against any of the special hazards which may be encountered in the performance of this contract as enumerated in the SPECIAL PROVISIONS.

5. Builder's Risk Insurance (Fire and Extended Coverage): (Building Construction Only) Until the project is completed and accepted by the City, the Contractor is required to maintain Builder's Risk Insurance (fire and extended cover) on a 100 percent completed value basis on the insurable portion of the project for the benefit of the City, the Contractor, Subcontractors as their interests may appear. The Contractor shall not include any costs for Builder's Risk Insurance (fire and extended coverage) premiums during construction unless the Contractor is required to provide such insurance; however, this provision shall not release the Contractor from his obligation to complete, according to plans and specifications, the project covered by the contract, and the Contractor and his Surety shall be obligated to full performance of the Contractor's undertaking.

6. Proof of Carriage of Insurance: The Contractor shall furnish the City with certificates showing the type, amount, class of operations covered, effective dates and date of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be cancelled or materially altered, except after ten (10) days' written notice has been received the City."

The minimum amount of such insurance including underlying and umbrella excess shall be as follow:

BODILY INJURY AND PROPERTY DAMAGE LIABILITY COMBINED SINGLE LIMIT

Each Occurrence \$2,000,000.00

SECTION 104 – GENERAL WORK REQUIREMENTS

- 104.01 INTENT OF CONTRACT
- 104.02 ALTERNATION OF PLANS OR CHARACTER OR WORK
- 104.03 EXTRA WORK
- 104.04 MAINTENANCE OF TRAFFIC AND ACCESSIBILITY TO UTILITIES
- 104.05 RIGHTS IN AND USE OF MATERIALS FOUND ON THE WORK
- 104.06 FINAL CLEANING UP

104.01 Intent of Contract. The intent of the Contract is to provide for the construction and completion in every detail of the work described. The contractor shall perform all items of work covered and stipulated in the proposal and perform altered and extra work, furnish all labor, materials, equipment, tools, transportation and supplies required to complete the work in accordance with the plans, specifications and terms of the contract. Should any misunderstanding arise as to the intent or meaning of the plans, specifications, special provisions or proposal, or any discrepancy appear, the decision of the Engineer shall be final and conclusive.

104.02 Alternation of Plans or Character of the Work. The Engineer reserves the right to make, at any time during the progress of the work, such increases or decreases in quantities and such alternations in the details of construction, including alterations in the grade or alignment of the road or structure or both, as may be found to be necessary or desirable. Such increases or decreases and alterations shall not invalidate the contract nor release the Surety, and the Contractor agrees to perform the work as altered, the same as if it had been a part of the original contract.

104.03 Extra Work. The Contractor shall perform unforeseen work, for which there is no price included in the contract, whenever it is deemed necessary or desirable in order to complete fully the work as contemplated. Such work shall be performed in accordance with the specifications and as directed. Payment shall be as provided under item 109.04.

104.04 Maintenance of Traffic and Accessibility to Utilities. The Contractor shall at all times provide and maintain access to fire hydrants, water valves, gas valves, manholes and other similar appurtenances.

When so stated on the plans or in the Proposal, public traffic shall be maintained during construction. This may be traffic through the project or it may be only cross traffic at intersections. Maintenance of traffic may be required only at certain stages of construction or at all times, if so noted.

At locations on the work where sewer construction only is called for and a part of the existing pavement will remain in place, traffic will be maintained and ingress and egress to all public and private entrances shall be provided.

In the event of the closure of any street, alley or private drive, the Contractor shall notify the occupants of all premises affected by such closure at least 24 hours in advance of closure.

Whenever the Contractor, for any reason, ceases operations on this contract for a period of 15 or more calendar days, the Contractor, if so directed by the Engineer, shall construct a temporary roadway to provide access to the premises affected by his operations. The temporary roadway shall be constructed of cinders, gravel, crushed stone or other acceptable materials and of suitable width and thickness to carry anticipated vehicles as directed by the Engineer. The temporary road shall be maintained by the Contractor in serviceable condition until such time that the contract work is resumed.

Failure of the Contractor to perform the operations stated in this section, when directed by the Engineer, will be the authority of the Owner to perform the work and deduct the cost of the same from the final estimate.

Temporary traffic facilities shall be furnished, maintained, and paid for in accordance with the provisions of Ohio, Maintaining Traffic, or indicated in the Proposal. The provisions of these items and this section shall not in any way relieve the Contractor of any of his legal responsibilities or liabilities for the safety of the public. The attention of the bidder is directed to the provisions of item 107.07 of these specifications.

104.05 Rights in and Use of Materials Found on the Work. The Contractor, with the approval of the Engineer, may use on the project such stone, gravel, sand, or other material determined suitable by the Engineer as may be found in the excavation and will be paid for the excavation of such materials at the corresponding contract unit price and for the pay item for which the excavated material is used. He shall replace at his own expense with other acceptable material all of that portion of the excavation material so removed and used which was needed for us in the embankments, backfills, approaches, or otherwise. No charge for the materials so used will be made against the Contractor. The Contractor shall not excavate or remove any material from within the highway location which is not within the grading limits, as indicated by the slope an grade lines, without written authorization from the Engineer.

Unless otherwise provided, the material from any existing old structure may be used temporarily by the Contractor in the erection of the new structure. Such material shall not be cut or otherwise damaged except with the approval of the Engineer.

104.06 Final Cleaning Up. Before final acceptance, the highway, including stream channels and banks within the right-of-way at drainage structures, and all borrow and waste areas, storage sites, temporary plant sites, haul roads and other ground occupied by the Contractor in connection with the work shall be cleaned of all rubbish, excess materials, temporary structures, and equipment. These areas shall have suitable vegetative cover established by seeding and mulching in accordance with 659 and all parts of the work shall be left in an acceptable condition. The cost of final cleanup shall be incidental to other items and no separate payment shall be made, however, ten percent of the payment for the mobilization item, if included, will be withheld until performance under this section is complete. See 624.06

## SECTION 105 – CONTROL OF WORK

|         |   |
|---------|---|
| 105.01  | AUTHORITY OF THE ENGINEER   |
| 105.02  | PLANS AND WORKING DRAWINGS  |
| 105.03  | CONFORMITY WITH PLANS AND SPECIFICATIONS  |
| 105.04  | COORDINATION OF PLANS, SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS |
| 105.05  | COOPERATION BY CONTRACTOR   |
| 105.051 | NIGHT WORK  |
| 105.052 | WORK ON SUNDAYS   |
| 105.06  | COOPERATION WITH UTILITIES  |
| 105.07  | COOPERATION BETWEEN CONTRACTORS   |
| 105.08  | CONSTRUCTION STAKES, LINES AND GRADES   |
| 105.09  | AUTHORITY AND DUTIES OF PROJECT ENGINEER  |
| 105.10  | AUTHORITY AND DUTIES OF THE INSPECTOR   |
| 105.11  | INSPECTION OF WORK  |
| 105.12  | REMOVAL OF UNACCEPTABLE AND UNAUTHORIZED WORK   |
| 105.13  | LOAD RESTRICTIONS   |
| 105.14  | MAINTENANCE DURING CONSTRUCTION   |
| 105.15  | FAILURE TO MAINTAIN ROADWAY OR STRUCTURES   |
| 105.151 | BORROW AREAS  |
| 105.16  | ACCEPTANCE  |
| 105.17  | CLAIMS FOR ADJUSTMENT AND DISPUTES  |

105.01 Authority of the Engineer. The Engineer will decide all questions which may arise as to the quality and acceptability of materials furnished and work performed and as to the rate of progress of the work; all questions which may arise as to the interpretation of the plans and specifications; all questions as to the acceptable fulfillment of the contract on the part of the Contractor, and as to compensation.

105.02 Plans and Working Drawings. Plans will show location and design details of all structures, lines, grades, and typical cross sections of roadways, conduits and all other items appearing on the proposal. The Contractor shall keep one set of plans available on the work site at all times.

It is mutually agreed that all authorized alterations affecting the requirements and information given on the approved plans shall be in writing. No changes shall be made in any plan or drawing after the same has been approved by the Engineer, except by direction of the Engineer.

The Contractor shall be responsible for the furnishing of copies of plans, specifications and special provisions, or the necessary portions thereof, to subcontractors and parties furnishing labor, materials and equipment for a project.

The plans will be supplemented by such working drawings as are necessary to adequately control the work. Working drawing for structures shall be furnished by the Contractor and shall consist of such detailed plans as may be required to adequately control the work and are not included in the plans furnished by the Department. They shall include sheets, shop drawings,

erection plans, false work plans, cofferdam plans, bending diagrams for reinforcing steel or any other supplementary plans or similar data required of the Contractor. All working drawings must be approved by the Engineer and such approval shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work.

Where work consists of repairs or extension or alteration of existing structures, the Contractor shall make such measurements of original construction as may be required to accurately join old and new work. Any measurements which may appear upon the plans to indicate the extent and nature of such repair or extension shall not relieve the Contractor of this responsibility.

The contract price will include the cost of furnishing all working drawings.

105.03 Conformity with Plans and Specifications. All work performed and all materials furnished shall be in reasonably close conformity with the lines, grades, cross sections, dimensions and material requirements, including tolerances, shown on the plans or indicated in the specifications.

In the event the Engineer finds the materials or the finished product in which the materials are used not within reasonably close conformity with the plans and specifications but that reasonably acceptable work has been produced, he shall then make a determination if the work shall be accepted and remain in place. In this event, the Engineer will document the basis of acceptance by contract modifications, which will provide for an appropriate adjustment in the contract price for such work or materials, as he deems necessary to conform to his determination based on engineering judgment.

In the event the Engineer finds the materials of the finished product in which the materials are used or the work performed are not in reasonably close conformity with the plans and specifications and have resulted in an inferior or unsatisfactory product, the work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.

105.04 Coordination of Plans, Specifications, Supplemental Specifications and Special Conditions. These specifications, the supplemental specifications, the plans, special conditions, and all supplementary documents are essential parts of the Contract, and a requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, figured dimensions will govern over scaled dimensions; specifications will govern over plans; supplemental specifications and proposals will govern over both specifications and plans.

The Contractor shall take no advantage of any apparent error or omission in the plans or specifications. In the event the Contractor discovers such an error or omission, he shall immediately notify the Engineer. Work done by the Contractor after his discovery of such omission or errors in the plans and specifications shall be at his own risk. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the plans and specifications.

105.05 Cooperation by Contractor. The Contractor will be supplied with adequate copies of the job specifications and approved plans and contract assemblies including special provisions, one set of which the Contractor shall keep available on the work site at all times.

The Contractor shall give the work the constant attention necessary to facilitate the progress thereof, and shall cooperate with the Engineer, his inspectors and other contractors in every way possible.

The Contractor shall have on the work at all times, as his agent, a competent superintendent capable of reading and thoroughly understanding the plans and specifications and thoroughly experienced in the type of work being performed, who shall receive instructions from the Engineer or his authorized representatives. The Superintendent shall have full authority to execute orders or directions of the Engineer without delay and to promptly supply such materials, equipment, tools, labor and incidentals as may be required. Such superintendence shall be furnished irrespective of the amount of work sublet. The Superintendent shall be in charge of all construction regardless of who performs the work.

105.051 Night Work. All work on this contract, unless otherwise stated on the plans, will be limited to the daylight hours except in cases of emergency and then may be performed only if permission is obtained from the Engineer and adequate lighting facilities are used.

105.052 Work on Sundays. No work will be permitted on Sundays and Holidays except to save property or life, or in case of extraordinary emergency and then only as authorized or directed by the Engineer.

105.06 Cooperation with Utilities. The Owner will notify all utility companies, all pipe line owners or other parties affected and endeavor to have all necessary adjustments of the public or private utility fixtures, pipe lines and other appurtenances within or adjacent to the limits of construction so as not to interfere with the progress of the work.

Existing surface or overhead structures or utility lines are not necessarily shown on the drawings and those shown are only approximately correct. The Contractor shall make such investigations as are necessary to determine the extent to which existing surface or overhead structures may interfere with the prosecution of the work contemplated under this Contract.

Existing sub-surface structures or utility lines including sewer service connections but excluding all other service connections which may be encountered during the construction of the work embraced under this Contract, or are located in such close proximity to the work to be done under this Contract as to require special precautions and methods for their protection, such as sewers, drains, sewage force mains, water mains, gas mains, telephone and electric conduits. Together with appurtenances, are shown in plan on the drawings, insofar as there is public record of their existence.

The sizes, locations and depths shown are, however only approximately correct and the Contractor shall make such investigations or explorations as may be necessary to verify the accuracy of the information given. Furthermore, it is recognized that the exact locations of water

mains are unknown, hence the Contract shall, if so ordered, uncover and locate these mains ahead of the excavation for the work required by these specifications.

In order to avoid damages to private or public sub-surface utility lines and services, as a result of excavating operations, the Contractor shall give advance notice (minimum of 48), of each line or service crossing to the particular company concerned.

Water lines, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cable ways, signals, and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted are to be moved by the owners at their expense, except as otherwise provided for in the special provisions or as noted on the plans.

It is understood and agreed that the Contractor has considered in his bid all of the known permanent and temporary utility appurtenances in their present or relocated positions and that no additional compensation will be allowed for any delays, inconvenience or damage sustained by him due to any interference from the known said utility appurtenance or the operation of moving them.

If through now fault of the Contractor, the progress of his work is delayed for an unreasonable length of time from that proposed in his progress schedule required by 108.03, because of failure of a utility company to relocate or adjust its lines, the Contractor shall immediately file with the Engineer a detailed statement describing the nature of the delay and its effect upon his work progress.

105.07 Cooperation Between Contractors. The Owner reserves the right at any time to contract for and perform other or additional work on or near the work covered by the Contract.

When separate contracts are let within the limits of any one project, each contractor shall conduct his work so as not to interfere with or hinder the progress or completion of the work being performed by other contractors. Contractors working on the same project shall cooperate with each other as directed.

Each contractor involved shall assume all liability, financial or otherwise, in connection with his contract and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delay, or loss experienced by him because of the presence and operations of other contractors working within the limits of the same project.

The Contractor shall arrange his work and shall place and dispose of the materials being used so as not to interfere with the operations of the other contractors within the limits of the same project. He shall join his work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

105.08 Construction Stakes, Lines and Grades. When the proposal does not contain a lump sum of 623 Construction Layout Stakes, the Engineer will set construction stakes establishing lines, slopes, and continuous profile-grade in road work, and centerline and bench marks for bridge work, culvert work, protective and accessory structures and appurtenances as he

may deem necessary, and will furnish the Contractor with all necessary information relating to lines, slopes and grades. These stakes and marks shall constitute the field control by and in accordance with which the Contractor shall establish other necessary controls and perform the work.

The Contractor shall be held responsible for the preservation of all stakes and marks, and if any of the construction stakes or marks have been carelessly or willfully destroyed or disturbed by the Contractor, the cost of replacing them will be charged against him and will be deducted from the payment for the work.

The Owner will be responsible for the accuracy of lines, slopes, grades, and other engineering work, which is set forth under this section.

When the proposal contains a lump sum for 623 Construction Layout Stakes, the Engineer will locate and reference the centerline of the project outside the construction limits and establish benchmarks, and the Contractor shall furnish and place construction layout stakes for the project, all in accordance with the provisions of 623.

105.09 Authority and Duties of Project Engineer. The Project Engineer has immediate charge of the engineering details of each construction project. He is responsible for the administration and satisfactory completion of the project. The project engineer has the authority to reject defective material and to suspend any work that is being improperly performed.

The Project Engineer will have the authority to suspend the work wholly or in part due to the failure of the Contractor to correct conditions unsafe for the workmen or the general public; for failure to carry out provisions of the contract, for failure to carry out orders; for such periods as he may deem necessary due to unsuitable weather. The suspension of the work for the above reasons does not relieve the Contractor of his responsibility according to 107.16.

105.10 Authority and Duties of the Inspector. Inspectors employed by the Owner will be authorized to inspect all work done and materials furnished. Such inspection may extend to all or any part of the work and to preparation, fabrication or manufacture of the materials to be used. The Inspector is not authorized to alter or waive the provisions of the contract. He is authorized to call the attention of the Contractor to any failure of the work or materials to conform to the specifications and contract. He is authorized to reject materials which do not meet specification requirements or suspend the portion of the work involved until any question at issue can be referred to and decided by the Engineer. The Inspector is not authorized to instructions contrary to the plans and specifications, or to act for the Contractor.

105.11 Inspection of Work. All materials and each part or detail of the work shall be subject to inspection by the Engineer. The Engineer or his representative shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the Engineer requests it, the Contractor at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications.



Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering or removing and the replacing of the covering or making good of the parts removed, will be at the Contractor's expense.

Any work done or materials used without supervision or inspection by an authorized Owner's representative may be ordered removed and replaced at the Contractor's expense. Failure to reject any defective work or material shall not in any way prevent later rejection when such defects be discovered, or obligate the Owner to final acceptance.

When any unit of government or political subdivision or any corporation is to pay a portion of the cost of the work covered by the contract, its respective representatives shall have the right to inspect the work. Such inspection shall in no sense make any unit of government or political subdivision or any corporation a part of his contract, and shall in no way interfere with the rights of either party hereunder.

105.12 Removal of Unacceptable and Unauthorized Work. All work which does not conform to the requirements of the contract will be considered unacceptable unless otherwise determined acceptable under the provisions in 105.03.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause found to exist prior to final acceptance of the work, shall be removed immediately and replaced in an acceptable manner.

Work done contrary to the instructions of the Engineer, work done beyond the lines as shown on the plans, or as given, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the Engineer under the provisions of this section, the Engineer will have authority to cause unacceptable work to be remedied or removed and replaced and unauthorized work to be removed and to deduct the costs from any monies due or to become due the Contractor.

105.13 Load Restrictions. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads. A special permit will not relieve the Contractor of liability for damage which may result from the moving of equipment or materials.

The operation of equipment of such weight or so loaded as to cause damage to structure or the roadway or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course of a roadway under construction shall be limited as directed by the Engineer. No loads will be permitted on a concrete pavement, base or structure before the expiration of the curing period. In no case shall legal load limits be exceeded unless permitted in writing. The Contractor shall be responsible for all damage done by his equipment.

105.14 Maintenance During Construction. The Contractor shall maintain the work during construction and until the project is accepted. This maintenance shall constitute

continuous and effective work prosecuted day by day, with adequate equipment and forces to the end that the roadway, conduits or structures are kept in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a roadway subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All cost of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various pay items and the Contractor will not be paid an additional amount for such work.

105.15 Failure to Maintain Roadway or Structures. If the Contractor, at any time, fails to comply with the provisions of 105.14, the Engineer will immediately notify the Contractor of such noncompliance. If the Contractor fails to remedy unsatisfactory maintenance within 24 hours after receipt of such notice, the Engineer may immediately proceed to maintain the project and the entire cost of this maintenance will be deducted from monies due or to become due the Contractor on his contract.

105.151 Borrow and Waste Areas. The terms borrow area and waste area as used in this section refer to locations outside the project area from which natural materials are removed for use in the work or upon which materials from the work are to be deposited as waste.

Before any borrow or waste disposal operations are begun, the Contractor shall submit his plan for operation, control of drainage water, cleanup, shaping and restoration of disturbed areas and obtain the Engineer's written approval. The plan for operation shall include the saving of topsoil, and proposed measures to keep sediment and other contaminants from entering streams, lakes and reservoirs by the use of methods such as diversion channels, dikes, sediment traps, and vegetative covers. When it becomes necessary to locate such areas in or near streams, special precautions shall be taken.

The stability of borrow and waste areas and any damage to surrounding property resulting from movement of the areas shall be the sole responsibility of the Contractor.

Restoration of all borrow or waste areas shall include cleanup, shaping, replacement of topsoil and establishment of vegetative cover by seeding and mulching in accordance with the requirements of 659 at no additional cost to the Owner. The restored area shall be well drained unless approval is given to convert a pit area into a pond or lake, in which case restoration measures shall be confined to the disturbed areas above the anticipated normal water level.

The cost of work described herein necessary to secure these results shall be included in the contract price bid for the items to which they apply.

105.16 Acceptance. Acceptance shall be provided in 109.07.

105.17 Claims for Adjustment and Disputes. If, in any case, the Contractor deems that additional compensation is due him for work or material not clearly covered in contract or not ordered by the Engineer as extra work, as defined herein, the Contractor shall notify the Engineer in writing of his intention to make claim for such additional compensation

before he begins the work on which he bases his claim. If such notification is not given, and the Engineer is not afforded proper facilities by the Contractor for keeping strict account of actual costs as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor, and the fact that the Engineer has kept account of the cost as aforesaid, shall not in any way be construed as proving or substantiating the validity of the claim. If the claim, after consideration by the Engineer, is found to be just, it will be paid as extra work as provide for herein. Nothing in this subsection shall be construed as establishing any claim contrary to the terms of 104.02.

## SECTION 106 – CONTROL OF MATERIAL

|        |   |
|--------|---|
| 106.01 | SOURCE OF SUPPLY AND QUALITY REQUIREMENTS |
| 106.03 | SAMPLES, TESTS, CITED SPECIFICATIONS      |
| 106.04 | PLANT INSPECTION                          |
| 106.06 | STORAGE MATERIALS                         |
| 106.07 | HANDLING MATERIALS                        |
| 106.08 | UNACCEPTABLE MATERIALS                    |
| 106.09 | OWNER – FURNISHED MATERIAL                |

106.01 Source of Supply and Quality Requirements. The materials used on the work shall meet all requirements of the contract. In order to expedite the inspection and testing of materials, the Contractor shall notify the Engineer of his proposed sources of materials prior to delivery. At the option of the Engineer, materials may be approved at the source of supply before delivery is started. If it is found after trial that sources of supply for previously approved materials do not produce specified products the Contractor shall furnish materials from other sources which shall, in turn, be subject to controls set forth herein.

106.03 Samples, Tests, Cited Specifications. All materials will be inspected, tested and compliance determined by the Engineer before incorporation in the work. Unless otherwise designated, tests in accordance with AASHTO, ASTM or methods on file in the office of the Engineer will be made by and at the expense of the Owner. Samples will be taken by qualified representative of the Engineer.

References included in these specifications to AASHTO, ASTM or Federal Specifications shall be the test method, sampling method or specification amended to the latest edition of the O.D.O.T. Construction and Material Specifications.

All materials being used are subject to inspection, test or rejection, test or rejection at any time prior to incorporation into the work. Copies of all tests will be furnished to the Contractor's representative. The contractor, in all cases, shall furnish the required samples without charge.

If, in the judgment of the Engineer, the quantity used of any one material is so inconsequentially small as to not warrant testing in accordance with the minimum requirements for sampling materials 700, verification of the quality of the material may be covered by a Field Inspection Report of Materials, prepared by the Engineer.

106.04 Plant Inspection. The Engineer may undertake the inspection of materials at the source.

In the event plant inspection sampling and testing is undertaken the following conditions shall be met:

- (a) The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.
- (b) The Engineer shall have full entry at all times to such parts of the plant as may concern the manufacture or production of the materials being furnished.
- (c) If required by the Engineer, the Contractor shall arrange for a n approved building for the use of the inspector; such building for the use of the inspector to be located conveniently near the plant, independent of any building used by the material producer.
- (d) Adequate safety measures shall be provided and maintained.

It is understood that the Owner reserves the right to retest all materials prior to incorporation into the work which have been tested and accepted at the source of supply after the same have been delivered and to reject all materials which, when retested, do not meet the requirements of these specifications, or those established for the specific project.

106.06 Storage of Materials. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the right-of-way may be used for storage purposes and for the placing of the Contractor's plant and equipment, but any additional space required therefore must be provided by the Contractor at his expense. Private property shall not be used for storage purposes without written permission of the owner or lessee, and if requested by the Engineer copies of such written permission shall be furnished him. All storage sites shall be restored to their original condition by the contractor at his expense. This shall not apply to the stripping and storing of topsoil, or to other materials salvaged from the work.

106.07 Handling Materials. All materials shall be handled in such manner as to preserve their quality and fitness for the work. Aggregates shall be transported from the storage site to the work in tight vehicles so constructed as to prevent loss or segregation of materials after loading and measuring in order that there may be no inconsistencies in the quantities of materials intended for incorporation in the work as loaded, and the quantities as actually received at the place of operations.

106.08 Unacceptable Materials. All materials not conforming to the requirements of the specifications at the time they are used shall be considered unacceptable and shall be removed immediately from the site of the work unless otherwise instructed by the Engineer. No materials, the defects of which have been corrected, shall be used until approval has been given. Upon failure on the part of the Contractor to comply immediately with any order of the Engineer made under the provisions of this section, the Engineer shall have authority to remove and replace defective materials and to deduct the cost of removal and replacement from any monies due or to become due to the Contractor.

106.09            Owner-Furnished Material. The Contractor shall furnish all materials required to complete the work, except when otherwise provided in the proposal.

Materials furnished by the Owner will be delivered or made available to the Contractor at the points specified in the special conditions.

The cost of handling and placing all materials after they are delivered to the Contractor shall be considered as included in the contract price for the item in connection with which they are used.

The Contractor will be held responsible for all material delivered to him, and deductions will be made from any monies due him to make good any shortages and deficiencies, from any cause whatsoever, and for any damage which may occur after such delivery, and for any demurrage charges.

SECTION 107 – LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

- 107.01            LAWS TO BE OBSERVED
- 107.02            PERMITS, LICENSES AND TAXES
- 107.03            PATENTED DEVICES, MATERIALS AND PROCESSES
- 107.04            RESTORATION OF SURFACES OPENED BY PERMIT
- 107.05            FEDERAL AID PROVISIONS
- 107.06            SANITARY PROVISIONS
- 107.07            PUBLIC CONVENIENCE AND SAFETY
- 107.10            BARRICADES AND WARNING SIGNS
- 107.11            USE OF EXPLOSIVES
- 107.12            PROTECTION AND RESTORATION OF PROPERTY
- 107.14            RESPONSIBILITY FOR DAMAGE CLAIMS
- 107.16            CONTRACTOR’S RESPONSIBILITY FOR WORK
- 107.17            CONTRACTOR’S RESPONSIBILITY FOR UTILITY PROPERTY  
                         AND SERVICES
- 107.18            FURNISHING RIGHT-OF-WAY
- 107.19            PERSONAL LIABILITY OF PUBLIC OFFICIALS
- 107.20            NO WAIVER OF LEGAL RIGHTS

107.01            Laws to be Observed. The Contractor shall keep fully informed of all Federal, State, and Local laws, ordinances, and regulations and all orders and decrees of authorities having any jurisdiction or authority, which in any manner affect those engaged or employed on 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 Owner 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 employees.

The Contractor agrees that in the hiring of employees for the performance of work under this contract or any subcontract hereunder, no Contractor or Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall, by reason of race, creed or color,

discriminate against any citizen of the United States in the employment of labor or workers, who is qualified and available to perform the work to which the employment relates.

That no Contractor, Subcontractor, no any personal on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed or color.

107.02 Permits, Licenses and Taxes. The Contractor shall procure all permits and licenses, pay all charges, fees and taxes, and give all notices necessary and incidental to the due and lawful prosecution of the work.

A permit for drawing water from fire hydrants must be secured from the Superintendent of the Water Department.

107.03 Patented Devices, Materials and Processes. If the contractor employs any design, device, material, or process covered by letters of patent or copy right, he shall provide for such use by suitable legal agreement with the patentee or owner. The Contractor and the Surety shall indemnify and save harmless the Owner any affected third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of any infringement, at any time during the prosecution or after the completion of the work.

It is intended that the Bidder in addition thereto, bid on one or more patented or unpatented devices, materials, and processes as alternates when provided in the Proposal which may be bid upon and furnished by the Bidder in lieu of the patented devices, materials and processes specified in the Proposal.

107.04 Restoration of Surfaces Opened by Permit. The right to construct or reconstruct any utility service in the highway or street or to grant permits for same, at any time, is hereby expressly reserved by the Owner and the Contractor shall not be entitled to any damages either for the digging up of the street or for any delay occasioned thereby.

Any individual, firm, or corporation wishing to make an opening in the highway must secure a permit. The Contractor shall allow parties bearing such permits, and only those parties, to make openings in the highway. When ordered by the Engineer, the Contractor shall make in an acceptable manner all necessary repairs due to such openings and such necessary work will be paid for as extra work, or as provided in these specifications, and will be subject to the same conditions as original work performed.

107.05 Federal Aid Provisions. When the United States Government pays all or any portion of the cost of a project, the Federal laws and the rules regulations made pursuant to such laws must be observed by the Contractor and the work shall be subject to the inspection of the appropriate Federal Agency.

Such inspection shall in no sense make the Federal Government a party to this contract and will in no way interfere with the rights of either party hereunder.

107.06 Sanitary Provisions. The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of his employees and Owner Representatives as may be necessary to comply with the requirements of the State and Local Boards of Health, or other authorities having jurisdiction.

107.07 Public Convenience and Safety. The Contractor shall at all times so conduct his work as to assure the least possible obstruction to traffic. The safety and convenience of the general public and the residents along the street and the protection of persons and property shall be provided for by the Contractor as specified under subsection 104.04.

The Contractor shall provide and maintain safeguards, safety devices and protective equipment and take any other needed actions as may be necessary to protect the public and property in connection with the work.

The presence of barricades or lights, provided and maintained by any party other than the Contractor, shall not relieve the Contractor of this responsibility.

The Contractor should notify the Owner in writing a minimum of two (2) days in advance of the date he proposes to close any portion of a Street.

107.10 Barricades and Warning Signs. Temporary traffic control devices and facilities shall be furnished, erected, maintained and paid for in accordance with the provision of O.D.O.T. Item 614, Maintaining Traffic. All traffic control devices shall conform to Part VII of the Ohio Manual as required under Section 4511.09 O.R.C. The provisions of this section shall not in any way relieve the Contractor of any of his legal responsibilities or liabilities for safety of the public.

107.11 Use of Explosives. When necessary, for the prosecution of the work to be done under this contract, to resort to blasting with explosives, the Contractor shall use the highest degree of care and adequate protective measures so as not to endanger life, completed portions of the Contract project, and all other property, both public and private. Before conducting any blasting operations, the Contractor shall furnish the Engineer in writing, a schedule of intended blasting operations and he shall give the Engineer prior written notification of any changes in such schedule.

The use, handling, storage and transportation of explosives shall conform and be in accordance with the applicable requirements and/or provisions: (a) of the latest revision of "Bulletin No. 202, Specific Safety Requirements Relating to Building and Construction Work", issued by Department of Industrial Relations and the Industrial Commission of The State of Ohio; (b) of the Ohio Explosive Laws, Section 3743.01 – 3743.26 of the Ohio Revised Code and amendments thereto; (c) of local regulations, and (d) as specified herein.

All blasting operations shall be covered by public liability and property damage insurance as elsewhere specified herein. Except in the case of continuous tunnel operations, all blasting shall be conducted during daylight only with the provision that, when required by the Engineer, blasting shall be limited to certain daylight hours.

All firing shall be done by electrical means only. The Contractor shall make suitable provisions to prevent the scattering of broken rock, earth, stones, or other material during blasting operations.

The Contractor shall notify the Engineer, in writing, 48 hours in advance of any blasting.

107.12 Protection and Restoration of Property. The Contractor shall be responsible for the preservation of all public and private property.

The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the work, or any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

Dust, mud, noise or other nuisance originating from any operations either inside or outside the right-of-way shall be controlled by the Contractor in accordance with local ordinances regulations and/or as directed by the Engineer at the sole expense of the Contractor.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his own expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, rebuilding or otherwise restoring as may be directed by the Engineer, or he shall make good such damage or injury in acceptable manner to the owner of the property.

The Contractor shall cooperate with the Engineer in protecting and preserving cornerstones and monuments that may be within the right-of-way. The Contractor shall not start grading or resurfacing operations until the Engineer has referenced all known cornerstones, monuments, and land markers in the area to be improved. Monuments, cornerstones, and land markers unexpectedly encountered shall be protected, referenced and preserved in the same manner.

When cornerstones, monuments and land markers are encountered in the performance of the work and monument covers are not listed in the proposal, the Owner will furnish them and supervise their precise location and installation, and the Contractor will furnish all the labor, tools and other materials required incidental to such installations. Any labor, tools and materials so furnished shall be paid for as extra work.

The cost to the Owner for repair, redetermination of location and replacement of any cornerstone, monument or land marker within the project, damaged, destroyed, or made inaccessible during the progress of the work by the Contractor or his employees, in violation of these provisions, is a charge deductible from any estimate payable on account of the work.

107.14 Responsibility for Damage Claims. The Contractor and Surety shall save harmless the owner and all of its representatives from all suites, actions, or claims or any character brought on account of any injuries or damages sustained by any person or property in consequence of any neglect in safeguarding the work or through the use of unacceptable



materials in the construction of the improvement or on account of any act or omission, by the Contractor, or his agents and he shall pay any judgment obtained or growing out of any claims or suits.

107.16 Contractor's Responsibility for Work. Until final written acceptance of the project by the Engineer, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part thereof by the action of the elements, from vandalism or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God, or the Public enemy or governmental authorities.

The Contractor shall not suspend the work unless approved by the Engineer and in such a case or under the provisions of 105.09 the Contractor shall be responsible for the project and shall take such precautions as may be necessary to prevent damage to the project, provide for adequate drainage and shall erect any necessary temporary structures, signs, or other facilities at his expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established plantings, seedings, and soddings furnished under his contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

107.17 Contractor's Responsibility for Utility Property and Services. At points where the Contractor's operations are adjacent to properties of railway, telegraph, telephone, and power companies, or are adjacent to other property, damage to which might result in considerable expense, loss, or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made.

The Contractor shall cooperate with the owners of any underground or overhead utility lines in their protection and in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication of rearrangement work may be reduced to a minimum, and that services rendered by those parties will not be unnecessarily interrupted.

In the event of interruption to underground or overhead utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall immediately alert the occupants of nearby premises as to any emergency that the Contractor may create or discover at or near such premises. The Contractor shall then notify the Engineer and the owner or operator of the utility facility of the disruption and shall cooperate with the said utility owner or operator in the restoration of service. If water or sewer service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority.

107.18 Furnishing Right-of-Way. The Owner will be responsible for the securing of all necessary right-of-way in advance of construction. Any exceptions will be indicated in the contract.

107.19            Personal Liability of Public Officials. In carrying out any of the provisions of these specifications, or in exercising any power of authority granted to them by or within the scope of the contract, there shall be no liability upon the Owner or its authorized representatives, either personally or as officials of the Owner it being understood that in all such matters they act solely as agents and representatives of the Owner.

107.20            No Waiver of Legal Rights. Neither the inspection by the Engineer, nor by any of his duly authorized representatives, nor any order, measurements, or certificate by the Engineer, or said representatives, nor any order by the Engineer for the payments of money, nor any payment for, nor acceptance of any work by the Engineer, nor any possession taken by the Owner or its duly authorized representatives, shall operate as a waiver of any provision of this Contract, or of any power herein reserved to the Owner or any right to damages herein provided; nor shall any waiver of any breach of this contract be held to be a waiver of any other subsequent breach.

#### SECTION 108 – PROSECUTION AND PROGRESS

|         |   |
|---------|---|
| 108.01  | SUBLETTING OF CONTRACT                      |
| 108.03  | PROSECUTION AND PROGRESS                    |
| 108.031 | SUSPENSION OF WORK                          |
| 108.04  | LIMITATION OF OPERATIONS                    |
| 108.05  | CHARACTER OF WORKMEN: METHODS AND EQUIPMENT |
| 108.06  | DATE FOR COMPLETION                         |
| 108.07  | FAILURE TO COMPLETE ON TIME                 |
| 108.08  | CANCELLATION OF CONTRACT                    |

108.01            Subletting of Contract. The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the contract or contracts or any portion thereof, or of his right, title, or interest therein, without written consent of the Engineer. In the case such consent is given, the Contractor will be permitted to sublet a portion thereof, but shall perform with his own organization, work amounting to not less than 50 percent of the total contract cost, except that any items set forth in the proposal to be “specialty items” may be performed by subcontract and the cost of any such specialty items so performed by sub-contract may be deducted from the total cost before computing the amount of work required to be performed by the Contractor with his own organization. No sub-contract, or transfer of contract, shall in any case release the Contractor of his liability under the contract and bonds.

108.03            Prosecution and Progress. The Contractor shall submit a progress schedule for approval by the Engineer or an approved form within fifteen (15) days after the execution of the contract showing how he proposes to prosecute the work. If the Contractor’s operations are materially affected by changes in the plan or in the amount of the work or if has failed to comply with the approved schedule, the Contractor shall submit a revised progress schedule, if requested by the Engineer, which schedule shall show how he proposes to prosecute the balance of the work. The Contractor shall submit the revised progress schedule within ten days after the date of the request. The Contractor shall incorporate into every progress schedule submitted, any contract requirements regarding the order of performance of portions of the work. The Contractor shall use all practicable means to make the progress of the work conform to that

shown on the progress schedule which is in effect. No payment will be made to the Contractor while he is delinquent in the submission of a progress schedule.

On contracts of \$100,000 (One Hundred Thousand Dollars) or less, the Contractor shall convey to the Engineer information of this proposed schedule of work, by a written statement.

108.031 Suspension of Work. The Engineer may instruct the Contractor to delay the start of his operations or suspend the Contractor's operations in whole or in part, for the length of time the Engineer may deem necessary. The Contractor shall start or resume his operations when he is notified to do so by the Engineer.

108.04 Limitation of Operations. The Engineer may direct the Contractor to complete specific sections of the project when such sections are required to put a section of the project into operation.

The Contractor shall conduct the work at all times in such a manner and in such sequence as will assure the least interference with traffic and other operations of the public. He shall have due regard to the location of detours and to the provisions for handling traffic. He shall not open up work to the prejudice or detriment of work already started. The Engineer may require the Contractor to finish a section on which work is in progress before work is started on any additional sections if the opening of such section is essential to public convenience, or if necessary for the protection of portions of the existing and/or new facility from damages by action of the elements or from any other causes.

The Contractor shall take all necessary precautions and actions to prevent pollution of streams, lakes and reservoirs with fuels, oils, bitumens, calcium chloride or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

Proposed erosion control items provided in the contract, exclusive of seeding, shall be constructed concurrently with or immediately following earthwork or structure work of which they are a part. Seeding, mulching and protecting of major exposed slopes shall not be delayed until such time as they can be performed on a project wide basis. This work shall be performed in stages and shall be accomplished as soon as finished grade for seeding can be established in any significant portion of the project. The Contractor shall finish and seed, consistent with the general requirements of the specifications, significant portions of the project where, as determined by the Engineer, the grading has reached a stage that finishing thereof is incidental. Temporary control of water pollution, soil erosion, sedimentation and additional limitations of areas of erodible earth material exposed by clearing, grubbing and earthwork operations shall be in accordance with 207. The Contractor shall at all times conduct his operations in accordance with approved schedule.

108.05 Character of Workmen, Methods of Equipment. The Contractor shall at all times employ sufficient competent labor and equipment for prosecuting the several classes of work to full completion in the manner and time required by these specifications.

All workmen shall have sufficient skill and experience to perform properly the work assigned to them. Workmen engaged in special work or skilled work shall have sufficient

experience in such work and in the operation of the equipment required to perform all work properly and satisfactorily.

Any person employed by the Contractor or by and subcontractor who, in the opinion of the Engineer, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the Engineer, be removed by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without the approval of the Engineer.

Should the Contractor fail to remove such person or persons as required above, or fail to furnish suitable and sufficient personnel for the proper prosecution of the work, the Engineer may withhold all estimates which are or may become due, or may suspend the work by written notice until the Contractor complies with such orders.

All equipment which is proposed to be used on the work shall be of sufficient size and in such mechanical conditions as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the project shall be such that no injury to the roadway, adjacent property, or other streets or highways will result from its use.

When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the contract, the Contractor is free to use any methods or equipment that he demonstrates to the satisfaction of the Engineer will accomplish the contract work in conformity with the requirements of the contract.

When the contract specifies that the construction be performed by the use of certain methods and equipment, such methods and equipment shall be used unless other are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than those specified in the contract he may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed to be used and an explanation of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing construction work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute methods or equipment and shall complete the remaining construction with the specified methods and equipment. The Contractor shall remove the deficient work and replace it with work of specified quality, or take such other corrective action as directed. No change will be made in a basis of payment for the construction items involved nor in contract time as a result of authorizing a change in methods or equipment under these provisions.

108.06 Date for Completion. The Contractor shall have completed the work on or before the calendar date specified in the proposal, or on or before a later date determined as specified herein, otherwise the Engineer shall proceed as provided in 108.07 or 108.08.

If the contract is revised in any material respect and it is determined that said revision will cause delay in the completion of the work, the Engineer will postpone the completion date by the number of calendar days he determines to be equitable.

If the Contractor finds it impossible for reasons beyond his control to complete the work by the date as specified or as extended in accordance with the provisions of this subsection, he may, at any time prior to the expiration of the contract time as extended make a written request to the Engineer for an extension of time setting forth therein the reasons which he believes will justify the granting of his request. The Contractor's plea that insufficient time was specified is not a valid reason for extension of time. If the Engineer finds that the work was delayed because of conditions beyond the control and without the fault of the Contractor, he may extend the time for completion in such amount as the conditions justify. The extended time for completion shall then be in full force and effect the same as though it were the original time for completion.

If the Engineer should suspend the work in whole or in part as provided in 108.031m the date for completion shall be postponed the number of days that the suspension directly or indirectly delays the completion of the work.

108.07 Failure to Complete on Time. For each calendar day that any work shall remain uncompleted after the contract completion date, the sum specified herein will be deducted from any money due the Contractor, not as a penalty but as liquidated damages; provided however, that due account shall be taken of any adjustment of the completion date granted under the provisions of 108.06.

Permitting the Contractor to continue and finish the work or any part of it after the date fixed for its completion, or after the date to which completion may have been extended, will in no way operate as a waiver on the part of the Owner of any of its rights under the contract.

The Owner may waive such portions of the liquidated damages as may accrue after the work is in condition for safe and convenient use.

Table of Liquidated Damages

| Original Contract Amount<br>(Total Amount of the Bid) | Amount of Liquidated Damages to<br>be Deducted for Each Calendar Day |          |
|---|--|----------|
| From More than To and Including                       |  |          |
| \$.....00   | \$ 25,000  | \$ 50.00 |
| .....25,000   | 50,000   | 100.00   |
| .....50,000   | 100,000  | 150.00   |
| .....100,000  | 500,000  | 200.00   |
| .....500,000  | 1,000,000  | 300.00   |
| ...1,000,000  | 2,000,000  | 400.00   |
| Over  | 2,000,000  | 600.00   |

108.08 Cancellation of Contract. If the work to be done under this Contract shall be abandoned by the Contractor; or if this Contract shall be assigned or the work under this Contract sub-let by the Contractor, otherwise than therein specified; or if before the completion of the work under this Contract, the Contractor shall become financially unable to meet his current obligations or shall become bankrupt or shall make a general assignment for the benefit of the creditors or shall have a receiver appointed for him or to take charge of his affairs or shall have his property levied upon or taken in execution or under attachment; or if, at any time, the Engineer shall be of the opinion that the performance of the Contract is unnecessarily or unreasonably delayed or that the Contractor is violating any of the conditions or agreements of this Contract, or is executing the same in bad faith or is not fulfilling the terms thereof, or is not making such progress in the execution of the work as to indicate its completion within the time specified in the Contract, or within the time to which the completion of the Contract may have been extended by the Engineer, then the Engineer, at his discretion, acting for the Owner may at any time declare this Contract or any portion thereof, terminated by a written notice served upon the Contractor, a copy of which shall be given to the Surety or the authorized agent of the Surety.

Upon the service of such notice, the Contractor shall discontinue the work or such part thereof as the Engineer shall designate, whereupon the Surety may, at its option, assume this Contract or that portion thereof on which the Engineer has ordered the Contractor to discontinue work and proceed to perform the same and may, with the written consent of the Engineer, sublet the work, or portion of same taken over, provided, however, that the Surety shall exercise its option, if at all, within two week after written notice to discontinue work has been served upon the Contractor and upon the Surety or its authorized agent. The Surety, in such event, shall take the Contractor's place in all respects and shall be paid by the Owner for all work performed by it in accordance with the terms of this Contract and if they Surety, under the provisions hereof, shall assume said entire Contract, all monies remaining due the Contractor at the time of his default, shall thereupon become due and payable to the Surety as the work progresses, subject to all the terms of this Contractor.

In case the Surety does not, within the specified time, exercise its right and option to assume this Contract or that portion thereof on which the Engineer has ordered the Contractor to discontinue work, then the Engineer shall have the power to work at and to complete the work herein described, furnishing the necessary labor and material therefore, without advertising for bids or letting a contract, or to contract to complete the same as herein provided for, in the manner provided by law for the letting of contracts by the Owner or to procure other materials, tools, machinery and appliances for the completion of the same and to charge the expense of said labor, materials, tools, machinery and appliances, or of the new contract, to the Contractor, and the expense so charged shall be deducted and paid out of such money as may then be due or thereafter at any time to become due to the Contractor, and in case such expense is less than the sum which would have been payable under this Contract, if the same had been completed by the Contractor, he shall be entitled to receive the difference, and in case such expense is greater, the Contractor or in case of his default, his Surety shall, on notice from the Engineer pay the amount of such excess to the Owner.

108.09 Payroll Records. Payroll records shall be open to inspection of authorized representatives of the Owner. Upon completion of the work and prior to the payment of the final estimate, the Contractor shall submit an affidavit stating that wages have been paid in conformance with the minimum rates set forth in the contract for construction of the project.

SECTION 109 – ACCEPTANCE, MEASUREMENT AND PAYMENT

|        |                                     |
|--------|-------------------------------------|
| 109.01 | MEASUREMENT OF QUANTITIES           |
| 109.02 | SCOPE OF PAYMENT                    |
| 109.03 | COMPENSATION FOR ALTERED QUANTITIES |
| 109.04 | EXTRA AND FORCE ACCOUNT WORK        |
| 109.05 | ELIMINATED ITEMS                    |
| 109.06 | PARTIAL PAYMENTS                    |
| 109.07 | FINAL INSPECTION AND ACCEPTANCE     |
| 109.08 | FINAL ESTIMATE                      |
| 109.09 | GUARANTEE AND RETAINER              |

109.01 Measurement of Quantities. Where work is to be paid for by united of length, area, weight, or volume, all work accepted under this contract shall be measured by the Engineer, and the quantities of various items of work performed will be determined by the Engineer, as the basis for final settlement. For the calculation of quantities in which the computation of area by geometric methods would be comparatively laborious, it is stipulated and agreed that the planimeter shall be considered in instrument of precision adapted to the measurement of such areas.

The Contractor, in case of unit price items, will be paid for the actual amount of work performed in accordance with these specifications as provided under the various items.

The term “Lump Sum,” when used as an item of payment, will mean complete payment for the work described in the item.

When a complete structure or structural unit is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

109.02 Scope of Payment. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials and equipment for performing all work under the contract in a complete and acceptable manner and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof, except as otherwise provided in 104.02, 104.03, 105.17 and 107.16.

If the “Basis of Payment” clause in the specifications relating to any unit price in the bid schedule requires that the said unit price cover and be considered compensation for certain work or material essential to the item, this same work or material will not also be measured or paid for under any other pay item which may appear elsewhere in the specifications.

109.04

109.03 Compensation for Altered quantities. When the accepted quantities of work vary from the quantities in the bid schedule, the Contractor shall accept as payment in full, so far as to contract items are concerned, payment at the original contract unit prices for the accepted quantities of work done. No allowance except as provided in 104.02, will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or

claimed by the Contractor resulting either directly from such alterations or indirectly from such alterations or indirectly from unbalanced allocation among the contract items of overhead expense on the part of the bidder and subsequent loss of expected reimbursement therefore or from any other cause.

Increased work involving supplemental agreements shall be paid for as stipulated in such agreements. The Contractor shall furnish substantiating data required in the preparation of these agreements.

109.04 Extra Work. Extra work, when ordered, shall be paid for under a written order in accordance with the terms therein provided.

1. Labor and Materials

- (a) For all labor and supervision in direct charge of the specified operations, the Contractor shall receive the current local rate or wage to be agreed upon in writing before starting such work, for the time that said labor and supervision is actually engaged in such work, to which may be added an amount equal to thirty-five percent (35%) of the sum thereof.

The wages of any foreman or timekeeper who is employed partly on Extra Work and partly in other work shall be prorated between the two classes of work according to the number of men employed on each class of work as shown by the payrolls.

The Contractor shall receive the actual costs paid to, or in behalf of, workmen by reason of subsistence and travel allowances, health and welfare benefits, pension fund benefits or other benefits, when such amounts are required by collective bargaining agreement or other employment contract generally applicable to the classes of labor employed on the work. No percentage shall be added to these costs.

- (b) For all materials entering permanently into The Work, the Contractor shall receive the actual cost of such material delivered to The Work, including freight and hauling charges as shown by original receipted bills; to such cost may be added a sum equal to 15 percent (15%) thereof.
- (c) For any machinery or special equipment other than small tools, and including fuel and lubricants which may be deemed necessary or desirable to use, the Contractor shall be allowed a reasonable rental price to be agreed upon in writing before such work is begun, for the time that such equipment is in use on the project. No profit or overhead shall be added to any charges in connection with the use of owned equipment, however, 15 percent (15%) of the total cost



of rented equipment as shown by original receipted bills may be added for profit and overhead.

THE COMPENSATION as above provided in (a), (b) and (c) shall be received by the Contractor as payment in full for EXTRA WORK done including administration, overhead, use of tools and equipment for which no rental is allowed, profit, taxes, premiums on bonds and insurance, unemployment contributions and any other expense incidental to performing the Extra Work.

The Contractor and Engineer, or their authorized representatives, shall compare records of payrolls for labor furnished EXTRA WORK BASIS at the end of each day; claim for Extra Work done shall be submitted to the Engineer by the Contractor upon certified quadruplicate statements to which shall be attached original receipted bills and invoices covering the costs of the freight and haulage charges on all materials permanently entering into such work.

## 2. Lump Sum

Where total cost will be less than two thousand five hundred dollars (\$2,500.00) a "LUMP SUM" agreement may be entered into subject to approval of the Board of Public Affairs, which sum shall include full compensation for all supervision, labor, material, tools and equipment used to complete the item.

109.05 Eliminated Items. Should any items contained in the proposal be found necessary for the proper completion of the work, the Engineer may, upon written order to the Contractor, eliminate such items from the contract, and such action shall in no way invalidate the contract. When a Contractor is notified of the elimination of items, he will be reimbursed for actual work done and all costs incurred, including mobilization of materials prior to said notification.

## 109.06 Partial Payments.

- (a) At least (10) days before each progress payment falls due (but not more often than once a month), the Contractor will submit to the Engineer a partial payment estimate filled out and signed by the Contractor covering the Work performed during the period covered by the partial payment estimate and supported by such data as the Engineer may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site, the partial payment estimate shall also be accompanied by supporting data, as follows: 1) waiver of lien, 2) proper invoice for material, 3) assurance of City's title to material, 4) proof of payment to vendor for material, 5) proof of applicable insurance on material is in effect. Payment for material stored on site shall be limited to major items of construction with a value exceeding one percent (1%) of contract value. The Engineer will, within (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the Owner, or return the partial payment estimate to the Contractor indicating in writing his reasons for refusing to approve

payment. In the latter case, the Contractor may make the necessary corrections and resubmit the partial payment estimate. The Owner will, within thirty (30) days of presentation to him of an approved partial payment estimate, pay the Contractor a progress payment on the basis of the approved partial payment estimate. The Contract will be paid the bid and stipulated unit and lump sum prices as set forth in his Proposal, for the amount of work approved for payment by the Engineer. The sum total for these items shall constitute full payment for the job complete, tested, and ready for use.

- (b) The Owner shall retain ten percent (10%) of the amount of each partial payment until the work is complete. With the final payment the Owner shall pay the Contractor seventy percent (70%) of retainage held.

109.07 Final Inspection and Acceptance. When the Contractor feels that the work has been entirely completed, the Engineer will inspect the improvement. If items remain which must be completed or remedied by the Contractor, he shall perform the work immediately upon being notified by the Engineer. When such items have been corrected by the Contractor, final inspection will be made. The work must pass final inspection before it will be accepted by the Owner.

108.08 Final Estimate. Before the final estimate is allowed, the Owner shall require the Contractor to submit an affidavit from each and every subcontractor showing that all claims and obligations arising in connection with the performance of his portion of the contract have been satisfactorily settled. The improvement shall be inspected by the Engineer, and if he finds the Work is completed according to the contract, shall, within 60 days after the completion of this contract, prepare a statement of the total cost of the Work done hereunder, and the Owner shall pay the entire sum so found to be due hereunder after deducting therefrom all previous payments under the provisions of this contract and ALSO DEDUCTING THE GUARANTEE AND RETAINAGE CHARGE AS SET FORTH IN SECTION 109.09 following.

109.09 Guarantee and Retainage. The Contractor shall guarantee all Materials and Equipment furnished and work performed for a period of one (1) year from the date of completion. The Contractor warrants and guarantees that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make sure repairs, adjustments, or other work that may be necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

Further, the City will retain three percent (3%) of the entire cost of the work done by the Contractor for the above guarantee period of one year beginning on the date of the Engineer's final estimate payment sheet.

If the Contractor shall have complied with all the requirements of the Contracts in keeping said improvement in good and proper repair, at the end of his guarantee period upon

order of the director the Contractor shall receive this retainer; but, if the Contractor shall fail to make all necessary repairs as indicated by said Engineer at any time during the above period, Engineer shall have power to expend all or such of the amounts so retained as the said Engineer may see fit, and apply the same to making the necessary repairs.

Should the amount retained not be sufficient to make the required repairs, the Contractor shall at once make good the deficiency. At the expiration of the guarantee period as above specified, whatever remains to the credit of the Contractor, provided all repairs shall have been made satisfactory to the said Engineer, shall be paid to the Contractor as full settlement of any balance due on said contract as herein provided whereupon and not until then, shall the contractor be released from the obligation assumed in this contract and his bond discharged. The final acceptance of the work shall be the date when the guarantee is released.

## SECTION 200 – EARTHWORK

### ITEM 201 – CLEARING AND GRUBBING

|        |                       |
|--------|-----------------------|
| 201.01 | DESCRIPTION           |
| 201.02 | GENERAL               |
| 201.03 | CLEARING AND GRUBBING |
| 201.04 | SCALPING              |
| 201.05 | METHOD OF MEASUREMENT |
| 201.06 | BASIS OF PAYMENT      |

201.01 Description. This work shall consist of clearing grubbing, scalping, removal of trees and stumps, and removing and disposing of all vegetation and debris within the limits of the right-of-way and easement area, except such objects as are designated to remain or are to be removed in accordance with other section of these specifications. When the bid schedule contains a lump sum for 201, Clearing and Grubbing, the lump sum price bid will be paid and shall be full compensation for all the work described in this section, including removal of all trees and stumps marked for removal. When the bid schedule contains 201, Removal of Trees and Stumps on an individual basis, the balance of the work described in this section shall be performed but will not be paid for directly but shall be considered as a subsidiary obligation of the Contractor under other contract items.

201.02 General. The Engineer shall exercise control over clearing and grubbing and shall designate all trees, shrubs, plants and other objects to be removed or to remain. This work shall also include the preservation from injury or defacement of all vegetation and objects designate to remain. Paint required for cut or scarred surfaces of trees or shrubs selected for retention shall be a suitable asphaltum base paint.

Before the Contractor removes any tree or stump which the planted state is to be removed, the Engineer shall appropriately mark each tree or stump which is to be removed.

Only such trees and stumps which have been marked for removal by the Engineer shall be removed.

201.03 Clearing and Grubbing. All surface objects, roots, and other protruding obstructions, not designated to remain, and all trees and stumps marked for removal, shall be cleared and/or grubbed, including mowing, as required.

Except in areas to be excavated, stump holes and other holes from which obstructions are removed, shall be back filled with suitable material and compacted in accordance with 203.10.

Materials and debris shall be removed from the right-of-way and disposed of at locations off the project outside the limits of view from the projects with the written permission of the property owner on whose property the materials and debris are placed. Such written permission shall be presented to the Engineer prior to disposal operations. The Contractor shall make all necessary arrangements with property owners for obtaining suitable disposal locations and the cost involved shall be included in the unit price bid.

Low hanging branches and unsound or unsightly branches on trees or shrubs designated to remain shall be removed as directed. Branches of trees extending over the pavement limits shall be trimmed to give a clear height of 20 feet above the pavement surface.

201.04 Scalping. The Contractor shall scalp areas where excavation or embankment is to be made. Scalping shall include the removal of material such as brush, roots, sod, grass, residue of agricultural crops, sawdust and decayed vegetable matter from the surface of the ground.

The depth of scalping performed under this section is not intended to include topsoil. Additional depth of material which is required to be moved over and above scalping operations as described in this section shall be measured and paid for at the Contract unit price bid per cubic yard for 203.

201.05 Method of Measurement. Measurement will be by one of the following methods:

- (a) Lump Sum Basis. When the bid schedule contains a clearing and grubbing lump sum item, no measurement of area will be made.
- (b) Individual Unit Basis.
  - 1. The diameter of trees will be measured at a height of 24 inches above the ground. Trees less than 12 inches in diameter will be classed as brush.
  - 2. Stumps will be measured by taking the average diameter at the cut-off.

201.06 Basis of Payment. The accepted quantities will be paid for at the Contract unit prices as follows:

| Item | Unit     | Description                |
|------|----------|----------------------------|
| 201  | Lump Sum | Clearing and Grubbing      |
| 201  | Each     | Trees and/or Stumps remove |

ITEM 202 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS

|        |   |
|--------|---|
| 202.01 | DESCRIPTION   |
| 202.02 | CONSTRUCTION REQUIREMENTS   |
| 202.03 | BRIDGES, CULVERTS AND OTHER DRAINAGE STRUCTURES<br>REMOVED              |
| 202.04 | PIPE REMOVED  |
| 202.05 | PAVEMENT, SIDEWALKS, CURBS, ETC., REMOVED                               |
| 202.06 | BUILDING REMOVED  |
| 202.07 | GUARD RAIL AND FENCE REMOVED  |
| 202.08 | MANHOLE, CATCH BASIN INLET, AND OTHER UNDERGROUND<br>STRUCTURES REMOVED |
| 202.09 | METHOD OF MEASUREMENT   |
| 202.10 | BASIS OF PAYMENT  |

202.01 Description. This work shall consist of the removal wholly or in part, and satisfactory disposal of all buildings, fences, structures, old pavements, abandoned pipe lines, and any other obstructions which are not designated or permitted to remain, except for the obstructions to be removed and disposed of under other items in the Contract. It shall also include the salvaging of designated materials and backfilling the resulting trenches, holes, and pits.

202.02 Construction Requirements. The Contractor shall raze, remove, and dispose of all buildings and foundations, structures, fences and other obstructions any portions of which are on the right-of-way, except utilities and those items for which other provisions have been made for removal. All designated salvageable material shall be removed, without unnecessary damage, in sections or pieces which may be readily transported, and shall be stored by the

Contractor at specified places within the project limits. Unusable material shall be destroyed or disposed of outside the limits of view from the project with written permission of the property owner on whose property the material is placed. Copies of all agreements with property owners shall be furnished to the Engineer. Basements or cavities left by structure removal shall be filled to the level of the surrounding ground, and if within the area of construction, shall be compacted in accordance with 203.12.

202.03 Bridges, Culverts and Other Drainage Structures Removed. Bridges, culverts, and other drainage structures in use by traffic shall not be removed until satisfactory arrangements have been made to accommodate traffic. Where required, existing superstructures shall be entirely removed and existing substructures shall be removed to at least six inches below the proposed ground surface and to the extent necessary to avoid interference with the new construction, including the driving of piles. Portions of substructures within the area of the approach pavement and shoulders shall be removed to at least three feet below the top of the finished pavement and shoulders. The surface of the ground shall be left in a sightly condition.

Where such portions of existing structures lie wholly or in part within the limits for a new structure, they shall be removed as necessary to accommodate the construction of the proposed structure.

When specified all structural steel, timber, and other reusable materials shall be carefully dismantled, and when specified steel members shall be match marked as directed by the Engineer. Specified salvaged materials shall be considered as the property of the Owner and such materials shall be stored as specified in 202.02. Where alteration of the existing structure requires removal of portions of the structure, such removal shall be performed with sufficient care as to leave the remaining portion of the structure undamaged. In case of damage to the existing structure, repair or replacement shall be made at the Contractor's expense and to the approval of the Engineer

The Contractor shall be responsible for any damage to salvage materials due to improper methods used or carelessness and shall replace such materials at no additional cost to the Owner. Care shall be taken in blasting to prevent injury to buildings or to and bridge or part thereof that will be retained.

Materials which are to be salvaged as called for on the Plans shall be considered as the property of the Owner. All other materials shall become the property of the Contractor and shall be removed from the work site.

202.04 Pipe Removed. This section provides for "Pipe Removed for Re-use or Storage" and "Pipe Removed for Disposal". For both types of removal, the work under this section shall include excavating all material necessary to permit removing the pipe; disposing of excavated material, including broken pipe; and removing and disposing of pipe headwalls.

- (a) For “Pipe Removed for Re-use or Storage”, the work shall include removing, cleaning, transporting, and storing the pipe. All pipe shall be carefully removed and every precaution taken to avoid breaking or damaging the pipe. Pipe to be re-laid ??? removed and stored when necessary, so that there will be no loss or damage before relaying. The Contractor will be required to replace sections lost from storage or damage by negligence or by use of improper metal at not additional cost the Village.
- (b) For “Pipe Removed for Disposal”, the pipe disposal becomes the responsibility of the Contractor and shall be disposed of in accordance with 202.02.
- (c) Excavating. Where the plans call for pipe to be removed for re-use or storage, a section of pipe line shall be removed sufficient in length to permit determining the quality of pipe and the possibility of removing it without damage. If the Engineer determines that the pipe is worth salvaging and can be salvaged the Contractor shall perform the remainder of the excavation in a manner that will not damage the pipe. If the Engineer determines otherwise, the pipe will be removed under “Pipe Removed for Disposal”, and the original item shall be non-performed.

Where caving, occurs, the caved material shall be excavating before the trench is backfilled.

All excavated material shall be used or disposed of in accordance with the provisions of 203.

- (d) Backfill. The trench resulting from the removal of pipe shall be backfilled in accordance with the provisions of 203 except when the trench lies within limits of subsequent excavation.

202.05 Pavement, Sidewalks, Curbs, etc., Removed. When designated for removal, an existing wearing course, concrete base course, concrete pavement, bituminous wearing course, concrete sidewalks, concrete gutters, stone or concrete curbs, concrete combined curb and gutter, concrete traffic dividers, etc., shall be removed and disposed of.

Removal methods shall be used which insure that other existing installations such as adjacent pavement, etc., which are to remain in place will not be damaged. Installations which are to remain in place and which are damaged by the Contractor’s operations shall be repaired to the satisfaction of the Engineer at not cost to the Owner.

Removal of damaged curbs shall consist of removal of entire sections or partial removal if the concrete is cut neatly in an acceptable manner and then separated from the undamaged portion. The minimum length of the curb removed for replacement shall be five feet.

If the amount of pavement, sidewalks and/or other item(s) to be removed is of sufficient size to warrant the use of graders or other mechanical equipment, these machines shall operate only in such areas and in such a manner that the above provisions will not be violated.

The removal of the wearing course shall extend to the surface of existing base course as shown on the plan cross-section, which shall serve as the base for the pavement courses to be constructed under this Contract. The Contractor shall employ such methods and tools as will not disturb or damage the existing base. Broken or damaged base resulting from the Contractor's operations shall be repaired or replaced as directed by the Engineer at the Contractor's expense. If any portions of the exposed base are found to be broken, loosened, soft or otherwise in an unsatisfactory condition through no fault or neglect of the Contractor, they will be repaired or removed and replaced by the Owner without cost to the Contractor.

Precautions shall be taken by the Contractor or prevent the displacement of, or damage to manholes or valve boxes located within the limits of the wearing course to be removed, or to the curbing, catch basins and pavement adjacent to the area of the wearing course to be removed. The Contractor shall repair, or replace, as may be required, at his own expense, any and all such items which are damaged by his operations. The wearing course removal will be limited to the areas shown on the plan or as determined by the Engineer. The edges of the adjoining bituminous pavements shall be neatly cut to form vertical joints with the pavement courses to be constructed under this Contract.

This item shall include also the furnishing of all equipment and labor required for the thorough cleaning of the base course surface of whatever type encountered within the limits of the removal of the existing wearing course. The cleaning shall be done prior to the application of the prime or tack coats (if such item is provided for in this Contract) and the leveling course, and in such manner as to remove completely all mud, earth, dust, surplus bituminous material and other foreign material from the base course to prevent the dislodging of the embedded aggregate.

Materials to be salvaged shall be stored on the right-of-way at locations determined by the Engineer and shall be cleaned and ready for re-use.

Materials that are not to be salvaged or that are not suitable for re-use shall be disposed of in the same manner as excavation.

202.06 Buildings Removed. Buildings and appurtenances designed for removal shall not be disturbed until the Contractor has secured written approval of the Engineer to proceed. As soon as such approval has been given, the Contractor shall schedule and perform the removals, under the direction of the Engineer, in a manner that will accommodate utility re-arrangements as early in the contract period as practicable.

Unless otherwise directed, foundations, floors, and walls of cisterns and wells shall be removed to a minimum of one foot below the grade of the surrounding area. Walls of pits, and basements, shall be removed.

Tanks shall be completely removed and basements shall be clear of all debris, appliances, wood or metal partitions, wood floors, etc. so that only masonry walls and concrete basement floors remain. The floor slabs, under which a pit, well, cistern or tank exists shall be broken and



removed. Basement floors which are left in place shall be broken and all drains that are not removed shall be sealed with masonry or with precast clay or concrete stoppers.

Unless otherwise specified, all material except that belonging to a public or private utility company shall become the property of the Contractor. The Contractor shall notify the utility companies when their respective meters are ready for removal.

The Contractor shall comply with all laws, City ordinances and building code regulations. Unless otherwise permitted by the Engineer the Contractor shall furnish, erect, and maintain suitable barricades outside the limits of basements, pits, cisterns and well openings to prevent personal injury or property damage.

As soon as removal work has been otherwise completed and approved by the Engineer, filling shall be performed as described in 202.07. The final grade of backfill in areas outside the prism of construction shall be as such as to present a neat appearance. It shall be well drained and shall prevent water from draining unnecessarily onto adjacent properties.

202.07 Guard Rail and Fence Removed. Where so required by the plans and proposal, existing guardrail and fence shall be carefully dismantled and stored for re-use as specified or for salvage by the Owner. Unless otherwise specified, wood posts and other materials not considered salvageable shall be disposed of as directed.

202.08 Manhole, Catch Basin, Inlet and Other Underground Structures Removed. Unless otherwise provided, all existing drainage structures or parts thereof of these types, which are not to remain as an integral part of a drainage system, shall be removed.

Castings shall be carefully removed and stored for re-use as specified or for salvage by the Owner.

When the structures extend into the upper foot of the finished subgrade or ground surface, they shall be removed to a minimum of one foot below these limits, in a manner that will not damage pipes that are to remain.

When directed, existing pipes shall be connected through the structure in a manner which assures continuity of flow.

When directed existing inlet and outlet pipes shall be bulk headed with material, and method, in accordance with applicable provisions of 904 or as directed by the Engineer.

After connecting across or sealing the existing pipes and removing walls to the required depth, remaining cavities shall be backfilled as required. When connecting pipes are used, suitable backfill shall be carefully tamped solidly under and around the pipe.

The removal and/or draining of the contents of manholes, catch basins, inlets and other underground structures necessary prior to the removal of the structures, and all equipment required therefore shall be included in the price bid for the removal of such structure.

202.09 Method or Measurement. When the Contract stipulates that payment will be made for removal of structures and obstructions on a “lump sum” basis, the pay item will include all areas designated on the plans or in the proposal, in accordance with the provisions of this section. When the proposal stipulates that payment will be made for the removal of specific items on a “linear foot”, “square foot”, “square yard”, “cubic foot”, “cubic yard”, “pound”, or “each” basis, measurement will be made by the unit stipulated in the Contract.

202.10 Basis of Payment. The accepted quantities of structures and obstructions removed and stored or disposed of, as directed, will be paid for at the contract lump sum price bid or at the price bid per unit specified in the proposal, which prices shall be full compensation for removal and storage or disposal of such items including excavation and backfill incidental to their removal, and the custody, preservation, storage on the right-of-way, and disposal as provided herein.

Payment will be made at contract price for:

| Item | Unit        | Description                                      |
|------|-------------|--|
| 202  | Each        | Existing _____ removed and disposed of           |
| 202  | Lump Sum    | Portion of _____ removed and disposed of         |
| 202  | Linear Foot | _____ inch Diameter Pipe removed and disposed of |
| 202  | Square Foot | Existing _____ removed                           |
| 202  | Linear Foot | Existing _____ removed and disposed of           |
| 202  | Linear Foot | _____ inch Diameter Pipe removed and disposed of |
| 202  | Square Yard | Yard Existing _____ removed                      |
| 202  | Linear Foot | Existing _____ removed and disposed of           |

ITEM 203 – ROADWAY EXCAVATION AND EMBANKMENT

|        |  |
|--------|--|
| 203.01 | DESCRIPTION                                      |
| 203.02 | DEFINITION                                       |
| 203.03 | BORROW   |
| 203.04 | GENERAL  |
| 203.05 | DISPOSAL OF EXCAVATED MATERIAL                   |
| 203.06 | TOLERANCE  |
| 203.07 | EMBANKMENT CONSTRUCTION                          |
| 203.08 | REQUIREMENTS FOR SUITABLE MATERIAL               |
| 203.09 | CONSTRUCTION METHODS                             |
| 203.10 | CONSTRUCTION OF EMBANKMENT AND SUBGRADE WITH     |
|        | MOISTURE AND                                     |
|        | DENSITY CONTROL AND TREATMENT OF SUBGRADE IN CUT |
| 203.11 | MOISTURE CONTROL                                 |
| 203.12 | EMBANKMENT COMPACTION                            |
| 203.13 | SUBGRADE   |
| 203.14 | PROOF ROLLING                                    |
| 203.15 | METHOD F MEASUREMENT                             |
| 203.16 | BASIS OF PAYMENT                                 |

203.01 Description. This work shall consist of preparation of areas upon which embankments are to be placed; excavation for the roadway and channel, including the removal of all material encountered not being removed under some other item; constructing embankments with the excavated material and material from other sources necessary to complete the planned embankments; disposing of unsuitable and surplus material; preparing the subgrade; finishing shoulders, slopes and ditches; all in accordance with these specifications and in reasonable close conformity with the lines, grades, thicknesses and cross sections show on the plans. All excavation shall be considered as unclassified excavation.

Where embankment is a separate pay item, payment for roadway excavation shall be made under 203 Excavation Not Including Embankment Construction. Payment for roadway embankment shall be made under 203 Embankment, which shall include payment for furnishing suitable material from sources other than excavation if needed to complete embankments, with no separate payment for borrow for planned embankments. The Contractor shall control disposition of excavated material, using in embankment or wasting as he desires.

Where embankment is not a separate pay item, payment for roadway excavation shall be made under 203 Excavation Including Embankment Construction, which shall include payment for placing suitable excavated material in embankment. If borrow is needed to complete planned embankments, it shall be measured and paid for separately under 203 Borrow. No excavated material shall be wasted without permission and all suitable material from excavation, or an equivalent volume from other sources, shall be used for planned embankment to the extent of project requirements.

When the proposal does not contain a lump sum for 201, Clearing and Grubbing, or an estimated quantity for 201, Removal of Trees and/or Stumps, or an estimated quantity for 202, Removal of Structure and Obstructions, this work shall be performed but will not be paid for directly, and shall be considered as a subsidiary obligation of the Contractor under 203.

203.02 Definitions.

**Embankment.** A structure consisting of soil, granular material, shale, rock or random material, constructed in layers to a predetermined elevation and cross section.

**Subbase.** Selection material of planned thickness placed on the subgrade as a foundation for a base or surface course. Subbase is a part of the pavement structure.

**Soil.** All earth materials, organic or inorganic which have resulted from natural processes such as weathering, decay, and chemical action in which more than 35 percent by weight of the grain or particles will pass a No. 200 sieve.

**Granular Material.** Natural or synthetic mineral aggregate such as broken or crushed rock, gravel, slag, sand or cinders which can be readily incorporated in an 8-inch layer, in which at least 65 percent by weight of the grains or particles are retained on a No. 200 sieve.

**Shale.** Laminated material, formed by the consolidation in nature of soil, having finely stratified structure.

Rock. Sandstone, limestone, glacial boulders, brick and old concrete which cannot readily be incorporated in an 8-inch layer.

Random Material. A mixture of previously defined materials suitable for use in embankment which can be readily incorporated in an 8-inch layer.

Optimum Moisture. The water content at which the maximum density is produced in a soil by a given compactive effort (AASHTO Designation: T 99).

Laboratory Dry Weight. The maximum laboratory dry weight shall be the weight provided by the Laboratory when the sample is tested in accordance with AASHTO T99 Method A.

Excavation. The excavation and disposal of all materials of whatever character encountered in the work.

203.03 Borrow. Approved material required for the construction of embankments or for other portions of the work, obtained from approved sources outside the right-of-way. Borrow shall meet the requirements for suitable embankment material set forth in this section. Borrow shall be resorted to only when sufficient quantities of suitable materials are not available from other items of the contract. Unless otherwise designated in the contract, the Contractor shall maintain his own arrangements for obtaining borrow and shall pay all costs involved.

Borrow used in embankment shall be placed in accordance with all the requirements for constructing embankment.

Borrow will not be paid for a separate item:

- (a) where embankment is a pay item in the contract, or
- (b) where the Contractor elects to use borrow in place of the excavation.

If the Contractor places more borrow than is required and thereby causes a waste of excavation, the amount of such waste will be deducted from the borrow volume as measured in the borrow area. All borrow areas shall be bladed and left in such shape as to permit accurate measurements after excavating has been completed.

The Contractor shall notify the engineer sufficiently in advance of opening any borrow areas so that cross section elevations and measurements of the ground surface after stripping may be taken and the borrow material can be tested before being used.

Borrow areas nearer than 500 feet to any right-of-way line shall meet the requirements of 105.151 and cleaning up of all borrow areas shall meet the requirements of 104.06

203.04 General. Excavation and embankments for the roadway, intersections and entrances shall be finished to conform to the plan cross sections within the tolerance set forth in 203.06. The Contractor shall satisfy himself as to the nature and distribution of the materials to be excavated. The unit price bid for excavation shall apply to all materials, of whatever nature, to be excavated.

Prior to beginning excavation, grading, and embankment operations in any area, all necessary clearing and grubbing in that area shall have been performed.

Obliteration of old roadways shall include all grading operations necessary to incorporate the old roadway into the new roadway and surroundings in order to provide a pleasing appearance. Removal of Portland cement concrete pavement and Portland cement concrete base course will be paid for as a contract item. Roadway obligation will be paid for as excavation.

When the Contractor's excavating operations encounter remains of prehistoric people's dwelling sites or artifacts of historical or archeological significance, the operations shall be temporarily discontinued. The Engineer will contact archeological authorities to determine the disposition thereof. When directed by the Engineer the Contractor shall excavate the site in such a manner as to present the artifacts encountered and shall remove them for delivery to the custody of the proper authorities. Such excavation will be considered and paid for as extra work.

Where excavation to the finished graded section results in a subgrade of unstable soil, the Engineer may require the Contractor to remove the unstable materials and backfill to the finish graded section with approved material in accordance with 203.12. The Contractor shall conduct his operations in such a way that the Engineer can take the necessary cross-sectional measurements before the backfill is placed.

- (a) **Drainage.** During the process of excavation, the roadway area shall be maintained in such condition that it will be well drained at all times. When trenching is done for narrow base widening ditches of an adequate depth shall be constructed at frequent intervals across the berms. Side ditches shall be deepened, if necessary, to provide a free outlet for water to insure the thorough drainage of the subgrade at all times.
- (b) **Rock and Shale Excavation.** Where granular subbase is not a part of the pavement design, and where rock, shale or coal is encountered in subgrade, it shall be excavated to a depth of six inches below the surface of the subgrade for the full cross section width of the roadway between the ditches, and the additional excavation so made shall be paid for at the contract unit price bid for excavation. The portion so excavated shall be filled with suitable embankment material.

Where granular subbase is a part of the pavement design, excavation of rock, shale or coal below plan subgrade elevation is not required. The contractor shall be paid for the thickness of granular subbase material shown on the typical sections in rock excavation areas. Any pockets in the rock below the plan subgrade elevation shall drain either longitudinally or laterally and all irregularities in the rock below this elevation shall be filled with granular subbase material at no additional cost to the Village.

- (c) **Drilling and Blasting in Rock Cuts.** Where rock encountered in cuts requires drilling blasting, all necessary precautions shall be exercised to preserve the rock in the finished slope in a natural undamaged condition, with the surfaces remaining reasonably straight and clean. Where

necessary, the method of blasting shall be modified by such procedures: as drilling of blast holes at the inclination of the slope along the line of the proposed finished slope and adjacent area; use of delayed blasting technique or reducing the quantity of explosives.

The spacing of the blast holes and the method of blasting required will be dependent upon the quality and structure of the rock encountered and the method of blasting used in approaching the slope. The Contractor shall adjust his operations to obtain the required slope conditions as called for on the plans.

In rock cuts, portions of rock which, in the opinion of the Engineer, would be hazardous to highway traffic if allowed to remain shall be removed. The use of explosives shall be governed by the provisions of 107.11.

- (d) Slides and Breakages. All slides and breakages beyond the finished work as planned, if caused by improper methods of excavation, shall be removed by the Contractor at his own expense. Slides and breakages beyond the finished work as planned which occur due to no fault or neglect of the Contractor shall be paid for in accordance with the provisions of 104.02 and 104.03
- (e) Shoulders, Slopes and Ditches. Sod and topsoil salvaged in the scalping operations shall be placed upon areas to be seeded or sodded. With two inches of the surface in a loose condition, the shoulders shall be built at an elevation that will allow subsequent operation of seeding and sodding to conform to the lines shown on the plans within the tolerance set forth in 203.0???. Shoulders, slopes and ditches which have been damaged by erosion during construction shall be reshaped by the Contractor at no additional expense to the County.

Earth or other berm materials shall not be dumped or stockpiled on the new or existing pavement or on the paved area of the berm. Such material shall be kept clear of the pavement and paved berm areas at all times.

203.05 Disposal of Excavated Material. All materials excavated under this item shall be disposed of by the Contractor as follows:

- (1) Fills within the right-of-way and replacement of unsuitable materials encountered in the preparation of the roadway subgrade and sidewalk areas.
- (2) Acceptable materials upon lots abutting the right-of-way when requested by the owners of the same. Materials wasted in such manner shall be placed without cost to the owner.
- (3) Disposed of by the Contractor at his own responsibility and expense outside the limits of the right-of-way. All haul shall be considered as “free haul”.

Material wasted within 500 feet of the right-of-way shall be blended into the topography. Any work necessary to achieve this result such as sloping, reducing size of large rocks, seeding, specific drainage, etc., shall be provided at no additional cost to the Contractor. Material which is placed adjacent to the finished work shall be placed as directed by the Engineer. Where material is to be disposed of on property outside the limits of the right-of-way, the Contractor shall furnish the Engineer a copy of the written permission from the property owner before beginning disposal operations.

203.06 Tolerances. The Contractor shall check the work under this item with templates, slope boards or other devices satisfactory to the Engineer. The completed work shall conform to the plans within the following tolerances:

For cut slopes back of the ditch line and for fill slopes beyond the shoulder, deviations of one foot measured in a horizontal plane will be permitted. For shoulders and ditches the horizontal measurements from the centerline shall not be less than the plan dimensions, and the elevations thereof shall not be higher than specified, but will vary not more than ½ inch at the pavement edge and two inches elsewhere, below the established grades. For subgrade for pavement types other than traffic compacted surface course the surface shall at no place vary more than ⅜ inch from a 10-foot straight edge applied to the surface parallel to the centerline of the pavement, nor more than ½ inch from a template conforming with the cross section shown on the plans, and the edge grade of the subgrade shall not deviate from the plan grade for subgrade by more than ½ inch. The surface of the subgrade for traffic compacted surface course shall at no place vary more than ¾ inch from plan dimensions.

For excavation and embankment beyond plan lines, measurement will be made only to plan lines.

203.07 Embankment Construction. Embankment construction shall consist of preparation of the areas upon which embankments are to be placed; the placing and compacting of approved material within the roadway areas where unsuitable material has been removed; and the placing and compacting of embankment material in holes, pits and other depressions within the roadway areas. Only approved materials shall be used in the construction of embankments and backfills. Frozen material shall not be placed in the embankment nor shall embankment be placed on frozen material.

202.08 Requirements for Suitable Material. Granular material shale, rock and random material as defined in 203.02 are suitable for use in embankment.

Soil is suitable for use in embankment provided it has the following characteristics:

Maximum laboratory dry weight shall be not less than 90 pounds per cubic foot, except that soils having maximum dry weights of less than 100.0 pounds per cubic foot shall not be used in the top 12 inches of embankment subgrade.

Soil, in addition to the above requirements, shall have a liquid limit of not to exceed 65, and the minimum plasticity index number of soil with liquid limits between 40 and 65 shall not be less than that determined by the formula Liquid Limit minus 30.

Between the dates of May 1 and November 1, soil in area to be excavated for which the moisture content exceeds optimum moisture for that soil by eight percentage points or more, shall be considered unsuitable for use in embankment, except that such wet soil, if suitable when drier, may be dried and used in embankment if the Contractor so elects. The foregoing provision shall not apply to surface soil which has become temporarily wet because of recent rains, or to soil which has become wet because of failure of the Contractor to maintain adequate surface drainage as required in 203.04(a) Drainage. Moisture content shall be determined by thoroughly drying a soil sample from the excavation area and computing the moisture as follows:

$$\text{percent moisture} = \frac{\text{weight of water in sample} \times 100}{\text{dry weight of sample}}$$



203.09 Construction Methods. When embankment is to be placed and compacted on hillside or where new embankment is to be compacted against existing embankments, or where embankment is built half width at a time, slopes that are steeper than 8:1 measured at right angles to the roadway shall be continuously benched over those area where it is required as the work is brought up in layers.

Benching shall be of sufficient width to permit operations of placing and compacting equipment. Each horizontal cut shall begin at the intersection of the original ground and the vertical sides of the previous cuts. Material thus cut out shall be recompacted along with the new embankment material at the Contractor's expense, unless the width of excavation required exceeds six feet, in which case the excavated material in excess of six feet will be measured and paid for as roadway excavation. When embankments less than three feet in depth are constructed over existing pavement, the surface of the existing pavement shall be scarified to a depth of two inches.

Soil, granular material, shale and random material shall be spread in a successive level layers of a depth to allow compaction to the specified density and of not more than nine inches in thickness (loose depth), unless otherwise specified, and unless otherwise authorized in writing by the Engineer. The layers thus placed shall be compacted as specified in this section. Compaction of the outer five feet of each layer measured horizontally from the face of the slope shall be obtained with a roller capable of covering the layer to the outer edge.

The Contractor shall replace all sections of embankment which have been damaged or displaced, due to carelessness or neglect on the part of the Contractor or due to natural causes such as storms, and not attributable to the unavoidable movement of the natural ground upon which the embankment is made.

If embankment can be deposited on one side only of abutments, wing walls, piers or culvert headwalls, care shall be taken that the area immediately adjacent to the structure is not compacted to the extent that it will cause overturning of or excessive pressure against the structure. When embankment is to be placed on both sides of a concrete wall of a pipe or box type structure, operations shall be so conducted that the embankment is always at approximately the same elevation on both sides of the structure.

(a) Soil. All soil used in embankment shall be placed in accordance with provisions of 203.12.

(b) Granular Material. Granular material shall be compacted to the density established as satisfactory by the Engineer based on field density tests. The moisture content shall be determined by the Engineer to obtain the desired compaction.

- (c) Shale. Shale shall be placed in accordance with the requirements for soil if possible. Shale containing sufficient amounts of large particles to make checking of the compaction impracticable shall be broken down in placing until the voids between the shale particles are filled insofar as is practicable. When so ordered by the Engineer, water shall be used to aid in breaking down shale. The moisture content and compaction shall be as directed by the Engineer.

Shale embankment, within a length of six times the height of the fill at an abutment, shall be sprinkled as directed by the Engineer to bring the moisture content to within a range of optimum minus three percent and optimum plus two percent. Each layer shall be rolled with at least six coverages of a fully ballasted tamping roller, or with other rollers satisfactory to the Engineer.

Mixtures of shale and rock shall be placed in accordance with the above noted provision for shale.

- (d) Rock. Rock fill shall be placed in not to exceed 3-foot lifts except that within a length of six times the height of the fill at an abutment, thickness of rock layers shall not be a greater than 18 inches. Rock which cannot be incorporated into lifts of the above specified thickness shall be reduced in size until it can be so incorporated. Lifts made up principally of small rock shall be rolled as directed by the Engineer. Care shall be exercised in placing rock so that the side slopes will conform substantially with the requirements of the plan.

When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portions of the embankment as rock fill and the other material shall be incorporated into the inner portion as rolled embankment. Rolled embankment adjacent to rock fill shall be held at substantially the same elevation as the rock, but always above the rock and of sufficient width to permit the proper compaction of this portion.

The top two feet of all embankment shall be constructed of mater other than rock according to the specifications for placing that material. Material for this upper two feet shall be reserved by the Contractor from suitable excavation to the extent that it is available. Should this material be available and not reserved, it shall be furnished and placed by the Contractor at his expense. In all cases where embankment material other than rock is superimposed upon rock, the top of the ???till shall be leveled and smoothed with suitable leveling equipment and distribution of spalls and finer fragments of earth.

- (e) Random Material. For random material the moisture content and compaction shall be as required by the Engineer. When random material is of such size that it cannot be readily incorporated into n 8-inch layer it shall be reduced in size until it can be so incorporated.
- (f) Areas Inaccessible to Rollers. Embankment in areas inaccessible to rollers shall be composed of embankment material which can readily be incorporated into a 4-inch layer, loose depth, placed and compacted in accordance with the following

provisions: Embankment material, other than granular material, shall be deposited in level layers not exceeding four inches in thickness, loose depth, and compacted by mechanical devices to the density required in 203.12. Granular material shall be compacted as required in this section except that it may be deposited in water without compaction to a height not exceeding normal water level. Compaction of granular material with water above normal water level is permitted if satisfactory drainage is provided.

Effective spreading equipment shall be used on each lift to obtain uniform thickness prior to compacting. As the compaction of each layer progress, continuous leveling and manipulating will be required to assure uniform density. Water shall be added or removed, if necessary, in order to obtain the required density.

203.10 Construction of Embankment and Subgrade with Moisture and Density Control and Treatment of Subgrade in Cut. All embankments, except rock embankments, shall be constructed using moisture and density control. All subgrade, except rock and shale in cut section shall be constructed using moisture and density control.

203.11 Moisture Control. Embankment and subgrade material which does not contain sufficient moisture to be compacted in accordance with the requirements of this subsection shall be sprinkled with water as directed by the Engineer. Water shall be applied by means of tank trucks equipped with suitable sprinkling devices and shall be thoroughly incorporated into the material which is to be completed by means of discs or other approved equipment.

Embankment and subgrade material containing excess moisture shall be required to dry prior to or during compaction to a moisture content not greater than three percentage points above optimum, except that for material which displays pronounced elasticity or deformation under the action of loaded rubber tire construction equipment, the moisture content shall be reduced to optimum if necessary to secure stability. For subgrade material, these requirements for maximum moisture shall apply at the time of compaction of the subgrade and also at the time of placing pavement or subbase. Drying of wet soil shall be expedited by the use of plows, discs, or by other approved methods when so ordered by the Engineer.

203.12 Embankment Compaction. Soil embankment shall be placed and compacted in layers until the density is not less than the percentage of maximum dry density indicated on the following table determined by AASHTO T99 Method of A:

| Condition I   |              | Condition II  |                |
|---|--------------|---|----------------|
| Fills 10 feet or less in height and not closer than 60 feet to a bridge abutment. |              | Fills exceeding 10 feet in height or less than 10 feet in height but within 60 feet of a bridge abutment. |                |
| Max Lab.  | Min Com.*    | Max Lab.  | Min. Comp.*    |
| Dry Wt.   | Requirements | Dry Wt.   | Requirements   |
| lbs/cu. ft.   | % lab. max.  | lbs./cu. ft.  | % of lab. max. |
| 90-104.9  | 100%         | 90-104.9  | 102%           |
| 105-119.9   | 98%          | 105-119.9   | 100%           |

|  |     |              |     |
|--|-----|--------------|-----|
| 120 and more   | 96% | 120 and more | 98% |
| * All soil subgrade shall be compacted to 100% of maximum dry density. |     |              |     |

203.13 Subgrade. All soil subgrade shall be prepared in accordance with this subsection. Soils with a maximum dry weight of less than 100 pounds per cubic foot are considered unsuitable and when encountered in the upper 12 inches of the subgrade shall be replaced with suitable soil or granular material.

- (a) **Compaction Requirements.** Subgrade under new pavement and paved shoulders shall be compacted to a width of 12 inches beyond the edge of the pavement or paved shoulder. The entire surface of the subgrade shall be rolled with an 8-12 ton tandem roller or pneumatic tired roller until compaction requirements are met. Ruts caused by trucks or equipment shall be corrected by reshaping and rerolling. The cost shall be included in the unit price bid for 203 Roadway Excavation.

Subgrade under driveways and sidewalks shall be compacted and the cost shall be included in the price bid per unit of measurement.

- (b) **Drainage.** The surface of the subgrade shall be maintained in a smooth condition to prevent ponding of water after rains, and ditches shall be constructed and maintained in accordance with 203.04(a) Drainage, to insure the thorough drainage of the subgrade surface all times.
- (c) **Soft Subgrade.** Where soft subgrade is encountered in cuts, due to no fault or neglect of the Contractor, in which satisfactory stability cannot be obtained by moisture control and compaction as provided as provided for under 203.11 (a), the unstable material shall be excavated to the depth required by the Engineer. The excavation thus required shall be measured and paid for at the contract unit price bid for 203 Excavation. Material thus excavated shall be disposed of in accordance with 203.05.

Where embankment is a separate pay item, the excavation thus made shall be filled with suitable material placed in accordance with the compaction and moisture requirements of this item and shall be paid for at the contract unit price for 203 Embankment.

Where embankment is not a separate pay item, the excavation thus made shall be filled with suitable material from 203, Excavation Including Embankment Construction, in accordance with 203.12, and shall be paid for under this item. If such suitable material is not available within ½ mile of the soft subgrade area, the excavation thus made shall be filled with suitable material placed in accordance with 203.12 and paid for under 203 Borrow.

Soil is considered unsuitable if 50 percent or over passes a 200 mesh screen.

Where soft subgrade is due to the failure of the Contractor to maintain adequate surface drainage as required in 203.04 (a) Drainage, or is due to any other fault or

neglect of the Contractor, the unstable condition shall be corrected as outlined above at no expense to the County.

- (d) Full Width New Pavement Construction. After the surface of the subgrade has been shaped to approximate cross section grade, and before any drainage tile, pavement, base or subbase mater is placed thereon, the subgrade and a portion of the berm for a distance of at least 18 inches outside the limits of the planned pavement shall be compacted. When the rolling is completed, the surface of the subgrade shall be shaped as necessary to conform to the grade and cross section shown on the plans within the tolerance set forth in 203.06 and shall be so maintained until the overlying course is in place.

203.14 Proof Rolling. When proof rolling is specified the work shall be performed and paid for in accordance as specified.

203.15 Method of Measurement. The quantities of excavation to be paid for shall be the number of cubic yards of material in the original position, acceptably excavated, measured by the method of average end areas. Excavation outside plan lines shall not be included in measurement for payment.

- (a) Contract Quantity Payment. The quantities of excavation and embankment, when embankment is specified as a separate bid item, for which pavement will be made will be those shown in the contract, provided the project is constructed to the lines and grade shown on the plans, within allowable tolerance, and provided the plan quantities are adjusted to correct errors and to take into account authorized changes. Check measurements of final cross section shall be used to establish the quantity for payment.

When the plans have been altered or when disagreement exists between the Contractor and the Engineer, as to the accuracy of the plan quantities, either party shall have the right to request and cause the quantities involved to be measured in accordance with “measured quantities”. When the quantities are measured for payment the original plan cross sections may be interpolated at points where necessary to more accurately determined quantities.

- (b) Measured Quantities. When payment is specified on a volume basis, all accepted excavation shall be measured in it original position by cross-sectioning the area excavated, which measurements will include overbreakage or slides not attributable to carelessness of the Contractor. Volumes will be computed from the cross section measurements by the average end area method.

Measurements will be made for unsuitable materials actually excavated and removed at the direction of the Engineer, to obtain proper stability in cut sections and in foundations for fill sections.

No measurement will be made of the suitable material temporarily removed and replaced to facilitate compaction of the material for the full depth shown on the plans.

Where it is impractical to measure material by the cross section method due to the erratic location of isolated deposits, acceptable methods involving three-dimensional measurements may be used.

- (c) Measurement on a Linear Basis. When an item of excavation is to be measured and paid for on a linear basis the actual length will be measured in the units specified in the contract.
- (d) Measurement of Embankment. Where the contract does not specifically provide for payment for embankment, the work of embankment, the work of embankment construction will not be paid for as such, but will be considered incidental to the various items of excavation.

When payment for embankment constructed with moisture and density control is specified as a separate bid item, the quantities to be paid for shall be the number of cubic yards of embankment in the completed position, acceptably placed as herein described, measured by the method of average end areas. Embankment outside plan lines shall not be included in measurement for payment.

- (e) Measurement of Borrow. Borrow will be measured and paid for by the cubic yard or ton in accordance with 109.

Borrow material in a natural formation shall be measured by the method of average end areas or by weight. Where measurement by the method of average end areas is used the borrow area shall be cross-sectioned after the surface has been cleared and scalped and again after excavating in the borrow area has been completed. The cubic yards to be paid for shall be determined from these cross-sections. Where measurement by weight is used, the density of the material in its original position shall be determined by a series of representations field measurements made after clearing and scalping have been performed, and as the material in the borrow area becomes exposed by excavating operations. Acceptable material excavated from the borrow area for incorporation into the embankment shall be weighed and load slips furnished. The cubic yards to be paid for shall be determined by dividing the average weight per cubic yard of the undisturbed material as determined by the density tests into the total weight of borrow material as determined by the load weight slips.

Borrow material from sources other than natural formations, such as cinders, slag, processed stone or gravel, and quarry strip shall be measured as follows: The weight per cubic yard of any such material in its compacted condition in the embankment shall be determined. Ninety-five percent of the density thus determined divided into the weight of the material furnished shall be the cubic yards of such material.

- (f) Measurement of Water. When payment is made for water as specified in the contract, the water used in the work will be measured by the M. Gallons (1,000

gallons) by means of calibrated tanks for distribution or by means of accurate water meters.

When water is not specified as a pay item in the contract, the water used will not be measured or paid for, but will be incidental to the work.

203.16 Basis of Payment. The accepted quantities of excavation and embankment will be paid for at the contract price per unit of measurement for each of the pay items listed below included in the bid schedule.

The price and payment shall constitute full compensation for excavation, hauling, formation and compaction of embankment, format and compaction of subgrades, the locating, cleaning, protecting and adjusting of water service boxes, disposing of surplus materials, a furnishing of all labor, equipment, tools and incidentals necessary to complete this item.

| Payment will be made at contract price for: |                   |   |
|---|-------------------|---|
| Item  | Unit              | Description                                     |
| 203   | Cubic Yards       | Excavation including embankment construction    |
| 203   | Cubic Yards       | Excavation no including embankment construction |
| 203   | Cubic Yard or Ton | Borrow  |
| 203   | Cubic Yard        | Embankment                                      |
| 203   | Station or Mile   | Linear Grading                                  |
| 203   | M. Gallons        | Water   |
| 203   | Hour              | Proof Rolling                                   |

ITEM 207 TEMPORARY WATER POLLUTION  
SOIL EROSION AND SILTATION CONTROL

- 207.01 DESCRIPTION
- 207.02 MATERIALS
- 207.03 CONSTRUCTION REQUIREMENTS
- 207.04 PERFORMANCE
- 207.05 METHOD OF MEASUREMENT
- 207.06 BASIS OF PAYMENT

207.01 DESCRIPTION. This work shall consist of temporary control measures as shown on plans or ordered by the Engineer during the life of the contract to control water pollution, soil erosion and siltation through use of benches, dikes, dams, sediment basins, plastic sheets, mats, coarse aggregate, mulches, grasses, slope drains and other erosion control devices or methods, including mowing of areas where the slope is not steeper than 4:1.

The permanent control provisions contained in the contract shall be coordinated with the temporary erosion control features to the extent practical to assure economical, effective and continuous erosion control throughout the construction and post-construction period.

Temporary control may include construction work outside the right-of-way such as borrow pit operations, haul roads, equipment and material storage sites, waste areas, and temporary plant sties.

207.02 MATERIALS. Materials shall be as follows:

- (a) Commercial fertilizer shall be (12-12-12) unless otherwise specified, and shall conform to 659.03.
- (b) Temporary seeding and mulching shall consist of annual ryegrass (*Lolium multifolium*). Seed and mulching material shall be in accordance with 659.04 and 659.06.
- (c) Temporary slope drains shall consist of pipe, coarse aggregate, riprap, rock channel protection, mats, plastic sheets, or other materials, such materials shall meet commercial grade standards and shall be approved by the Engineer before being incorporated into the work.

207.03 CONSTRUCTION REQUIREMENTS. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, the surface area of erodible earth material exposed by excavation, borrow, and fill operations and to direct the Contractor to provide immediate permanent or temporary control measures to prevent contamination of adjacent streams or other water courses, lakes, ponds, or other areas of water impoundment. Such work may involve the construction of temporary benches, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods necessary to control erosion.

The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time and as outlined in his accepted schedule. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding a mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. This will require the establishing of final grades and application of Items 659 Liming, if specified on the plans, Commercial Fertilizer, and Seeding and Mulching. Only in exceptional cases should the temporary items of fertilizer, seeding and mulching materials be used. Temporary Control measures will be used when and as directed by the Engineer to correct conditions that develop during construction that were not foreseen during the designation stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control feature on the project.

Where erosion is likely to be a problem, clearing and grubbing operation should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise temporary erosion control measures may be required between successive construction stages. Under no conditions shall the surface area of erodible earth material exposed at one time by clearing and grubbing, exceed 750,000 square foot without approval by the Engineer.

The Engineer will limit the area of excavation, borrow and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finished



grading, mulching, seeding and other such permanent control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

Under no conditions shall the amount of surface area of erodible earth material exposed at one time by excavation, borrow or fill within the right-of-way exceed 750,000 square feet without prior approval by the Engineer.

The Engineer may increase or decrease the allowable amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his analysis of project conditions.

In the event of conflict between these requirements and pollution control laws, rules, or regulations of other Federal or State or local agencies, the more restrictive laws, rules, or regulations shall apply.

Temporary seeding areas shall be fertilized at  $\frac{1}{2}$  the normal plan or specification rate of application in accordance with 659.

All areas of temporary seeding shall be seeded with annual **rye** grass sown at the rate of 2 pounds per 100 square feet and mulched at the rate of approximately 1 tone per acre, all in accordance with 659.

When directed by the Engineer, the seed bed shall be thoroughly watered, as soon as the seed is covered, at the rate of 120 gallons per 1000 square feet. The water shall be applied by means of a hydro seeder or a water tank under pressure with a nozzle that will produce a spray that will not dislodge the mulching material. A second water application shall be made no sooner than 7 days or later than 10 days after the first application, providing significant rainfall has not occurred within 7 days after the first application. When significant rainfall occurs within 7 days after the first application, the Engineer may delay or omit entirely the second application, depending on weather conditions. The rate of second application shall be 120 gallons of water per 1000 square feet. The maximum number of water applications required shall be two.

Mowing of excess growth on areas of temporary seeding shall be performed when and as directed by the Engineer. The vegetation shall be cut to approximately 6 inches in height by acceptable methods.

All temporary erosion control features installed by the Contractor shall be acceptably maintained by him, and shall subsequently be removed where necessary, as directed by the Engineer. Removed materials shall become the property of the Contractor and shall be disposed of in accordance with 203.05.

207.04 Performance. If, in the opinion of the Engineer, proper controls of water pollution, soil erosion and siltation are not being provided by the Contractor, the Engineer may take the necessary steps to provide corrective measures and the cost of such services will be deducted from any money which may be due or become due the Contractor.

207.05 Method of Measurement. In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled, and are ordered by the Engineer, such temporary work shall be performed by the Contractor at his own expense.

Temporary erosion and pollution control work required, which is not attributed to the Contractor's negligence, carelessness or failure to install permanent controls, will be performed as ordered by the Engineer. Completed and accepted work will be measured as follows:

- (a) Temporary seeding and mulching will be measured by the square yard of seeded and mulched area completed in accordance with these specifications.
- (b) Temporary slope drains will be measured by the linear foot complete in place.
- (c) Temporary benches, dikes, dams, and sediment basins will be measured by the cubic yard of excavation performed, including necessary cleaning of sediment basins, and the cubic yard of embankment placed at the direction of the Engineer, in excess of plan lines and elevations.
- (d) Mowing satisfactorily performed at the direction of the Engineer will be measured in 1000 foot units.
- (e) The quantity of water shall be the amount in thousands of gallons applied in accordance with the requirements of this item and measured in tanks, tank wagons or trucks of predetermined capacity, or by means of meters of a ?? satisfactory to the Engineer and furnished and installed by the Contractor at his won expense, or determined by weight conversion.
- (f) All fertilizing will be measured and paid for as Item 659 Commercial Fertilizer.

Control work performed for protection of construction areas outside the right-of-way, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor, with costs included in the contract prices bid for the items to which they apply.

207.06 Basis of Payment. Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the Engineer and measured as provided above, will paid for under:

| Item | Unit           | Description                                       |
|------|----------------|---|
| 207  | Square Yard    | Temporary seeding and mulching                    |
| 207  | M. Gallons     | Water   |
| 207  | Linear Foot    | Temporary Slope Drains                            |
| 207  | Cubic Yard     | Temporary Benches, Dikes, Dams, & Sediment Basins |
| 207  | M. Square Foot | Mowing  |

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the proper contract price, as provided in 104.02. Should the work not be comparable to the project work under the applicable contract items, the Contractor will be ordered to perform the work on an extra work basins, or by agreed unit prices, as provided in 104.03.

300 – BASES

ITEM 301 – BITUMINOUS AGGREGATE BASE

- 301.01 DESCRIPTION
- 301.02 COMPOSITION
- 301.03 MATERIALS
- 301.04 MIXING PLANTS
- 301.13 SPREADING AND FINISHING
- 301.16 SPREADING AND SURFACE TOLERANCE
- 301.17 METHOD OF MEASUREMENT
- 301.18 BASIS OF PAYMENT

301.01 Description. This work shall consist of constructing a base course of aggregate and bituminous material, mixed in a central plant and spread and compacted on a prepared surface in accordance with these specifications and in reasonably close conformity with the lines, grades and typical sections shown on the plans or established by the Engineer.

All materials and construction methods for Bituminous Aggregate Base shall conform to 401, General Plant Mix Pavements; deviations from these are as follows.

301.02 Composition. The graduation of the aggregate shall be uniform and shall be within the limits in the following table.

| COMPOSITION |                         |
|-------------|-------------------------|
| Sieve       | Total Passing, % by Wt. |
| 2 inch      | 100                     |
| 1 inch      | 70-90                   |
| ¾ inch      | 50-85                   |
| No. 4       | 25-60                   |
| No. 40      | 7-30                    |
| No. 200     | 2-10                    |

Bitumen content shall be as directed by the Engineer within the following limits:

Bitumen (Percent of total mix)            3-5

301.03 Materials. Material for this item shall meet the following:

Aggregate.....703.04  
 Bituminous Material.....702.01

301.04 Mixing Plants. Screen shall have openings of such sizes that will result in a reasonably balanced separation of dried and heated aggregate into a minimum of two bins.

301.13 Spreading and Finishing. The maximum compacted depth of any one layer shall be four inches. Following the completion of bituminous aggregate base, adjacent earth construction shall be placed and compacted a minimum of 18 inches in width.

301.16 Spreading and Surface Tolerances. The variation of the surface from the testing edge of the ten-foot straight edge shall not exceed ¼ inch.

Variations in excess of slope or surface tolerance shall be corrected by adding or removing material in a manner satisfactory to the Engineer. Asphalt concrete 402, 403, or 404 specified in the contract may be used for this purpose.

301.17 Method of Measurement. The number of tons of Bituminous Aggregate Base to be paid for under this item shall be the number of tons placed, completed and accepted according to plant weight tickets.

301.18 Basis of Pavement. Payment for accepted quantities, complete in place, will be made at the contract price bid for:

| Item | Unit | Description               |
|------|------|---------------------------|
| 301  | Tons | Bituminous Aggregate Base |

#### ITEM 302 – ASPHALT CONCRETE

|        |                                 |
|--------|---------------------------------|
| 302.01 | DESCRIPTION                     |
| 302.02 | COMPOSITION                     |
| 302.13 | PREADING AND FINISHING          |
| 302.16 | PREADING AND SURFACE TOLERANCES |
| 302.17 | METHOD OF MEASUREMENT           |
| 302.18 | BASIS OF PAYMENT                |

302.01 Description. This work shall consist of construction in a base course of aggregate and asphalt cement mixed in a central plant and spread and compacted on a prepared surface in accordance with these specifications and in reasonably close conformity with the lines, grades, and typical sections shown on the plans or established by the Engineer.

All materials and construction methods for this item shall conform to 401, General Plant Mix Pavements; deviations form these are as follows.

302.02 Composition. Coarse aggregate (No. 4 and No. 67 sizes) and fine aggregate shall be combined in such proportions that the resulting blend shall be as directed by the Engineer but within the following limits.

| COMPOSITION |                                    |
|-------------|------------------------------------|
| Sieve       | Aggregate, Total Passing, % by Wt. |
| 2 inch      | 100                                |
| 1 inch      | 65-90                              |
| ½ inch      | 30-80                              |
| No. 4       | 18-60                              |

|         |       |
|---------|-------|
| No. 6   | 15-55 |
| No. 50  | 2-20  |
| No. 200 | 0-5   |

Bitumen content shall be a directed by the Engineer within the limits shown.

Bitumen (Percent of total mix) 4-8

302.13 Spreading and Finishing. The maximum compacted depth of any one layer shall be three inches.

302.16 Spreading and Surface Tolerances. The variation of the surface from the testing edge of the ten-foot straightedge shall not exceed ¼ inch. Variations in excess of slope or surface tolerance shall be corrected by adding or removing material in manner satisfactory to the Engineer. Asphalt concrete 402, 403, or 404 specified in the contract may be used for this purpose.

302.17 Method of Measurement. The number of tons of Asphalt Concrete to be paid for under this item shall be the number of tons placed, completed and accepted according to plant weight tickets.

302.18 Basis of Payment. Payment for accepted quantities, complete in place, will be made at contract price bid for:

| Item | Unit | Description      |
|------|------|------------------|
| 302  | Tons | Asphalt Concrete |

#### ITEM 303 – WATERBOUND MACADAM BASE

|        |                       |
|--------|-----------------------|
| 303.01 | DESCRIPTION           |
| 303.02 | MATERIALS             |
| 303.03 | EQUIPMENT             |
| 303.04 | COMPACTION            |
| 303.05 | THICKNESS AND TONNAGE |
| 303.06 | INVERTED CHOKE        |
| 303.07 | COARSE AGGREGATE      |
| 303.08 | EDGE SUPPORT          |
| 303.09 | KEYING                |
| 303.10 | FILLING               |
| 303.11 | WATERBINDING          |
| 303.12 | SURFACE TOLERANCES    |
| 303.13 | METHOD OF MEASUREMENT |
| 303.14 | BASIS OF PAYMENT      |

303.01 Description. This item shall consist of furnishing and placing one or more courses of keyed, filled, waterbound and compacted coarse aggregate and screenings, placed on a

prepared surface in accordance with these specifications and in reasonably close conformity with the lines, grades, thickness, and cross-sections on the plans or established by the Engineer.

303.02 Materials. Material for this item shall meet the following:

- Course Aggregate shall be No. 1 or No. 2 size crushed stone...703.04
- Screenings shall be crushed screenings.....703.10

Aggregate acceptance shall be determined prior to incorporation into the work, based on samples taken from stock piles.

303.03 Equipment. Equipment to be used shall include: self-propelled coarse aggregate spreading and leveling machines, hopper equipped spreaders with revolving cylinders and adjustments for accurate spreading of screenings at the required rate, self-propelled steel wheel or pneumatic tired rollers, roller attached or individually operated broom drags and hand tools including templates and straight edges.

Any combination of rollers conforming to 401.11 may be used. Approved vibratory compactors may be used in conjunction with the above rollers in accordance with Section 303.04 of these specifications.

303.04 Compaction. Sufficient number of rollers shall be used to complete keying and filling all coarse aggregate placed each day.

Each course of waterbound macadam shall have received an equivalent minimum of eight hours of actual rolling time per 1,000 square yards. Each steel wheel roller shall be considered as having a capacity of 1,000 square yards per eight hours and each pneumatic tire roller 3,000 square/yards per eight hours based on continuous operation.

When rollers alone are used for keying and filling, the maximum compacted thickness of any one lift shall be five inches. When approved vibratory compactors are used in conjunction with rollers, the maximum compacted thickness of any one lift shall be ten inches.

303.05 Thickness and Tonnage. A test section of sufficient length to establish thickness of completed course for minimum tonnage requirements shall be built as the first operation in placing aggregate.

Tonnage of aggregates being used shall be determined at such intervals that a course if uniform thickness will be laid.

303.06 Inverted Choke. A one-inch course of screening shall be spread on the prepared subgrade or subbase. Inverted choke shall not be used on subsequent courses in multiple course construction.

303.07 Coarse Aggregate. The coarse aggregate shall be uniformly spread on the inverted choke. All areas of non-uniformly graded aggregate shall be removed and replaced with suitable material before rolling. These corrections shall be made by hand picking wherever

necessary and shall continue after initial rolling until the appearance and texture of the aggregate are uniform and all irregularities are corrected.

On small areas where the use of spreading machines is impractical, or on any project where the total area of base is less than 2,000 square yards, the aggregate may be spread by hand method.

303.08 Edge Support. Except where base course is placed between curbs, edge support shall be provided by means of a minimum 18-inch width of soil, placed to a height that will consolidate to the height of the lift being compacted. Adequate surface drainage of the berm shall be maintained at all times.

303.09 Keying. The coarse aggregate shall be rolled, or rolled and vibrated, until the aggregate is compacted and keyed. Rolling shall be parallel to the road center and shall start at the outer edges of the road, overlap aggregate and edge support, and progress toward the center, overlapping on successive passes by at least one-half the width of the roller, except that on superelevated curves rolling shall progress from the lower to the upper edge. Compaction shall continue until the aggregate does not creep or wave ahead of the rollers.

Material which crushes excessively during compaction or becomes segregated shall be removed and replaced with suitable aggregate which shall have a firm, even surface.

Along curves, headers and walls, and at all places not accessible to the roller, the aggregate shall be keyed with trench rollers or tamped thoroughly with mechanical tampers or vibratory devices.

Aggregate in any course that becomes coated or mixed with dirt or clay shall be removed and replaced with clean aggregate, and the area shall be rolled.

Compaction of unfilled aggregate shall be stopped as soon as maximum keying is obtained.

303.10 Filling. Screenings shall be machine spread in three or more applications and worked into the voids of the coarse aggregate by broom dragging and rolling or by broom dragging, rolling and vibrating. Additional screenings shall be spread and processed as required until the course is uniformly filled and compacted, and there is an excess of screenings on the surface just sufficient to cover the pattern of the coarse aggregate. The operation of filling shall be such as not to cause flotation of the coarse aggregate.

Damp screening may be spread but shall not be manipulated until they are surface dry and filling shall be performed in sections not to exceed in length that which can be filled and processed in one day's operation.

Inaccessible areas may be filled by hand methods and screening worked in which mechanical tampers or vibratory devices. In no case shall the screenings be dumped in piles on the aggregate.

303.11 Waterbinding. The course shall be waterbound by sprinkling, continuously rolling and brooming with a slight excess of screenings on the surface, until no further screenings can be worked into the course. Additional screenings shall be added where necessary and water shall be applied with suitable sprinkler trucks or pressure distributors. Completed sections shall be allowed to stand at least 24 hours before a successive course is placed thereon. Sections allowed to stand more than 24 hours shall be sprinkled sufficiently to retain the remaining moisture. The course shall be protected from freezing for at least 24 hours after waterbinding.

303.12 Surface Tolerances. The finished surface shall not vary more than 3/8" from a ten-foot straightedge parallel to the center line, nor more than 1/2 inch from a template conforming to the required section. The Contractor shall furnish straightedges, templates, or other devices satisfactory to the Engineer and check the surface for conformance with these requirements.

303.13 Method of Measurement. The yardage to be paid for shall be the number of square yards of Waterbound Macadam Base Course, of specified materials, thickness and weight, in place, completed and accepted. The widths for purpose of yardage calculation shall be the widths shown on the Plans. The weight of coarse aggregate and screenings determined as herein after described shall be not less than that tabulated herewith.

Stone.....0.0575 tons per sq. yd. Per **I??**

For irregular base widening, the number of cubic yards of Waterbound Macadam Base may be measured by conversion from weight on the following basis:

Stone.....4,140 pounds per cu. yd.

Copies of weigh-bills shall be furnished to the Engineer during the progress of the work.

303.14 Basis of Payment. Payment for accepted quantities complete in place, will be made at contract price bid for:

| Item | Unit        | Description                    |
|------|-------------|--------------------------------|
| 303  | Square Yard | Waterbound Macadam Base Course |
| 303  | Cubic Yard  | Waterbound Macadam Base Course |

ITEM 304 – AGGREGATE BASE

|        |                       |
|--------|-----------------------|
| 304.01 | DESCRIPTION           |
| 304.02 | AGGREGATES            |
| 304.03 | PLACING               |
| 304.04 | COMPACTION            |
| 304.05 | METHOD OF MEASUREMENT |
| 304.06 | BASIS OF PAYMENT      |



304.01 Description. This work shall consist of furnishing, placing and compacting one or more courses of aggregate, and additive if required, on a prepared surface in accordance with these specifications, in reasonably close conformity with the lines, grades, thickness and typical cross sections shown on the plans or established by the Engineer.

304.02 Aggregate. The aggregate shall be the following size and shall meet the requirements of 703.04.

| Seive Size | Total Percent Passing |
|------------|-----------------------|
| 2 inch     | 100                   |
| 1 inch     | 70-90                 |
| ¾ inch     | 50-85                 |
| No. 4      | 25-60                 |
| No. 40     | 7-30                  |
| No. 200    | 0-15                  |

Aggregate acceptance shall be determined prior to incorporation into the work based on samples taken from stockpiles.

Aggregate shall have a moisture content at or near optimum, as determined by the Engineer, at the time of loading for hauling to the project site.

304.03 Placing. The maximum compacted thickness of any one layer shall not exceed three inches; except when vibratory equipment is used in conjunction with other methods of compaction, the compaction depth of a single layer may be increased to six inches. When the required compacted depth of the base course exceeds six inches, the base shall be constructed in two or more layers of approximate equal thickness.

The aggregate shall be placed with self-propelled spreading machines capable of placing the aggregate true to line and grade. Approved hand placing methods may be used when the total area of base course is 2,000 square yards or less, or in small areas where machine spreading is impractical.

Unless the base course is placed in a trench section, the edges shall be backed up with an 18-inch width of soil, placed to such a height of the lift being compacted and furnish positive lateral support during compaction of the course.

Adequate surface drainage of the berm shall be provided at all times.

304.04 Compaction. At the beginning of the compaction operation, the density requirement shall be determined by compacting a short section, at the direction of the Engineer, until no further increase in density is obtained. The remainder of the course shall be compacted to a density not less than 98 percent of the test density. A new density requirement may be determined when the aggregate characteristics change appreciably. The surface of each layer shall be maintained during the compaction operations in such a manner that a uniform texture is produced and the aggregates firmly keyed. Water shall be uniformly applied over the base

materials during compaction in the amount necessary to maintain the moisture at or near optimum.

The finished surface shall not vary more than 3/8 inch from a 10-foot straightedge parallel to the centerline nor more than 1/2 inch from a template conforming to the required cross section. The Contractor shall furnish straightedges, templates or other devices satisfactory to the Engineer and check the surface for conformance with these requirements.

The base shall be sprinkled as required to maintain the moisture content until covered by subsequent construction.

304.05 Method of Measurement. Aggregate base course will be measured by the number of cubic yards computed from plan lines.

Water added to the materials during compaction shall be included in the price bid per cubic yard of aggregate base.

Where variable depth is specified, the number of cubic yards, of aggregate will be measured by conversion from weight on the following basis:

Crushed stone.....4,000 lbs. per cu. yd.  
Crushed gravel.....4,000 lbs. per cu. yd.

304.06 Basis of Payment. Payment for accepted quantities, complete in place, will be made at contract prices bid for:

| Item | Unit        | Description    |
|------|-------------|----------------|
| 304  | Cubic Yard  | Aggregate Base |
| 304  | Square Yard | Aggregate Base |

#### ITEM 305 – PORTLAND CEMENT CONCRETE BASE

The various sections of Item 305 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

#### ITEM 310 – SUBBASE

|        |                       |
|--------|-----------------------|
| 310.01 | DESCRIPTION           |
| 310.02 | MATERIALS             |
| 310.03 | CONSTRUCTION METHODS  |
| 310.04 | METHOD OF MEASUREMENT |
| 310.05 | BASIS OF PAYMENT      |

310.01 Description. This work shall consist of furnishing, placing and compacting subbase in reasonably close conformity with the lines, grade, and cross sections shown on the plans established by the Engineer.

Materials furnished under this item shall be durable gravel, sand, or crushed stone. When testing an aggregate proposed for use under this item and it is a type such that the major portion of the unsound material acquires a mud-like condition when tested in accordance with AASHTO T 104, the soundness loss shall not exceed five percent. Gravel, sand, and crushed stone shall meet one of the following gradings at the time of incorporation into the work:

|         | Total Percent Passing |           |           |           |
|---------|-----------------------|-----------|-----------|-----------|
|         | Grading A             | Grading B | Grading C | Grading D |
| 3 inch  | 100                   | 100       | 100       | 100       |
| 2 inch  | 90-100                | 95-100    | 90-100    | 95-100    |
| 1 inch  | 70-100                |           | 70-100    |           |
| No. 10  | 25-75                 | 40-100    | 25-75     | 40-100    |
| No. 200 | 0-10                  | 0-10      | 5-15      | 5-15      |

Broken salvaged road metal may be used provided it will all pass a three inch square sieve and not more than 20 percent will pass a No. 200 sieve.

The fraction of these materials passing a No. 40 sieve shall have a liquid limit not greater than 30 and a plasticity index not greater than six.

Material containing free water shall not be placed upon the subgrade.

Where materials from an untested source is furnished, the Contractor shall submit to the Engineer at least ten days in advance of delivery of such material to the work, a report from an accredited test laboratory showing test data which show that the source is capable of furnishing material meeting the requirements of these specifications, in sufficient quantity for the work and showing the location of the source.

310.03 Construction Methods. The subbase material shall be spread upon the subgrade after the prescribed subgrade and subbase drainage has been placed except that for Portland cement concrete pavements, shallow pip underdrains need not be placed prior to the placing subbase material, providing adequate surface drainage of the subgrade is maintained during construction. The material shall be spread with approved spreaders capable of spreading the material to the requirements for smoothness and crown.

The subbase shall be constructed in layers not to exceed six inches compacted depth except that for variable subbase used under concrete pavement or in the shoulder adjacent to concrete pavement, the material may be placed in single course thickness of not more than eight inches compacted depth. The moisture content shall be determined by the Engineer to obtain the desired compaction. Subbase material which does not contain sufficient moisture to compact in accordance with this section shall be sprinkled with water as directed by the Engineer. The water shall not be applied in a manner that will soften the subgrade. The cost of all work connected with the water operation shall be included in the price bid for 310, Subbase.

At the beginning of the work the Contractor shall build a test section for the purpose of the Engineer determining density requirements for the material to be placed. With the moisture content of the material near optimum, the compaction of the test section shall be continued with approved compaction equipment, consisting of rollers alone or vibratory equipment and rollers, until there is no appreciable increase in density as determined by test. Approved compaction equipment shall consist of rollers alone or vibratory equipment and rollers. Vibratory equipment alone may be used only where subbase material is of such a nature that it will not support rollers. For the remainder of the work the subbase course shall be compacted until the density is at least 98 percent of the weight in the test section. During the construction of the project, if there is an appreciable change in grading of material or a change of source of material, a new test section shall be built in order to establish a new weight for the density requirement.

Compaction of the subbase course shall immediately follow the spreading operation.

The finished surface of this course shall have sufficient stability to support loaded construction equipment used in construction of this and the subsequent course without rutting or deflection in excess of the surface tolerance permitted herein. When material falling within a grading permitted by this specification is used and surface stability cannot be obtained, a sufficient quantity of crushed angular material shall be added to secure the stated stability.

The finished surface for the subbase shall conform to the plan requirements within the tolerances set forth under 203.06.

Any irregularities or depressions that develop in the finished surface of the subbase under rolling shall be corrected by loosening the surface and adding or removing material and re-compacting until the surface presents a smooth regular appearance.

310.04 Method of Measurement. The quantity measured shall be the number of cubic yards, computed from plan lines, of approved subbase material compacted in place.

310.05 Basis of Payment. Payments for accepted quantities, complete in place, will be made at contract price bid for:

| Item | Unit        | Description |
|------|-------------|-------------|
| 310  | Cubic Yards | Subbase     |

## SECTION 400 – FLEXIBLE PAVEMENT

### ITEM 401 – PLANT MIX PAVEMENT – GENERAL

|        |                                 |
|--------|---------------------------------|
| 401.01 | DESCRIPTION                     |
| 401.02 | COMPOSITION                     |
| 401.03 | MATERIALS                       |
| 401.04 | MIXING PLANTS                   |
| 401.05 | WEATHER LIMITATIONS             |
| 401.06 | BITUMINOUS MATERIAL PREPARATION |

|        |                                  |
|--------|----------------------------------|
| 401.07 | AGGREGATE PREPARATION            |
| 401.08 | MIXING                           |
| 401.09 | HAULING                          |
| 401.10 | BITUMINOUS PAVERS                |
| 401.11 | ROLLERS                          |
| 401.12 | CONDITIONING EXISTING SURFACE    |
| 401.13 | SPREADING AND FINISHING          |
| 401.14 | COMPACTION                       |
| 401.15 | JOINTS                           |
| 401.16 | SPREADING AND SURFACE TOLERANCES |
| 401.17 | METHOD OF MEASUREMENT            |
| 401.18 | BASIS OF PAYMENT                 |

401.01 Description. These specifications include general requirements applicable to all types of plant mix bituminous pavements irrespective of gradation of aggregate, kind and amount of bituminous material, or pavement use. Deviations from these general requirements will be covered in the specific requirements for each type.

This work shall consist of one or more courses of bituminous mixture constructed on the prepared foundation in accordance with these specifications and the specific requirements of the type under contract, and in reasonably close conformity with the lines, grades, and typical cross sections shown on the plans or established by the Engineer.

Bituminous plant mix pavement thickness shown on the plans or stated in the proposal is for exclusive use in the calculating the weight required to be placed per unit of surface area.

401.02 Composition. The bituminous plant mix shall be composed of a mixture of uniformly graded aggregate and specified type and grade of bituminous material.

The composition table for the type under contract specified the limits within which the job-mix formula will be set by the Engineer after examination of the materials the Contractor proposes to use. Should the Contractor propose to change the source of the materials, sufficient notice shall be given the Engineer that samples may be taken and the job-mix formula checked prior to making the change.

The Engineer will establish a job-mix formula which will produce a satisfactory mix may make changes as required; not change, however, shall be made unless authorized by the Engineer.

During production, variation from the job-mix formula of plus or minus three percent passing the No. 6 sieve or plus or minus 0.3 percent bitumen shall be investigated and corrected by the Contractor.

A variation from the job-mix formula of plus or minus five percent passing the No. 6 sieve or plus or minus 0.5 percent bitumen shall be sufficient cause for the Engineer to order production discontinued until the cause of the variation is corrected.

401.03 Materials. Materials shall be:

|   |                          |
|---|--------------------------|
| Aggregates  | 703.05                   |
| Bituminous Material<br>(301, 302, 402, 403, 404, 412) | 702.01                   |
| Bituminous Material<br>(401.12)                       | 702.01, 702.02 or 70???? |

Aggregate and bituminous material shall be sampled in accordance with 106.01.

401.04 Mixing Plants. Plants shall be approved by the Engineer prior to preparation of the mixtures.

401.05 Weather Limitations. Bituminous plant mix shall not be placed under the following conditions: when the surface is wet, when the air temperature is below 40F. or when weather conditions otherwise prevent proper handling or finishing.

401.06 Bituminous Material Preparation. The bituminous material shall be heated and delivered to the mixer within the temperature range specified in 702.00. Bituminous material shall not be used while foaming.

401.07 Aggregate Preparation. Aggregates shall be fed to the cold elevator in their proper proportions and at a rate to permit correct and uniform control of heating and drying. All aggregates in the hot bins that will produce a mix outside the temperature limits or that contain sufficient moisture or expanding gases to cause foaming in the mixture shall be removed and returned to the proper stockpiles.

401.08 Mixing. When batch mixing is used, the order or sequence in which the several aggregates are drawn or weighed shall be determined by the Engineer. After all of the aggregate is in the mixer, the bituminous material shall be added in an evenly spread sheet over the full length of the mixer. The mixing time shall be the interval between the start of application of the bituminous material and the opening of the mixer gate. All bituminous material required for one batch shall be discharged in not more than 30 seconds. The Engineer will establish minimum mixing time of not less than 30 seconds.

When continuous mixing is used the bituminous material shall be added in an evenly spread sheet over the full width of the mixer at the charging end. The Engineer shall establish mixing time of not less than 30 seconds. The mixing time is a ratio of pounds of deadload of the mixer to the pounds per second delivered. The deadload shall be determined by weighing a mixer full of material. The pounds per second delivered shall be determined by timing and weighing a load of mixed material.

Temperatures of the several mixtures at the plant shall be maintained within the ranges set by the Engineer for the mix design. The temperature of the mixture on arrival at the project site shall be as determined by the Engineer in keeping with the temperature range set for the mix design and heat losses in transit.

401.09 Hauling. Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been thinly coated with a minimum amount of approved

material to prevent the mixture from adhering to the beds. Each truck shall have a securely fastened, waterproof cover of suitable material to adequately protect the mixture from the weather. At the request of the Engineer covers shall be removed prior to dumping into the paver.

When hot mixtures are being transported at prevailing air temperatures below 50F. or when the length of haul exceeds 20 miles, all truck beds shall be insulated to maintain workable temperature of the mixture, and all covers shall be fastened as to exclude all wind. The maximum distance mixtures may be transported from mixing plant to paving site shall not exceed 50 miles except by specific permission of the Engineer.

401.10 Bituminous Pavers. Bituminous pavers shall be self-contained, power-propelled units capable of spreading and finishing courses of bituminous plant mix material in lane widths applicable to the specified typical sections and details shown on the plan. Pavers shall be equipped with hoppers, distributing screws, and activated screeds with the controls or adjustments necessary to place a uniformly textured mat within spreading and surface tolerances.

Self-powered spreaders approved by the Engineer may be used in shoulder, widening or other construction where the use of bituminous pavers are not practical.

401.11 Rollers. Rollers shall be of the standard steel wheel and pneumatic tire types meeting the minimum requirements of the following tables. All ballasting shall conform to manufacturer's specifications.

| Roller Type  | Steel Wheel Rollers |        |                   |                    |
|--|---------------------|--------|-------------------|--------------------|
|  | Three Wheel         | Tandem | Three-Axle Tandem | Trench             |
| Total weight, tons                                 | 10                  | 8-12   | 12-20             |                    |
| Compression rolls, pounds per inch width, minimum  | 300                 | 200    | 240               | 300                |
| Capacity, tons per hour of mixture placed, maximum | 30                  | 30     | 30                | .08 per inch width |

| Roller Designation                                 | Pneumatic Tire Rollers    |                           |
|--|---------------------------|---------------------------|
|  | P-1                       | P-2                       |
| Number of wheels, minimum                          | 9*                        | 9                         |
| Tire size, minimum                                 | 9:00 x 20                 | 7:50 x 15                 |
| Gross tire contact area, minimum                   | 60 square inch            | -----                     |
| Average tire contact pressure, minimum             | 85 pounds per square inch | 55 pounds per square inch |
| Capacity, tons per hour of mixture placed, maximum | 90                        | 30                        |

\* For rollers equipped with a minimum tire size of 13:00 x 24, the minimum number of wheels shall be seven.

Pneumatic tire rollers shall be self-propelled, reversible units with vertical oscillation on all wheels on at least one axle. Tire inflation pressure shall be determined by the Contractor to meet the specified minimum contact area and contract pressure requirements. The Contractor shall furnish tire manufactures' charts or tabulations for verification of the required inflation pressure by the Engineer. Tire inflation pressure shall be checked by the Contract as directed by the Engineer and shall be maintained within five pounds per square inch of the required pressure.

Rolls and wheels shall be provided with the necessary accessories to prevent adhesion of the mixture and shall be kept properly moistened with water or water containing a detergent or other approved additive. The use of excess liquid will not be permitted.

401.12 Conditioning Existing Surface. Immediately prior to the arrival of pavement mixtures, the base, leveling course or old pavement shall have been thoroughly cleaned of all soil or foreign materials. All unstable or fatty patches of surplus bituminous material shall be removed from the old pavement and replaced, where necessary, with suitable material, before spreading of any of the bituminous mixtures.

When the surface of the existing pavement is irregular, it shall be brought to uniform grade and cross section as directed using the material specified.

Contact surfaces of curbing, gutters, manholes, and other structures shall be painted with a thin, uniform coating of bituminous material prior to the bituminous mixture being placed against them.

Where mixture is to be placed against the vertical face of rigid pavement, the vertical face shall be cleaned of foreign material and given an application of bituminous material in a manner which results in a coating of approximately  $\frac{1}{4}$  gallon per square yard.

401.13 Spreading and Finishing. The mixture shall be spread on an approved surface with bituminous pavers or spreaders in accordance with a weight to volume conversion at the rate of 4,000 pounds per cubic yard for stone or gravel aggregate. The weight required to be placed per unit of area shall be calculated from the plan lines and dimensions. Variable depth courses shall be placed as required on the plan or as directed by the Engineer.

Immediately after the mixture is spread, irregularities in grade and alignment shall be corrected by the addition or removal of mixture before compaction is started.

Any areas showing an excess or deficiency of bituminous material before or after compaction shall be removed and replaced.

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading or finishing equipment impracticable, the mixture may be spread, raked, and luted by hand tools. For such areas the mixture shall be dumped, spread, and screeded to give the required weight per unit of area.

401.14 Compaction. Immediately after the bituminous mixture has been spread, stuck off and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.



For all hot bituminous mixtures, the number and type of rollers shall be sufficient to compact the mixture at the hourly rate of spreading without exceeding the capacity of the rollers in operation established in 401.11. For base and intermediate courses, steel wheel rollers may be used in any combination and may be supplemented by pneumatic tire rollers. For surface courses, a three wheel roller shall be used for the initial rolling and a tandem roller for the final rolling. These rollers may be supplemented by additional steel wheel rollers or by pneumatic tire rollers operating in the intermediate position. In small areas a single tandem roller may be used.

Unless otherwise directed, rolling shall begin at the sides and proceed longitudinally parallel to the centerline at a slow, uniform speed. After each coverage or complete round trip, the roller shall progress toward the crown of the road by overlapping the previous pass by at least one-half of the width of the compression roll. On superelevated curves, the rolling shall begin at the low side and progress toward the high side. In all cases where a longitudinal joint is being made, it shall be rolled first and then followed by the applicable rolling procedure.

Rolling shall be continued until full coverage of the course has been completed and all roller marks are eliminated. Care shall be taken to prevent displacement of the edge line and grade. Where displacement occurs, the area shall be corrected immediately in a manner satisfactory to the Engineer.

Along curbs, headers, walls and in other areas not accessible to rollers, the mixture shall be thoroughly compacted with hot, hand tampers or with mechanical tampers. On depressed areas, trench rollers or rollers fitted with compression strips may be used.

Mixture that becomes loose, broken, contaminated, or otherwise defective shall be replaced with fresh, hot mixture compacted to conform with the surrounding area.

401.15 Joints. Placing of the bituminous paving shall be as continuous as possible. Longitudinal and transverse joints shall be made in a careful manner. Joints shall be “set up” at the proper height above the adjacent construction to receive maximum compaction. A well bonded and sealed joint is required; if necessary to achieve this result, the joint shall be painted with the bituminous material used in the mixture as directed by the Engineer.

401.16 Spreading and Surface Tolerances. When a uniform course is specified, the Contractor shall continuously maintain the weight-area placement within a tolerance of plus or minus ten percent of the required calculated weight. The Engineer will make periodic checks and may direct changes found to be necessary.

When variable depth courses are specified, the Contractor shall place the mixture at rates in accordance with the intent of the plans or as directed by the Engineer.

The transverse slope of the surface of the completed course shall not vary from the specified slope by more than  $\frac{3}{8}$  inch in ten feet.

The surface of each completed course shall not vary from the testing edge of a 10-foot straightedge by more than the tolerance specified for the type under contract. The Contractor

shall furnish straightedges and straightedges equipped with levels or other devices satisfactory to the Engineer and shall check the surface for conformance with requirements.

Portions of the completed pavement that are defective in surface, composition or composition shall be removed and replaced to otherwise corrected in a manner satisfactory to the Engineer.

401.17 Method of Measurement. The number of tons of asphalt concrete or bituminous aggregate base to be paid for under this item shall be the number of tons placed, completed and accepted according to plant batch weight or truck scale weight tickets. When uniform courses are specified, the number of tons to be paid for shall not exceed the quantity calculated from plan lines and dimensions.

401.18 Basis of Pavement. All work performed and measured as prescribed above will be paid for as provided in the respective items for each type.

#### ITEM 401 – ASPHALT CONCRETE INTERMEDIATE COURSE

|        |                                  |
|--------|----------------------------------|
| 402.01 | DESCRIPTION                      |
| 402.02 | COMPOSITION                      |
| 402.13 | SPREADING AND FINISHING          |
| 402.16 | SPREADING AND SURFACE TOLERANCES |
| 402.18 | BASIS OF PAYMENT                 |

402.01 Description. This work shall consist of construction of an intermediate course of aggregate and asphalt cement mixed in a central plant and spread and compacted on a prepared surface in accordance with these specifications and in reasonably close conformity with the lines, grades and typical sections shown on the plans or established by the Engineer.

The general plant mix pavement specifications, 401, shall apply: deviations from these are as follows.

402.02 Composition. Coarse aggregate (No. 67) and fine aggregate shall be combined in such proportion that the resulting blend shall be as directed by the Engineer but within the following limits:

| Sieve   | Total Passing, % by Wt. |
|---------|-------------------------|
| 1 inch  | 100                     |
| ¾ inch  | 90-100                  |
| ½ inch  | 65-90                   |
| ⅜ inch  | 45-85                   |
| No. 4   | 30-70                   |
| No. 6   | 25-60                   |
| No. 50  | 3-22                    |
| No. 200 | 0-8                     |

Bitumen content shall be as directed by the Engineer within the following limits:

Bitumen (percent of total mix) 4.0 to 9.5

402.13 Spreading and Finishing. Where the mixture is placed for correcting irregularities in the existing pavement, the maximum compacted depth of any one layer shall be three inches.

402.16 Spreading and Surface Tolerances. The variation of the surface from the testing edge of the 10-foot straightedge shall not exceed ¼ inch. Variations in excess of slope or surface tolerances shall be corrected by adding or removing material in a manner satisfactory to the Engineer.

402.18 Basis of Payment. Payment for accepted quantities, complete in place, will be made at the contract price for:

| Item | Unit | Description      |
|------|------|------------------|
| 402  | Ton  | Asphalt concrete |

#### ITEM 403 – ASPHALT CONCRETE LEVELING COURSE

|        |                                 |
|--------|---------------------------------|
| 403.01 | DESCRIPTION                     |
| 403.02 | COMPOSITION                     |
| 403.13 | SPREADING AND FINISHING         |
| 403.16 | SPREADING AND SURFACE TOLERANCE |
| 403.18 | BASIS OF PAYMENT                |

403.01 Description. This work shall consist of construction an intermediate course of aggregate and asphalt cement mixed in a central plant and spread and compacted on a prepared surface in accordance with these specifications and in reasonably close conformity with the lines, grades and typical sections shown on the plans or established by the Engineer.

The general plant mix pavement specifications, 401, shall apply; deviations from these are as follows.

403.02 Composition. Coarse aggregate (No. 8) and fine aggregate shall be combined in such portions that the resulting blend shall be a directed by the Engineer but within the following limits:

| Sieve   | Total Passing, % by Wt. |
|---------|-------------------------|
| ½ inch  | 100                     |
| ¾ inch  | 90-100                  |
| No. 4   | 45-75                   |
| No. 6   | 36-65                   |
| No. 50  | 3-22                    |
| No. 200 | 0-8                     |

Bitumen content shall be as directed by the Engineer within the following limits:

Bitumen (Percent of total mix) 4.5-9.5

403.13 Spreading and Finishing. Where the mixture is placed for correcting irregularities in the existing pavement, the maximum compacted depth of any one layer shall be three inches.

403.16 Spreading and Surface Tolerances. The variation of the surface from the testing edge of the 10-foot straightedge shall not exceed ¼ inch. Variations to excess of slope or surface tolerances shall be corrected by adding or removing material in a manner satisfactory to the Engineer.

403.18 Basis of Payment. Payment for accepted quantities. Complete in place will be made at the contract place, will be made at the contract price for:

| Item | Unit | Description      |
|------|------|------------------|
| 403  | Ton  | Asphalt concrete |

Item 404 – Asphalt Concrete Surface Course:

|        |                                  |
|--------|----------------------------------|
| 404.01 | DESCRIPTION                      |
| 404.02 | COMPOSITION                      |
| 404.12 | CONDITIONING EXISTING SURFACE    |
| 404.13 | SPREADING AND FINISHING          |
| 404.16 | SPREADING AND SURFACE TOLERANCES |
| 404.18 | BASIS OF PAYMENT                 |

404.01 Description. This work shall consist of constructing a surface course of aggregate and asphalt cement mixed in a central plant and spread and compacted on a prepared surface in accordance with these specifications and in reasonably close conformity with the lines, grades and typical sections shown on the plans or established by the Engineer.

The general plant mix pavement specifications, 401; shall apply deviations from these are as follows.

404.02 Composition. Coarse aggregate ( No. 8) and fine aggregate shall be combined in such proportions that the resulting blend shall be as directed by the Engineer but within the following limits:

| Sieve   | Total Passing, % by Wt. |
|---------|-------------------------|
| ½ inch  | 100                     |
| ¾ inch  | 90-100                  |
| No. 4   | 45-75                   |
| No. 6   | 36-65                   |
| No. 50  | 3-22                    |
| No. 200 | 0-8                     |

Bitumen content shall be as directed by the Engineer within the following limits:

Bitumen (Percent of total mix) 4.5-9.5

404.12 Conditions Existing Surface. In areas where the surface is required to be feathered to meet an adjoining surface, the existing surface shall be coated uniformly with a thin coat of asphalt cement approximately two feet in width.

404.13 Spreading and Finishing. The surface course shall be placed within ten days after completion of the intermediate course unless otherwise authorized by the Engineer.

Traffic shall not be permitted on the compacted mixtures until it has cooled sufficiently to prevent glazing as determined by the Engineer.

After completion of the surface course, gutters shall be sealed with asphalt cement as directed by the Engineer. The material shall be applied at a uniform width of approximately 12 inches and at a rate just sufficient to fill surface voids.

404.16 Spreading Surface Tolerances. The completed surface course will be checked with straightedges and/or rolling straightedges by the Engineer. The variation of the surface course from the testing edge of the 10-foot straightedge shall not exceed ¼ inch. Variations in excess of slope or surface tolerances shall be corrected by removal of mixtures to neat lines and replacement or by surface grinding in a manner satisfactory to the Engineer.

404.18 Basis of Payment. Payment for accepted quantities, complete in place, will be made at the contract price for:

| Item | Unit | Description      |
|------|------|------------------|
| 404  | Ton  | Asphalt concrete |

Item 405 – Bituminous Cold Mix

The various sections of Item 405 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: Where references are made to The Director revise to Engineer.

Item 406 – Bituminous Road Mix

The various sections of Item 406 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by references, with the following exceptions: Where references are made to The Director revise to Engineer.

Item 407 – Tack Coat

The various sections of Item 407 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

#### Item 408 – Prime Coat

The various sections of Item 408 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

#### Item 409 – Seal Coat

The various sections of Item 409 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: Where references are made to The Director revise to Engineer.

#### Item 410 – Traffic Compacted Surface

The various sections of Item 410 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

#### Item 411 – Stabilized Crushed Aggregate

The various sections of Item 411 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

#### Item 412 – Asphalt Concrete

The various sections of Item 412 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

#### Section 450 – Rigid Pavement

##### Item 451 – Reinforced Portland Cement Concrete Pavement

The various sections of Item 451 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

##### Item 452 – Plain Portland Cement Concrete Pavement

The various sections of Item 452 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

Item 454 – Plain Portland Cement Concrete Pavement With Integral Curb

|        |                       |
|--------|-----------------------|
| 454.01 | Description           |
| 454.02 | Method of Measurement |
| 454.03 | Basis of Payment      |

454.01 Description. This work shall consist of constructing a Portland Cement Concrete Pavement and an integrally formed curb on a prepared subgrade or base course in accordance with these specifications and in reasonably close conformity with the lines, grades, thicknesses and typical cross sections shown on the plans or established by the Engineer. This item shall conform to the same specifications and requirements as prescribed in 451 except that:

- (a) Fabricated steel reinforcement is not required. Load transfer devices are required only at transverse expansion and construction joints.
- (b) Transverse construction joints shall be constructed in accordance with standard drawings. Longitudinal joints shall be constructed between lanes in accordance with 451.08 (a).
- (c) All sawed or formed joints shall be sealed with joint filler conforming to 705.01, 705.02 or 705.11.

454.02 Method of Measurement. The yardage under this item will be the number of square yards completed and accepted in place. The width for measurement will be the width of the pavement and curb shown on the typical cross sections of the plans and additional widening where called for, or as otherwise directed by the Engineer. The length will be measured horizontally along the centerline of each roadway or ramp. The plan quantities as adjusted for changes, errors, and deviations in excess of allowable tolerances will be the method of measurement.

454.03 Basis of Payment. The accepted quantities of concrete pavement and curbing will be paid for at the contract unit price per square yard which price and payment shall be full compensation for furnishing and placing all materials; provided, however, that for pavement found deficient in thickness only the reduced price stipulated in 451.16 shall be paid.

No additional payment over the unit contract bid price will be made for any pavement which has an average thickness in excess of that shown on the plans.

Payment will be made under:

| Item | Unit        | Description   |
|------|-------------|---|
| 454  | Square Yard | Plain Portland Cement concrete pavement with integral curb. |

Item 499 – Concrete – General

|        |             |
|--------|-------------|
| 499.01 | Description |
| 499.02 | Materials   |

- 499.03 Proportioning
- 499.04 Equipment
- 499.05 Handling, Measuring, and Batching Materials
- 499.06 Mixing Concrete
- 499.07 Concrete Strength Requirements

499.01 Description. This work shall consist of proportioning and mixing concrete.

499.02 Materials. Materials shall be:

|                               |   |
|-------------------------------|---|
| Fine aggregate* .....         | 703.02  |
| Coarse aggregate.....         | 703.02  |
| Portland cement.....          | 701.01, 701.02, 701.03, 701.04,<br>701.05, 701.06 |
| Air entraining admixture..... | 705.10  |

\* 703.02 natural sand is required in 451, 452, 611, and 511 deck slabs.

Water used in concrete shall be free from sewage, oil, acid, strong alkalis or vegetable matter, and also shall be free from clay and loam. Water which is potable is satisfactory for use in concrete.

499.03 Proportioning. Proportioning shall be based on predetermined cement content. Except as otherwise provided herein, each cubic yard of concrete shall contain the specified number of sacks of cement as determined by the yield test. The water-cement ratio shall not exceed the maximum specified. Below this limit the quantity of water shall be adjusted to meet the slump requirements.

Concrete shall contain four to seven percent of entrained air; except that for walks, median pavement, combination curb and gutter, curbs other than integral curbs, and 511 curbs, walks and parapets, the concrete shall have six to nine percent of entrained air.

Slump, when tested in accordance with ASTM C-143, shall be maintained within the range of  $\frac{3}{4}$  to four inches, unless otherwise specified.

When used in paving, tests shall be made on plastic concrete after it is placed on the subbase. Tests for structure concrete shall be made at the site of the work at the time the concrete is being placed.

The weights of fine and coarse aggregate and the quantity of water per sack of cement shall be determined by the Engineer from the weights given in the Concrete Table, using not to exceed the net amount of water shown and the range in slump stated. If high-early-strength concrete is desired, the Contractor may use, at his own expense, additional cement, approved water-reducing or set-retarding agents or a combination of these.

The weights specified in the Concrete Table were calculated for aggregates of the following bulk specific gravities; slag 2.30, natural sand and gravel 2.62, limestone 2.65. For



aggregates of specific gravities, weights in the table shall be corrected as indicated in paragraph (c).

| Concrete Table           |                               |            |              |  |   |
|--------------------------|-------------------------------|------------|--------------|--|---|
| Type of Coarse Aggregate | Dry Aggregates                |            |              | Cement Content per Cu. Yd. Of Concrete | Net Water Content, gallon per sack, Minimum |
|                          | lb per sack (94 lb) of Cement | Fine Aggr. | Coarse Aggr. |  |   |
| Class A                  |                               |            |              |  |   |
| Gravel                   | 508                           | 585        | 1093         | 3.1                                    | 11.5  |
| Limestone                | 503                           | 587        | 1090         | 3.1                                    | 11.5  |
| Class B                  |                               |            |              |  |   |
| Slag                     | 300                           | 140        | 440          | 6.75                                   | 5.0   |
| Limestone                | 285                           | 175        | 460          | 6.75                                   | 5.0   |
| Class C                  |                               |            |              |  |   |
| Slag                     | 195                           | 235        | 430          | 6.5                                    | 5.75  |
| Limestone                | 180                           | 285        | 465          | 6.5                                    | 5.75  |
| Class D                  |                               |            |              |  |   |
| Slag                     | 195                           | 245        | 440          | 6.5                                    | 5.5   |
| Limestone                | 180                           | 300        | 480          | 6.5                                    | 5.5   |

Nor gravel coarse aggregate shall be permitted for use in Class "B", "C", or "D" concrete.

| Class E                  |  |            |              |       |  |   |
|--------------------------|--|------------|--------------|-------|--|---|
| Type of Coarse Aggregate | Dry Aggregates lb per sack (94 lb) of Cement | Fine Aggr. | Coarse Aggr. | Total | Cement Content per Cu. Yd. Of Concrete | Net Water Content, gallon per sack, Minimum |
| Gravel                   | 200  | 380        | 580          | 5.5   | 6.75                                   |   |
| Limestone                | 225  | 350        | 575          | 5.5   | 6.75                                   |   |
| Slag                     | 245  | 290        | 535          | 5.5   | 6.75                                   |   |
| Class F                  |  |            |              |       |  |   |
| Gravel                   | 193  | 307        | 500          | 6.0   | 5.5                                    |   |
| Limestone                | 196  | 294        | 490          | 6.0   | 5.5                                    |   |

At any time during the construction period, the relative weights of fine and coarse aggregates as determined from the above table may be varied slightly in order to insure the use of the least amount of fine aggregate which will produce workable concrete within the specified slump range. Coarse aggregates may be furnished in two separate sizes or in one size of coarse aggregate. If two separate sizes are used, they shall be No. 4 and No. 6. The single size shall be No. 57. The ratio of the No. 6 size of coarse aggregate to total coarse aggregate may be varied within the range of 40 to 60 percent by weight, to secure the most desirable and uniform gradation of the combined material. However, the total weight of aggregate per sack of cement shall not be changed except as provided in the preceding paragraph or for the following conditions or both.

- (a) For bath weights, the weights determined as described above shall be corrected to compensate for moisture contained in the aggregate at the time of use.
- (b) If it is found impossible to prepare concrete of the proper consistency without exceeding the maximum net water content specified, the total weight of aggregate shall be reduced until concrete of the proper consistency is obtained without

exceeding the maximum net water content specified. However, the Contractor shall not be compensated for any additional cement which may be required by reason of such adjustment.

- (c) If, during the progress of the work, the specified gravity of one or both of the aggregates changes, the batch weight shall be adjusted to conform to the new specific gravity.
- (d) Yield tests shall be made for the purpose of determining the cement content per cubic yard in accordance with the method on file with the Engineer. Based on these yield tests the batch weights may be adjusted provided that the specified cement factor is maintained and the maximum net water content is not exceeded.
- (e) The amount of mixing water shall be adjusted for the moisture contained in the aggregates and for the moisture which they will absorb, in order to determine the amount of water to be added at the mixer.

499.04        Equipment. Equipment shall be as follows:

- (a) Batch plant. The batching plant shall include bins, weighting hoppers, and scales for the fine aggregate, cement, and each size of coarse aggregate. The minimum graduation on the beam or dial shall not be greater than 0.2 percent of the rated capacity of the scale.

Bins with adequate separate compartments for fine aggregate and for each size of coarse aggregate shall be provided in the batching plant. The scales for weighing aggregates and cement shall be of either the beam type or the springless-dial type. They shall be accurate within 0.5 percent throughout the range of use. When beam-type scales are used, provisions, such as a "tell-tale" dial, shall be made for indicating to the operator that the required load in weighing hopper is being approached. A device on weighing beams shall indicate critical position clearly. The weigh beam and "tell-tale" device shall be in full view of the operator while charging the hopper, and he shall have convenient access to all controls.

Ten 50-pound standard test weights that conform to the regulations of the Ohio Department of Agriculture shall be provided at the batch plant for testing weighing equipment. Scales shall be tested as often as the Engineer may deem necessary to assure this continued accuracy.

All scales shall be checked and approved by the Sealer of Weights before their use will be permitted. In lieu of approval by the Sealer of Weights, the scales may be checked and approved by the scales servicing company.

- (b) Mixers. Each mixer shall have attached in a prominent place the manufacturer's plate showing the capacity of the drum in terms of volume of mixed concrete and the speed of rotation of the mixing drum or blades.

Site mixers shall be approved types capable of producing thoroughly mixed and uniform concrete within the specified mixing period, and of discharging and distributing the mixture without segregation on the prepared grade. The mixer shall be equipped with an approved timing device which automatically prevents the discharge of the batch before it has been mixed the specified minimum amount of time and which records the number of batches mixed.

Pick up or through-over blades in the drum of the mixer shall be repaired or replaced when worn down  $\frac{3}{4}$  inch or more.

Truck mixers used for mixing and hauling concrete, and truck agitators used for hauling central-mix concrete, shall conform to paragraphs 8 (a), 8 (b), 8 (c), 9 (b), 9 (d), and 9 (e) of AASHTO M 157.

Bodies of nonagitating hauling equipment for concrete shall be smooth, mortartight, metal containers, and shall be capable of discharging the concrete at a satisfactory controlled rate without segregation. Covers shall be provided when required by the Engineer. Trucks having dump bodies with fillet plates welded in the corners will be permitted for nonagitating hauling.

499.05 Handling, Measuring and Batching Materials. Aggregates from different sources and of different gradings shall not be stockpiled together. Aggregates that have become segregated, or mixed with earth or foreign material, shall be reworked or cleaned as directed by the Engineer, or rejected. Coarse aggregate shall be maintained with uniform moisture content not less than its maximum absorbed moisture by the use of an adequate system of water sprays.

499.06 Mixing Concrete. The concrete may be mixed at the site of the work, in a central mix plant, or in truck mixers. The mixer shall be of an approved type.

When mixed at the site of the work, the mixing time shall be not less than 50 seconds. Mixing time for the central mixers shall be 60 seconds. Mixing time begins when all materials are in the drum and ends when the discharge begins. Transfer time in multiple drum mixers is included in mixing time. The contents of an individual mixer drum shall be removed before a succeeding batch is emptied therein.

Ready-mixed concrete shall be mixed and delivered in accordance with 499.04 (b). The concrete shall be delivered to the site of the work and discharge shall be completed within one hour after the addition of the cement to the aggregates.

Mixers shall be operated at a drum speed as shown on the manufacturer's name plate on the approved mixer. The volume of concrete mixed per batch shall not exceed the mixer's nominal capacity in cubic feet, as shown on the manufacturer's standard rating plate on the mixer, except that an overload of ten percent may be permitted when paving mixers are operated on grades in excess of six percent, and an overload of 20 percent if the grade is six percent or less provided all parts of the mixer will hold the overcharge without spillage.

Mixed concrete from the central mixers shall be transported in truck mixers, truck agitators, or trucks having nonagitating bodies. The time elapsing from the time water is added to the mix until the concrete is incorporated in the work shall not exceed 45 minutes when the concrete is hauled in nonagitating trucks, nor 60 minutes when hauled in truck mixers or truck agitators.

Retempering concrete by adding water or by other means will NOT BE PERMITTED. When concrete is delivered in transit mixers or agitators, additional water within the limits specified may be added and sufficient mixing performed to adjust the slump and to regenerate the specified air content throughout the batch, provided all these operations are performed prior to discharging any of the batch and within the above time limitations.

Admixtures for increasing the workability or for accelerating the set will be permitted only when specifically provided for in the contract, or upon written permission of the Engineer.

The fine aggregate and each size of coarse aggregate shall be separately weighed into hoppers in the respective amounts set by the Engineer as outlined in 499.03. Separate scales and hoppers shall be used for weighing the cement with a device to indicate positively the complete discharge of the batch of cement into the batch box.

When mixing is at the site of the work, aggregates shall be transported from the batching plant to the mixer in batch boxes, vehicle bodies, or other containers of adequate capacity and construction to properly carry the volume required. Partitions separating batches shall be adequate and effective to prevent spilling from one compartment to another while in transit or being dumped. The Contractor shall use a suitable method of handling the bulk cement from weighing hopper to transporting container or into the batch itself for transportation to the mixer, with chute, boot, or other approved device, to prevent loss of cement and arrange to provide positive assurance of the actual presence in each batch of the entire cement content specifics.

Bulk cement shall be transported to the mixer in tight compartments carrying the full amount of cement required for the batch, between the fine and coarse aggregates, or in case of a one-stop plant it may be blended directly with the aggregate provided that the introduction of the cement to the blend is delayed until the bed of the truck is covered with aggregate and in no case shall any cement be discharged after the last of the aggregate. When the cement is placed in contact with the aggregates, batches may be rejected unless mixed within 1-½ hours of such contact.

Batches shall be delivered to the mixer separately and intact. Each batch shall be dumped into the mixer without appreciable loss of cement and without spilling of material from one batch compartment into another. Batching shall be so conducted as to result in the weights of each material required within a tolerance of one percent for cement and two percent for aggregates.

Water may be measured either by volume or by weight. The accuracy of measuring the water shall be within a range of error of not over one percent. Unless the water is to be weighed, the water measuring equipment shall include an auxiliary tank from which the measuring tank shall be filled. Means shall be provided for readily and accurately determining the amount of water in the measuring tank. The volume of the auxiliary tank shall be at least equal to that of the measuring tank.

Methods and equipment for adding air-entraining agent or other admixtures into the batch, when required, shall be approved by the Engineer. All admixtures shall be measured into the mixer with an accuracy of plus or minus one percent.

499.07 Concrete Strength Requirements.

| Class   | Min. Allowable Compressive Strength at 28 days |
|---------|--|
| Class C | 4000 psi                                       |
| Class D | 4000 psi                                       |
| Class E | 34000 psi                                      |

SECTION 500 – STRUCTURES

Item 501 – Structures General

|        |                            |
|--------|----------------------------|
| 501.01 | Description                |
| 501.02 | Verification of Dimensions |
| 501.03 | Foundation Information     |
| 501.04 | Approval of Fabricator     |
| 501.05 | Shop Drawings              |
| 501.06 | Approval of Plans          |
| 501.07 | Mill Test Reports          |
| 501.08 | Utilities                  |
| 501.09 | Erection Stresses          |
| 501.10 | Traffic                    |

501.01 Description. Structures shall be built as indicated on the plans, conforming to the lines, grades and dimensions shown on the plans, and in accordance with the specifications for the various items which constitute the complete structure.

The Contractor shall so plan and carry on his work, including fabrication, erection, and construction, that the structure as a whole and all its component parts will function as contemplate in the design.

501.02 Verification of Dimensions. So far as is possible the Contractor shall verify all dimensions established by the Engineer and satisfy himself as to the correctness thereof and the mutual agreement of parts.

501.03 Foundation Information. The Owner assumes no responsibility for the accuracy of sounding, test boring or rock elevation shown on the plans, even though this information is the result of field investigation.

501.04 Approval of Fabricator. Before any steel or prestressed concrete members requiring fabrication are ordered by the Contractor, the fabricator or fabricators shall be approved by the Engineer. Request for such approvals shall be made in writing on or before the date of the award of construction.

501.05 Shop Drawings. Structural steel requiring shop fabrication and Prestressed concrete members shall be detailed by the contractor in accordance with the “Design Specifications for Highway Structures” of the State of Ohio, Department of Transportation in effect on the date of advertisement for bids, or as otherwise indicated on the Contract Plans.

The Contractor shall submit to the Engineer for review and approval, five copies of the shop drawings, unless additional copies are requested. All shop drawings shall show detailer’s and checker’s initials as an indication that details have been checked for accuracy. Fabrication shall not begin until written approval of the submitted drawings has been received from the Engineer. Following approval of the shop drawings, four complete sets shall be submitted to the Owner unless additional copies are requested.

501.06 Approval of Construction Plans. Plans for sheeting and bracing of excavation adjacent to railroad tracks shall have been approved by the Engineer and by the railroad company before work on this excavation begins. For such approval eight copies of the plans shall be submitted to the Owner if one railroad company is involved and five copies for each additional railroad company.

For cast-in-place concrete bridges over 20 feet in span, the Contractor shall submit to the Engineer for approval five (5) copies of the falsework plans, submittal being made at least 15 days before the construction of falsework is to begin. For such bridges over railroad tracks, eight copies shall be submitted, if one railroad company is involved and five copies for each additional railroad company. Such plans shall be prepared by a registered professional engineer and shall bear his signature or professional engineering seal. No superstructure materials shall be placed until approval of the plans has been obtained.

501.07 Mill Test Reports. Three certified copies of the chemical and physical tests of all structural steel, wrought iron and aluminum to be supplied for each bridge shall be furnished the Engineer showing compliance with the requirements of 711. All test reports shall be accompanied by copies of all shipping notices or invoices showing the quantity and size of material being certified. Structural steel will not be accepted for erection until the test reports have been approved by the Engineer.

The Contractor shall furnish certified copies of test reports of all the pertinent required tests of Tentative Specifications for Mild Steel Arc-Welding Electrodes (AWS A 5.1; ASTM A 233) made on electrodes of the same type, size and brand and by the same process and material as the electrodes furnished. The tests may have been for process qualification or quality control and shall have been made within one year prior to manufacture of the electrodes furnished. The Contractor shall furnish copies of the manufacturer’s certification that the process and material requirements were the same for manufacturing the tested electrodes and the furnished electrodes.

501.08 Utilities. When appurtenances for gas, water or electric lines, car tracks or other utilities are to be installed on a new structure, the Contractor shall cooperate with the utility company or agency, in their installation of these utilities, after the installation and method of installation have been approved by the Engineer.

501.09            Erection Stresses. No part of the structure shall be subjected to unit stresses that exceed by more than one-third the allowable unit stresses, as given in the Ohio Department "Design Specifications for Highway Structure: due to erection or construction onto or across the uncompleted or completed structure.

501.10            Traffic. Traffic, including heavy construction equipment, shall not be allowed on structures where concrete elements span more than ten feet until 14 days after the concrete is placed when ordinary Portland Cement concrete is used or until seven days when high-early –strength concrete is used. For structures where the concrete elements have spans of ten feet or less, the time may be reduced to seven and three days, respectively. These requirements are subject also to temperature and strength requirements as stated under 508.01. None of the above requirements may be waived except by written permission of the Engineer.

#### Item 502 – Temporary Bridge

The various sections of Item 502 of the latest edition of State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference with the following exceptions: None.

#### Item 503 – Excavation for Structures

|        |                                |
|--------|--------------------------------|
| 503.01 | Description                    |
| 503.02 | Classification                 |
| 503.03 | Cofferdams, Cribs and Sheeting |
| 503.04 | Protection of Excavation       |
| 503.05 | Footings in Rock               |
| 503.06 | Approval of Foundations        |
| 503.07 | Additional Excavation          |
| 503.08 | Disposal of Excavated Material |
| 503.09 | Backfill                       |
| 503.10 | Method of Measurement          |
| 503.11 | Basis of Payment               |

503.01            Description. This work shall consist of the excavation of all materials necessary for the construction of bridges culverts other than pipe culverts, foundations for culverts and for other structures, except those materials included under 200. Included in this item are (1) the constructing, maintaining and subsequent removing of cofferdams, cribs and sheeting, or other materials used for this work, (2) the providing of adequate protection of excavation where cofferdams are not separately itemized, (3) pumping, dewatering and back filling, and (4) the disposal of materials not required or not suitable for backfill.

503.02            Classification. Excavation is classified as (1) unclassified excavation, (2) unclassified excavation including rock (or shale), and (3) rock (or shale) excavation, regardless of the elevation at which the rock or shale is encountered.

503.03            Cofferdams, Cribs and Sheeting. This item shall include the construction, maintenance and subsequent removal of all cofferdams, cribs, sheeting, shorting , bracing or

other materials necessary to safely support the sides of excavations, embankments, adjacent buildings, track so other premises, and all pumping while excavating and concreting.

When sheeting is used, it shall be driven a sufficient depth below the bottom of footing, unless rock is encountered at a higher elevation, to obtain adequate stability. If practicable, cofferdams shall be so designed that the wales and cross bracing will clear the top of footings by at least one foot, and that no cross bracing will be left in the concrete. If this is not practicable, such bracing shall be of structural steel and shall be left in place. The end of such structural members that would be exposed when the structure is completed shall be boxed back at least six inches from the face of the concrete and shall be burned off at least three inches back of the concrete face. The resulting holes shall be completely filled with concrete. The ends of other such structural members shall be burned off flush with the surface of the concrete. Where water is not encountered, cofferdam sheeting may be placed on neat lines and used as forms for footing concrete, provided the requirements for wales and bracing mentioned elsewhere in this section are met. This sheeting either shall be left in place at least to top of footing or shall be properly separated from the footing concrete so that the sheeting may be removed without injury to the concrete.

Where water is encountered and cofferdam, cribs and sheeting are necessary, they shall be practically watertight before any excavation is made below water level. Drainage facilities shall be provided outside of footing forms so as to drain all water to a sump and sufficient pumping facilities shall be provided to remove all water until the concreting has progressed above water level. Subfoundation and footing concrete shall be effectively protected from displacement due to the pumping operations. If a concrete seal is used to stop the flow upward from the bottom of a cofferdam it shall be placed below the regularly planned footer and it shall be considered as a part of the cofferdam and not allowed as concrete yardage unless a seal is specifically called for on the plans.

503.04 Protection of Excavation. Excavation shall be made by such methods that the sides of all excavations are protected from caving and the original material below the bottom of footings will not be disturbed. Blasting shall not be done in a manner that will damage the material which supports the structure vertically or laterally or promotes subsequent slides that will damage the structure, road or adjacent property. Blasting shall be done by workmen thoroughly experienced in the use of explosives.

Where the material below the bottom of footings has been removed or disturbed any loose material shall be removed and the entire space filled with concrete at the Contractor's expense, except on pile foundations. In case of pile foundations the material removed or disturbed shall be replaced and compacted as directed. If caving occurs outside the excavation area, as described in 503.10, the resulting hole shall be backfilled as specified hereafter. All excavation adjacent to railroad tracks shall be done subject to the supervision of the railway company involved and shall be sufficiently braced to insure the proper support of railroad roadbed and tracks. See approval of plans for sheeting and bracing, 501.06.

503.05 Footings in Rock. Where foundations are shown as extending into rock, they shall, unless otherwise directed by the Engineer, be carried into rock the minimum distance called for on the plans, or where not otherwise called for shall extend into solid rock a distance at least equal to 2 feet 6 inches minus one-half the vertical distance from flow line down to top of



rock, with a minimum depth into rock of 3 inches, or in case of bridges of less than 20-foot span, 2 feet 6 inches minus two-thirds the vertical distance from flow line down to top of rock, with a minimum of 3 inches. Where excavations for footing is rock or hard shale, the entire portion of excavation in the rock or shale, below tops of footings, shall be completely filled with concrete, and there shall be no payment made for rock excavation or concrete outside of the footing dimensions shown on the plans.

503.06 Approval of Foundations. The Contractor shall notify the Engineer in due time as to when excavation will be completed to the depth shown on the plans and no footings shall be placed until the Engineer has approved the subfoundation.

Culvert, other than pipe and pipe-arches, may be placed directly on solid rock, if rock exists for the full length of the culvert, but boulders and unstable material, and rock over a portion of the length, shall be removed and replaced with suitable compacted material within the limits specified in 503.07.

503.07 Additional Excavation. The elevations for bottoms of footings shown on the plans shall be considered as approximate. Excavation including cofferdams to a depth of 3 feet below plan elevations of the bottoms of footings, if required, shall be done at the unit price bid for this class of excavation. This shall include any additional pumping required; and where cofferdams and pumping are a separate pay item, the lump sum price shall be considered as including any extra cost involved either for cofferdams, pumping or both, for this additional depth. Excavation deeper than this may be provided for as extra work, as described in 109.04.

For culverts other than pipe or pipe-arches, rock, boulders and unstable material shall be removed and replaced for a depth determined by the Engineer but in no case less than 6 inches below the bottom of the culvert. Rock and boulders shall be removed for a width sufficient for placing and proper compaction of the backfill. Unstable material shall be removed for a width on each side of the culvert equal to the span of the culvert.

503.08 Disposal of Excavated Material. Excavated masonry shall be disposed of in accordance with 202.03, other suitable excavated material shall be used for backfill. Material which is not needed or not suitable for backfill shall be disposed of in accordance with 203.05.

503.09 Backfill. Backfill under this item shall be considered as all replaced excavation and new embankment adjacent to structures, including that surrounding open abutments. Backfill shall be of materials meeting the requirements of 203.08.

Backfill shall be constructed in accordance with 203, except as modified in this section, and except that where soil backfill is permitted, the compaction required shall be 95 percent of maximum laboratory dry weight.

Backfill in front of abutments and around piers shall be carried to existing ground lines. All structural foundation units shall be backfilled as soon as practicable after the concrete has cured sufficiently so that it will not be damaged, to avoid the ponding of surface water and the accumulation of debris. Back fill around piers in streams and not within the embankment area need not be placed in thin layers or compacted as described for abutments, wing and retaining walls but shall be left in a near condition, due allowance being made for settlement. The

channels of all ditches or water courses shall be left free from any excavated material or other refuse incident to the work.

No backfill shall be placed against abutments, piers, or retaining walls until the walls have been approved by the Engineer. Where backfill is placed against a waterproofed surface, care shall be taken that no damage is done to the waterproofing material.

Backfill behind abutments, piers, wing walls and retaining walls will not be permitted until the concrete has attained adequate strength as determined either by the length of curing time or by the testing of standard beams. For full height of backfill, the minimum curing time shall be 14 days when ordinary Portland cement is used and seven days for high-early-strength cement concrete. For half height of backfill, the respective curing times shall be seven days and three days. These requirements are subject also to the temperature and strength requirements of 508.01.

Embankments shall not be placed over concrete structures until the same requirements for strength or age have been complied with as given for placing backfill behind abutments, wing walls and retaining walls in the preceding paragraph, except that for spans of 10 feet or less the time may be reduced to seven days in case concrete of ordinary strength is used or three days in case high-early-strength concrete is used.

Whenever a culvert is placed by trenching into existing foundation material, the back filling and operation of heavy construction equipment, after the placing of the culvert, shall be governed by the requirements of Method (b). In other instances, Method (a) and Method (b) shall be considered alternates.

Method (a). Where culverts are placed without trenching, the backfill shall be placed in layers not to exceed 4 inches in thickness (loose depth) and compacted by means of mechanical tampers or other approved mechanical compactors for a distance beyond each side of the culvert equivalent to the span of the culvert, with a maximum requirement of the feet, and a minimum depth of 2 feet over the top of the culvert, unless the finished embankment is of lesser depth.

Construction equipment, other than approved tampers and compactors, shall not be operated within the above limitations except that light weight motor graders and light weight dozers may be used after a minimum cover of 12 inches has been placed and compacted over the top of the culvert.

Heavy earth moving and compaction equipment shall be operated closer to the culvert than 4 feet until after a cover equivalent to at least one-fourth the span of the culvert, but in no case less than 2 feet, has been placed and compacted over the top of the culvert. For multiple span culverts, the span as used above shall be the longest individual span.

Any additional fill and subsequent excavation required to provide this minimum cover shall be made at no additional cost to the owner.

Method (b). Whenever a culvert is to be placed within or beneath new embankment, before placing the culvert the embankment shall be placed and compacted, in accordance with 203, to a depth of at least 2 feet above the top of the culvert unless the top of the finished

embankment is of lesser depth. A trench shall then be excavated to sufficient width for the placing of the culvert and the proper placing and compaction of the backfill.

The operation of heavy construction equipment over the culvert shall be governed by the requirements of Method (a). Additional excavation incurred by use of this alternate method shall be made at no additional cost to the owner.

503.10 Method of Measurement. The pay quantities for this item are: Cofferdams, cribs and sheeting, lump sump, if separately itemized, otherwise included with excavation; and excavation, cubic yards. After the requirements of 201, 202, and 203 have been met, the cubic yards of excavation shall be measured as a solid:

- (1) Bounded on the bottom, by they bottom plane of the footing.
- (2) Bounded on the top:
  - (a) In cut sections, by the surface of the remaining ground.
  - (b) In fill sections:
    - Where excavation is performed prior to embankment, by the surface of the original ground.
    - Where excavation is performed after embankment, by the surface of the embankment.
- (3) Bounded on the sides:
  - (a) For rock or shale excavation, by the outer edge of the footing.
  - (b) For earth excavation, one foot outside the outer edge of the footing.

For keys below footings the number of cubic yards shall be volume of key as shown on the plans.

503.11 Basis of Payment. Payment will be made at contract price for:

| Item | Unit       | Description  |
|------|------------|--|
| 503  | Lump Sum   | Cofferdams, cribs and sheeting                     |
| 503  | Cubic Yard | Unclassified excavation                            |
| 503  | Cubic Yard | Unclassified excavation including rock ( or shale) |
| 503  | Cubic Yard | Rock (or shale) excavation                         |

Item 504 Sheet Piling Left in Place

|        |                       |
|--------|-----------------------|
| 504.01 | Description           |
| 504.02 | Materials             |
| 504.03 | Driving               |
| 504.04 | Method of Measurement |
| 504.05 | Basis of Payment      |

504.01 Description. This work shall consist of the furnishing and driving of steel sheet piling to be left in place including the furnishing and installing of any specified anchor or other attachments to structures.

504.02 Materials. Used sheet piling in good condition which meets the sectional and strength requirements may be used if inspected and approved by the Engineer. Mill test reports will not be required for used sheet piling.

Where new sheet piling is specified, it shall conform to the requirements of ASTM A 328 and mill test reports will be required.

504.03 Driving. Steel sheet piling shall be driven to the penetration or bearing capacity called for on the plans

504.04 Method of Measurement. The quantity shall be the number of square feet of sheeting in place as required by the plans.

504.05 Basis of Payment. Payment will be made at contract price for:

| Item | Unit        | Description  |
|------|-------------|--|
| 504  | Square Foot | Steel sheet piling left in place (minimum section modulus of _____ in. per foot of wall) |

#### Item 505 – Test Pile

The various sections of Item 505 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference with the following exceptions: None.

#### Item 506 – Pile Test Load

The various sections of Item 506 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: Where references are made to the Director – revise to Engineer.

#### Item 507 – Bearing Piles

The various sections of Item 507 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference with the following exceptions: Where references are made to The Director revise to Engineer.

#### Item 508 – Falsework and forms

|        |              |
|--------|--------------|
| 508.01 | Falsework    |
| 508.02 | Forms        |
| 508.03 | Oiling Forms |

508.04 Payment

508.01 Falsework. Falsework shall be substantial and rigid shall not unduly obstruct any waterway, highway or railroad traffic. Intermediate bents and supports shall be so constructed as to produce in the completed structure the camber shown on the plans (in addition to any required for conformance with the profile of the highway). The maximum deflection “d”, in inches, in the longitudinal falsework members at the edges of the concrete deck shall be not more than that given by the formula:

$$\frac{S + 100}{d}$$

d = 1000, but not more than ½ inch, in which S, in inches, is the distance between bents or supports. For transverse falsework members, and for longitudinal falsework members other than those near the edges of the deck, the permissible deflection as obtained from the above formula may be increased 75 percent.

In all cases where the falsework does not rest on rock, shale, or other firm foundation material, it shall be supported on piling driven to sufficient penetration to carry the superimposed loads, in accordance with 507, but not less than eight tons per pile. Double hardwood wedges shall generally be used in connection with falsework or centering to facilitate vertical adjustment.

The Contractor shall remove and replace, at his own expense any part of the structure made unsatisfactory by settlement.

Falsework for arches shall be so constructed that it may be released gradually.

Falsework construction shall be removed before final acceptance of the structure. Falsework piling shall be cut off or pulled. If piling are cut off, they shall be cut at least to the slope line, riprap line or bed of stream.

For all bridges over 20-foot span whose main supporting members are case-in-place concrete, falsework plans must be submitted and approved according to 501.

Falsework for structures shall remain in place until the concrete has attained adequate strength as determined either by the length of curing time or by the testing of beams. For spans of ten feet or more, the minimum curing time shall be 14 days when ordinary Portland cement is used and seven days for high-early-strength cement concrete. For spans of less than ten feet, the respective curing times shall be seven days and three days. Days when the temperature of the air surrounding the concrete is below 50 F. shall be counted in curing time. When concrete strength is determined by transverse beam bending tests the average modulus of rupture of two beam tests shall be not less than 650 pounds per square inch. However, in no case shall the curing time be less seven days for ordinary Portland cement concrete and three days if high-early-strength cement is used, both subject to the above temperature requirement.

In the foregoing paragraphs, the span for a slab supported on steel beams shall be the distance center to the center of beams.

Spandrel walls, decks of arches, sidewalks and curbs or any superimposed concrete to be completed after the main supporting member or the deck is constructed shall not be placed until the falsework has been removed or released.

For continuous concrete slab or beam super structures the concrete shall not be placed on any span until the falsework and forms are complete for the adjacent spans. The falsework shall not be released or removed from any span until the concrete in adjacent spans has been placed a sufficient length of time to meet all requirements for the removal of falsework as set forth above.

Field riveting or high-strength bolting of steel truss tension chord members shall be done before the falsework is removed, but compression cord members shall not be riveted or bolted until the span is released sufficiently from the falsework to bring the compression chord joints into full bearing.

Before the field riveting or bolting is begun, the structure shall be adjusted for correct alignment and proper camber and the elevations of panel points, ends of floor beams, shall properly regulated and maintained until the bridge is swung.

508.02 Forms. All concrete shall be placed in proper forms. The use of the unprotected side of the excavation, instead of forms, will not be permitted, except as indicated in 503.05 for rock or hard shale excavation. For dry excavation as described under 503.03, cofferdams sheeting, if cofferdams substantially conform to the footing outlines, may be considered as forms for footings, but the volume of concrete paid for will be based on plan dimensions.

The forms shall be substantial and unyielding, and shall be so designed that the finished concrete will conform to the to the proper dimensions and contours. Forms for exposed surfaces shall be made of approved material requiring a minimum number of joints or dressed lumber of uniform thickness using a form liner of approved type. Forms and form liners are to be used in a manner to reduce to a minimum the joints showing on the finished surface. Advantage is to be taken of rustication strips in breaking joints to reduce the form marks showing on the finished surface. Forms shall be properly braced or tied together with approved form ties so arranged that when forms are removed, no metal will be within one inch of an exposed surface of the finished structure. An approved insert shall be used in connection with all ties in the region of exposed surfaces. No material except metal, and precast mortar blocks placed in according with 509.09, shall be permitted to remain in the concrete.

Temporary openings shall be provided at the base of column and wall forms and in the bottom of all narrow, deep members where necessary to facilitate cleaning or inspection immediately before depositing concrete.

All exposed edges shall be beveled  $\frac{3}{4}$  inch with a triangular strip built into the forms.

In order to facilitate the placing, finishing and curing of deck slabs, catwalks or working platforms shall be provided.

Where rustication is used, the molding shall be fastened to the forms in such a manner that the molding will remain in the concrete when the forms are removed. Molding for rustication shall be surfaced on all sides. This molding shall not be removed until the concrete has set sufficiently so that the edges of the concrete will not be damaged.

If weep holes through abutments or retaining walls are called for on the plans or are required to provide outlets for backfill drainage, they shall be formed in such a manner as to obtain a smooth circular opening and straight gradient through the wall. They shall be not less than three nor more than four inches in diameter, with a gradient of one inch per foot, spaced not closer than 6-foot no more than 10-foot centers, and placed so that the bottom of weep holes, at face of wall, is approximately six inches above ground line or low water elevation.

508.03 Oiling Forms. The inside of forms shall be coated with non-standing mineral oil or other approved material, prior to placing the reinforcing steel.

508.04 Payment. Falsework and forms will not be paid for separately, but their cost shall be included for payment in the price bid for the item for which they are used.

#### Item 509 – Reinforcing Steel

|        |                            |
|--------|----------------------------|
| 509.10 | DESCRIPTION                |
| 509.02 | MATERIALS                  |
| 509.03 | CARE OF MATERIAL           |
| 509.04 | METHOD OF PLACING MATERIAL |
| 509.05 | BENDING                    |
| 509.06 | SHOP ASSEMBLED UNITS       |
| 509.07 | APPROVAL OF PLACING        |
| 509.08 | SPLICING REINFORCEMENT     |
| 509.09 | SUPPORTS                   |
| 509.10 | PROTECTIVE COATING         |
| 509.11 | METHOD OF MEASUREMENT      |
| 509.12 | BASIS OF PAYMENT           |

509.01 Description. This item shall consist of furnishing and placing in concrete, reinforcing steel of the quality, type, size and quantity designated, including steel dowels. Welding or reinforcing steel shall be governed by 513.23 and as specified herein.

509.02 Materials. Reinforcing steel shall be deformed and shall conform to the intermediate and hard grade of 709.01, 709.02, 709.07 and all other 709 materials. Spiral reinforcement need not be deformed and shall conform to the structural grade of 709.01. Wire mesh shall conform to 709.10, 709.12.

The Contractor shall furnish additional reinforcing steel of each size to be used in the structure sufficient for test samples, if so required by the Engineer.

509.03 Care of Material. All reinforcing steel when received on the work, prior to its use shall be stacked off the ground and shall be kept free from dirt, oil, grease, or avoidable rust. When placed in the concrete, it shall be clean and free from loose rust.

Table 1  
Standard Bends

| Bar Number | Nominal Diameter Inches | Area Square Inches | Weight Lbs. Per Lin. Ft. | DIM % A |      | DIM % A |      | DIM % A   |       |
|------------|-------------------------|--------------------|--------------------------|---------|------|---------|------|-----------|-------|
|            |                         |                    |                          | 180°    | Bend | 90°     | Bend | 135°      | Bend  |
|            |                         |                    |                          | D       | A    | D       | A    | Stirrup D | A     |
| 3          | 0.375                   | 0.11               | 0.376                    | 2       | 5    | 2       | 4    | 2         | 4     |
| 4          | 0.5                     | 0.2                | 0.668                    | 3       | 6    | 3       | 5    | 2 1/2     | 4 1/2 |
| 5          | 0.625                   | 0.31               | 1.043                    | 4       | 7    | 4       | 6    | 3         | 5     |
| 6          | 0.75                    | 0.44               | 1.502                    | 4 1/2   | 8    | 4 1/2   | 8    |           |       |
| 7          | 0.875                   | 0.6                | 2.044                    | 5       | 10   | 5       | 10   |           |       |
| 8          | 1                       | 0.79               | 2.67                     | 7       | 13   | 7       | 11   |           |       |
| 9          | 1.128                   | 1                  | 3.4                      | 9       | 15   | 9       | 12   |           |       |
| 10         | 1.27                    | 1.27               | 4.303                    | 10      | 17   | 10      | 13   |           |       |
| 11         | 1.41                    | 1.56               | 5.313                    | 11      | 19   | 11      | 14   |           |       |
| 14S        | 1.693                   | 2.25               | 7.65                     | *       | *    | 17      | 25   | *         | *     |
| 18S        | 2.257                   | 4                  | 13.6                     | *       | *    | 23      | 33   | *         | *     |

**Tolerances:**

For diameter of bends, "D", the tolerance may be plus or minus the diameter of the bar.

For straight bars the tolerance may be plus or minus one inch.

For out to out dimensions of bent bars the tolerance may be plus or minus 1/2 inch for No. 7 bars or smaller and one inch plus or minus for No. 8 bars or larger.

For truss bars the tolerance for height may be minus 1/2 inch, with no allowances for increased height.

No weight allowances will be made for tolerances.

Tolerances listed above may not operate to reduce the clear cover to the face of concrete as specified elsewhere or as shown on plans.

180° bars and 135° Stirrup Bends are not permitted in these ???.

509.04 Method of Placing Materials. Before any concrete is placed in a member, all reinforcing steel shall be placed in the position shown on the plans and shall be securely held in this position during the concreting operation. In no case shall reinforcing steel be driven or forced into the concrete after it has taken its initial set.

Except for slabs, the clearance between reinforcing steel and the surface of concrete shall be two inches. For slabs, the clearance shall be as follows: For the bottom of slabs, the clearance shall be not less than one inch. For the top of slabs with monolithic wearing surface, the clearance shall be one inch plus the thickness of the monolithic wearing surface. For the top of slabs with separate wearing surface, the clearance shall be 1 1/2 inches. Where dimensions for clearance are indicated on the plans, these dimensions shall supercede the above.

509.05 Bending. Reinforcement shall be carefully shaped to the pertinent dimensions shown in the Standard Bends table unless otherwise indicated on the plans.

509.06 Shop Assembled Units. The use of unit frames or shop assembled reinforcement where practicable, is recommended.



509.07 Approval of Placing. Reinforcing steel shall be in place and approved by the Engineer before any concrete is placed.

509.08 Splicing Reinforcement. Whenever it is necessary to splice reinforcement, the bars shall be connected by a direct splice of strength equal to that of the bar, either by welding or by other approved method, or by overlapping their ends not less than 30 diameters, except that bars near the top of beams and girders having more than 12 inches or concrete under the bars shall be lapped 35 diameters to make the splice and in accordance with A.C. 1-71.

Welded splices shall be made only on intermediate grade steel bars and then only with low hydrogen electrodes.

509.09 Supports. Precast mortar blocks or metal supports, of adequate strength, of the proper depth and in sufficient number shall be used for supporting the bars in slabs, beams or girders. If metal supports are used, the portion which extends to the surface of the concrete shall be galvanized or plastic coated and shall be of such shape that they will be easily enveloped by the concrete.

If mortar blocks are used they shall be made from the same materials and of the same proportions of sand and cement as that of the concrete in which they are to be used. They shall be cast and properly cured for at least seven days before use and shall have a wire or other device case into each block for the purpose of attaching them securely to the reinforcing steel.

If welded connections are made to intermediate grade reinforcing steel, to hold bars in position, low hydrogen electrodes shall be used. Welded connections to hard grade or rail steel bars will not be permitted without special permission from the Engineer.

509.10 Protective Coating. All exposed reinforcing steel at construction joints shall be protected with a brush coat of neat cement, mixed to a consistency of thick paint, within one week after the placing of the initial concrete, unless it is definitely known that the steel will be imbedded within 60 days. This coating shall be entirely removed, by lightly tapping with a hammer or other tool, not more than one week previous to the placing of the final pour.

509.11 Method of Measurement. The numbers of pounds of reinforcing steel shall be the actual number of pound of the various sizes incorporated in the concrete as shown on the plans, completed and accepted. The number of pounds shall be determined from the number, length and weight of the bars as shown on the steel list of the plans, based on the weight per linear foot shown in the table, with deductions for bars not used and additions for extra bars used as directed by the Engineer.

509.12 Basis of Payment. Payment shall be made at contract prices for:

| Item | Unit  | Description       |
|------|-------|-------------------|
| 509  | Pound | Reinforcing steel |

ITEM 510 – DOWEL HOLES

- 510.01 DESCRIPTION
- 510.02 METHOD OF CONSTRUCTION
- 510.03 BASIS OF PAYMENT

510.01 Description. This item consists of the drilling of holes into masonry and the furnishing and placing of grout into the holes. The furnishing and placing of grout into the holes. The furnishing and placing of grout into the holes. The furnishing and placing of steel for dowels is included with 509, Reinforcing Steel.

510.02 Method of Construction. The holes shall be drilled at the location and to the depth shown on the plans and shall be approximately ½ inch larger in diameter than the dowel bars. The holes shall be partially filled with a non-shrinking cement grout and the bars shall be forced into the holes the specified depth spreading the grout mortar around the bar and solidly filling the hole. The bar and the filler shall be held in place until the filler has taken its initial set.

510.03 Basis of Payment. Payment shall be made at contract price for:

| Item | Unit        | Description |
|------|-------------|-------------|
| 510  | Lump Sum    | Dowel Holes |
|      | Each        |             |
|      | Linear Foot |             |

ITEM 511 – CONCRETE FOR STRUCTURES

- 511.01 DESCRIPTION
- 511.02 MATERIALS
- 511.03 PROPORTIONS
- 511.04 CONCRETE TEST SPECIMENS
- 511.05 HIGH-EARLY-STRENGTH CONCRETE
- 511.06 MEASUREMENT OF MATERIALS
- 511.07 MIXING OF CONCRETE
- 511.08 SLUMP
- 511.09 PLACING CONCRETE
- 511.10 CONSTRUCTION JOINTS
- 511.11 EMERGENCY
- 511.12 DEPOSITING CONCRETE UNDERWATER
- 511.13 DEPOSITING, PROTECTING AND CURING CONCRETE DURING  
COLD WEATHER
- 511.14 REMOVAL OF FORMS
- 511.15 CURING AND LOADING
- 511.16 SURFACE FINISH
- 511.17 ROADWAY FINISH
- 511.18 SIDEWALK FINISH
- 511.19 METHOD OF MEASUREMENT

511.20 BASIS OF PAYMENT

511.01 Description. This item shall consist of furnishing and placing Portland cement concrete consisting of a mixture of Portland cement, fine aggregate, coarse aggregate and water, properly proportioned to produce at least the minimum allowable compressive strength required for the various classes of concrete noted on the plans, in accordance with these specifications and to the lines, grades and dimensions shown on the plans.

For prestressed concrete see 515.

511.02 Materials. Materials shall conform to the following.

Fine Aggregate for bridge slabs with monolithic wearing surfaces, only natural sand shall be used.....703.02

Coarse aggregate for superstructure concrete shall be beneficiated by heavy media separation or by crushing. The sum of all deleterious materials shall not exceed 4 percent. At least 90 percent by weight of crushed gravel must have at least two fractured faces and at least 98 percent by weight must have at least one fractured face.....703.02

Portland cement – only one brand, grade or kind shall be used in a given structure above the ground line.....701.01, 701.02, 701.03, 701.05

Air entraining admixture.....705.01, 705.04, 705.05, 705.07 (Type I)

Mixing Water. Water for use with cement in mortar or structural concrete shall normally be fit for drinking purposes but in no case shall mixing water contain quantities in excess of the following:

Chlorides calculated as Sodium Chloride.....2500 ppm

Sulphates calculated as Sodium Chloride.....1000 ppm

Total dissolved solids.....2000 ppm

In addition, mixing water shall not contain any impurities in amount sufficient to cause unsoundness or marked change in time of setting in the cement nor a reduction in mortar strength or more than 5 percent compared to results obtained with distilled water, tested at 7 and 28 days.

All concrete above the ground line, in a given structure, shall be made of aggregates of the same kinds and colors, except upon the written permission of the Engineer.

511.03 Proportions. Concrete for structures shall be proportioned according to 499.03 using Class C or Class E as specified, except as modified below.

The concrete shall contain  $6 \pm 2$  percent of entrained air except that curbs, walks, parapets and railings shall contain  $8 \pm 2$  percent of entrained air.

The coarse aggregates, for all structural concrete except railings and encasement of steel beams, shall be of No. 4 and No. 6 sizes combined unless otherwise determined by the Engineer. Each size shall be weighed into the batch separately. The ratio of No. 6 size of coarse aggregate to total coarse aggregate may be varied within the range of 40 to 60 percent by weight in order to obtain the most desirable and uniform gradation of the combined material. In concrete for railings and encasement of steel beams the coarse aggregates may be No. 57. However, the total weight of aggregate per sack of cement shall not be changed except for the conditions of 499.03 as modified below:

If it is found impossible (1) to prepare concrete of the proper consistency without exceeding the maximum net water content specified or (2) to obtain the compressive strength indicated by 511.04, the total weight of aggregate shall be reduced until concrete of the proper consistency and strength is obtained without exceeding the maximum net water content specified. However, the Contractor shall not be compensated for any additional cement which may be required by reason of such adjustment.

511.04 Concrete Test Specimens. On structures over 20-foot span, two test cylinders will be made from each 200 cubic yards, or fraction thereof, of each class of concrete that is incorporated each day in the work. On structures of 20-foot span or less, not less than two cylinders will be made for each 50 cubic yards of each class or concrete.

Test cylinders shall be made and tested according to ASTM C 31 and C 39.

The design stresses for concrete for structures, for which the specification reference on the proposal (for the pertinent pay item) is 511, are based on compressive strength at 28 days of 4000 pounds per square inch for the Class C concrete specified to have  $6 \pm 2$  percent air, 3500 pounds per square inch for the Class Con concrete specified to have  $8 \pm 2$  percent air, and a compressive strength at 28 days of 3400 pounds per square inch for Class E concrete specified to have  $6 \pm 2$  percent air.

When necessary to permit early removal of falsework or to permit backfilling, concrete test beams shall be made and tested according to standard ASTM methods.

511.05 High Early Strength Concrete. When high early strength concrete is required, it shall be obtained by the use of cement meeting the requirements of 701.02 or 701.05. Curing shall be done in accordance with 511.15 for a period of not less than three days.

511.06 Measurement of Materials. Measurement of cement, aggregates and admixtures shall be according to 499.05.

511.07 Mixing of Concrete. Mixing shall be according to 499.06.

511.08 Slump. Concrete shall have a slump such that it will be workable in the required position. It shall be of such a consistency that it will flow around reinforcing steel but individual particles of coarse aggregate when isolated shall show a coating of mortar containing its proportionate amount of sand. The quantity of mixing water shall be determined by the Engineer in accordance with 499.03 and shall not be varied without his consent.

The slump of concrete placed by the vibration method shall not exceed the following, the slump being determined according to ASTM C143:

For mass concrete and reinforced concrete sections easily accessible for spading and working, such as deck slabs, not over three inches, except that under the adverse condition of high temperature, low humidity and considerable winds, the slump for deck slabs may be increased to not over four inches, if approved by the Engineer.

For reinforced concrete sections, not easily accessible for spading and working due to amount or spacing of steel or other reasons, not over four inches.

All concrete shall be as dry as it is practicable to place and all batches in the same sections shall be of uniform consistency.

511.09 Placing Concrete. The Contractor shall notify the Engineer at least 24 hours in advance of placing concrete, unless shorter notice is approved by the Engineer.

When a concrete deck is to be placed on continuous steel beams or girders, the placing of the concrete deck in any span shall not be started until all of the main beam or girder splices have been completed at least two piers beyond the pier or piers supporting the span in question.

Concrete for backwalls, where expansion has been provided for by a steel expansion joint, shall not be placed until the abutments have been backfilled to within one foot of the bridge seat elevation and all structural steel has been erected, unless a different procedure is approved by the Village. The steel expansion joint shall serve as a template for the top of the backwall. In case temporary bolts are used to support the backwall portion of an expansion device during the placing of the backwall concrete, these bolts must be removed as soon as possible after the concrete has taken its initial set and before a change in temperature causes superstructure movement sufficient to damage the backwall. Where backwall construction or contraction joint occurs with welded steel expansion joint assembly, concrete for the second pour will only be placed when the ambient temperature permits proper alignment of steel elements of the expansion devices with those already secured by the first concrete pour.

In order that the concrete will be properly finished, when the amount of concrete to be placed continuously is such that it cannot be finished before the end of the regular working day, the time of starting the concrete operations shall be subject to the approval of the Engineer.

The Contractor shall furnish assurance to the Engineer of any adequate and uniform source of supply of concrete to permit proper placing and finishing, standby vibrators, and of the availability of coverings for protection in case of rain, before work will be permitted to start.

In order to facilitate water curing of the concrete of the deck slab, the placing of concrete shall progress upgrade. The slab may be placed in sections, between transverse construction joints that are parallel to transverse reinforcing steel and are located near the center of any span. However, deck slabs may be placed with a finishing machine in a continuous operation from either end of a bridge to the other regardless of grade. When the placing of concrete progresses downgrade, water curing shall be accomplished by the use of wet burlap or mats as described in 511.15 (Method A).

Concrete deck slabs with monolithic concrete wearing surfaces shall be finished in accordance with the requirements of 451.09 and 511.17.

Before placing the concrete, all forms shall be thoroughly cleaned and the space to be occupied by the concrete shall be free from all laitance, silt, dirt, shavings, sawdust and other debris. The methods of depositing shall be such as to insure that all reinforcing steel is completely enveloped in concrete mortar and such that this condition can be verified by inspection. The concrete shall be deposited in this layers to facilitate spading, ramming or packing. The method or device used for conveying the concrete from the mixer to its place in the work shall be such as to insure against separation of the coarse aggregate from the mortar. When concrete is being deposited in shallow members, such as slabs, it shall be placed by the method which will insure as short a vertical drop as practicable. In beams, girders and similar members, mortar of the proportions used in the concrete may be placed in the bottom of the form to insure against honeycomb. This mortar shall be placed immediately ahead of the concrete. In other sections where it is extremely difficult to place concrete containing the larger sizes of the coarse aggregate a modified mix, secured by deleting that part of the coarse aggregate that is No. 4 size, may be used. The concrete shall be deposited at various places so as to maintain a surface practically horizontal over the section being placed.

Concrete shall not be dropped into the forms a distance of more than five feet, unless confined by closed chutes or pipes. Sliding concrete down long inclined slopes in the forms will not be permitted.

When a chute is used its slope shall be such as to allow concrete of the proper consistency to flow readily without separation of the ingredients. The delivery end of the chute shall be vertical, for a short distance, rather than steeply inclined, and the concrete shall be deposited as near as possible to its final position. Water used for flushing the chute shall be discharged outside the forms.

The Contractor shall designate one or more men, preferably form carpenters, to continually inspect the forms during the placing of concrete, and any bulges or settlements shall be corrected, the concrete being removed if necessary, at the Contractor's expense.

The use of mortar topping for concrete railing caps and other similar surfaces shall not be permitted.

The use of the vibration method of placing all concrete, in structures over 20 foot span is required. The Contractor shall furnish and have in use sufficient vibration equipment of an approved type and size to properly compact each batch immediately after it is placed in the forms.

The vibrators shall generally be of the type that is applied directly to the concrete and that has frequency of at least 3200 impulses per minute, but where inaccessibility precludes this method of vibration, the vibrators may be applied to the forms.

The concrete shall be deposited as near its final position as possible and shall not be caused to flow long distances. Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete. Vibrators shall be pushed into and pulled out of the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly compact the concrete, but not continued so as to cause segregation. Care must be used not to disturb partially hardened concrete.

Such spading as it necessary to insure smooth surfaces and dense concrete shall be done along form surfaces and in corners and locations impossible to reach with the vibrators. The Engineer shall with the collaboration of the Contractor closely observe the results obtained on the first concrete placed and such alterations shall be made in the mix, as permitted by these specifications, as are necessary to secure the best results.

511.10 Construction Joints. Construction joints shall be made where shown on the Drawings on approved shop drawings or as ordered by the Engineer. They shall be located with reference to the stability, strength and watertightness of the concrete. Joints shall be provided with plastic-water stops where shown on the Drawings and as required by approved shop drawings.

Before proceeding with the placing of any section of concrete the joints shall be located and all formwork, bulkheads, reinforcement, vertical waterstops and other embedded material for that section shall be in place. The joints shall have continuous straight and regular keys or grooves where shown or required. The waterstops shall be installed in the horizontal joints before the last layer of concrete is placed and secured in position by means of anchors and tie wire to the reinforcing steel. Top surface of every horizontal construction joint shall be brought to a true level line and the form for the construction key shall be forced into place, and then the concrete surface rodged off to a true horizontal level.

All contact surfaces shall be clean at the moment the fresh concrete is placed and if the aggregate has not been properly exposed or laitance is present it shall be removed and if ordered by the Engineer the old surface shall be cut back until fresh concrete aggregate is exposed at the Contractor's expense.

When beginning a new pour at each construction joint the surface of same shall be thoroughly wetted and then coated with cement grout just prior to the placing of the new concrete. The mixture of the grout shall be the same as for the concrete with the coarse aggregate omitted. Waterstops shall be polyvinyl-chloride waterstops and conforming the Corps of the Engineers Specification Number CRD C572, or approved equal.

Field Splices shall be performed in accordance with the approved manufacturer's recommendations. All joints shall develop watertightness equal to that of the continuous waterstop material and shall develop not less than 50 percent of the mechanical strength of the parent section.

511.11 Emergency. When the work is unexpectedly interrupted by break-downs, storms or other causes and the concrete as placed would produce an improper construction joint, the Contractor shall rearrange the freshly deposited concrete, until a suitable arrangement is made for a construction joint. When such a joint occurs at a section on which there is a shearing stress, he shall provide an adequate mechanical bond across the joint by forming a key, inserting reinforcing steel or by some other means satisfactory to the Engineer, which will prevent a plan of weakness.

511.12 Depositing Concrete Under Water. No concrete except for cofferdam seals shall be deposited under water, unless by special permission of the Engineer. If such permission is granted, care shall be exercised to prevent the formation of laitance. Concrete shall not be deposited until any laitance, which may have formed on concrete previously placed has been removed. Pumping shall be discontinued while depositing foundation concrete if it results in a flow of water inside of forms. If concrete except for cofferdam seals is deposited under water, the proportion of cement used shall be increased at least 25 percent at no extra expense to the County to compensate for losses due to water. Concrete deposited under water shall be carefully placed in a compact mass in its final position by means of a tremie, or other approved method and shall not be disturbed after being deposited.

511.13 Depositing, Protecting and Curing Concrete During Cold Weather. When concrete is placed at or below an atmospheric temperature of 40 F. or whenever the predicted temperature will fall below 40 F. within the curing period, the water, aggregates or both shall be heated and suitable enclosing and heating devices shall be provided. The concrete shall be placed at a temperature of not less than 50 F. and not more than 70 F. and the air surrounding the forms and deposited concrete shall be maintained within this temperature range for a period of not less than five days when ordinary Portland cement is used and not less than three days when high early strength cement is used. The enclosures and heating devices shall not be removed at the end of this period until the temperature of the concrete has been permitted to drop, at a rate not to exceed 20 F per 24 hours, to within 20 F. of the atmospheric temperature.

Mixing water shall be heated under such control and in sufficient quantity to avoid appreciable fluctuation in temperature from batch to batch. In no case shall the water be heated to a temperature greater than 160°F.

Aggregates shall be uniformly heated to eliminate all frozen lumps, ice and snow, but in no case shall the aggregates be heated to a temperature of more than 100°F.

The following formula may be used as a guide for estimating the temperature of mixed concrete.

$$\text{Temperature of mixed concrete} = \frac{Wt + 0.2W't'}{W + 0.2W'}$$

In which    W    =    weight of water  
              W'    =    weight of cement and aggregates



t = temperature of water  
t' = temperature of cement and aggregates

Concrete shall not be placed in contact with materials having a temperature of less than 32°F. If necessary, the forms, reinforcing steel and foundation materials shall be enclosed and heated before the concrete is placed.

Before any concrete is placed, the enclosures and heating devices shall be as nearly complete as the placing of concrete will permit. Throughout the entire concreting operation the completion of enclosures and the application of heat, when required to bring the air surrounding the forms and deposited concrete to the specified temperature, shall follow the placing of concrete as closely as possible.

Enclosures shall be strong and wind proof and adequate space shall be provided to allow a free circulation of air around the forms and deposited concrete.

Heat may be supplied by any method which will maintain the required temperature continuously and with a reasonable degree of uniformity in all part of the enclosure without overheating or discoloring the concrete.

A permanent temperature record will be kept by the Engineer showing the maximum and minimum temperatures within the enclosures each morning and late afternoon during the heating period together with date, hour and outside temperature.

If heat is supplied by any method other than free steam, all exposed concrete shall be covered with two thicknesses of wet burlap or wet cotton mats, as soon after placing the concrete as it can be done without marring the surface. The burlap or mats shall be kept continuously wet and shall not be removed during the heating period, except as required for rubbing. Wood forms without liners, if left in place more than two days after the placing of concrete, shall be thoroughly wet down at least once each day for the remainder of the heating period. If forms are removed during the heating period, the concrete shall be thoroughly drenched with water and covered with wet burlap or mats for the remainder of the heating period.

An operator shall be in active charge throughout the entire 24 hours each day and adequate fire protection equipment shall be accessible at all times during the period of heating.

Footing concrete may be protected and cured by the use of insulating materials if the concrete is maintained at a minimum temperature of 50 F. for a period not less than five days. Insulating materials and methods of application shall meet the approval of the Engineer. The Engineer will keep a permanent record of the surface temperatures of the concrete throughout the curing period.

In the case of footers that can be flooded, the following method for curing may be used when approved by the Engineer. The heat may be discontinued after 48 hours when ordinary Portland cement concrete is used and after 24 hours when high-early-strength cement concrete is used and the footer flooded to a depth of at least one foot above the top of the concrete and kept flooded for a period of at least 120 hours; or the footer may be flooded as soon after placing the concrete as is possible without damaging the concrete and the water heated to a temperature of at

least 50 F., and not more than 75 F., by the use of steam or otherwise and kept at this temperature for 48 hours if ordinary Portland cement concrete is being used or 24 hours if high-early-strength cement concrete is used and kept flooded for an additional period of at least 72 hours after heat is discontinued.

In lieu of the heated enclosures hereinabove specified the Contractor may protect structure concrete, except for deck slabs less than then inches thick, by the use of insulation.

When form insulation is used, the concrete shall be placed at a temperature of not less than 50 F. and not more than 70 F., as directed by the Engineer, and maintained by the insulation at a surface temperature of the concrete of not less than 50 F. and not more than 100F. Sufficient thermometers shall be furnished and installed by the Contractor in such a manner that the surface temperature of the concrete may be readily determined. Whenever the surface temperature, as indicated by the thermometer readings, exceeds the specified maximum temperature the forms or insulation shall be loosened or otherwise vented until the surface temperature is within the specified limits. If the thermometer readings indicate that the minimum required temperature is not being maintained, the structure shall be promptly enclosed and heat furnished as provided hereinabove.

The insulating material shall be wind and water resistant. Special precautions shall be take at edges and corners to insure that such points of extreme exposure are adequately protected. The tops of pours shall be protected by a tarpaulin, or other approved waterproof cover, over the insulation.

At the close of the protection period, the temperature of the concrete within the forms shall be gradually decreased, by loosening the forms or insulation to permit a rate of cooling not to exceed 20 F. per 24 hours, to within 20 F. of the atmospheric temperature.

In any case, responsibility for any defective concrete shall rest with the Contractor, and he will be held for the replacement of any defective concrete.

511.14 Removal of Forms. In order to facilitate finishing, forms on vertical surfaces which are to receive a rubbed surface finish shall be removed as soon as the concrete has hardened sufficiently that it will not be injured.

Curb forms shall be left in place at least 24 hours so that removal of forms does not crack, shatter or otherwise injure the face and top of the curb.

511.15 Curing and Loading. All concrete in bridge superstructures of over 20-foot span, all construction joints and all surfaces which receive a rubbed surface finish or are to be waterproofed, shall be cured in accordance with Method (a) Water Curing. All other concrete shall be cured either by Method (a) Water Curing or Method (b) Waterproof Membrane Curing.

Method (a) Water Curing. All surfaces not covered by form shall be protected with two thicknesses of wet burlap which have been spot stitched, wet jute felt cotton mats or wet cotton mats, as soon after placing the concrete as it can be done without marring the surface and kept wet by the continuous application of water by means of suitable sprinkling devices for a period of not less than seven days. Wood forms without liners, if left in place longer than two days

after the placing of concrete, shall be thoroughly wet down at least once each day for the remainder of the curing period. Formed surfaces shall, after the removal of forms be cured in like manner for the remainder of the curing period, the entire surface of the concrete being thoroughly drenched with water and covered immediately after forms are removed. Portions of the covering material may be removed temporarily continuous sprinkling stopped when and as necessitated by any required finishing operation.

Method (b) Waterproof Membrane Curing. Immediately after the free water has disappeared on surfaces not protected by forms and immediately after the removal of forms, if such are removed before the end of the seven-day curing period, the concrete shall be sealed by spraying as a fine mist a uniform application of the curing material 705.07 in such manner as to provide a continuous, uniform water impermeable film without marring the surface of the concrete.

The membrane curing shall be applied in one or more separate coats as the rate of at least one gallon per 200 square feet of surface. To insure that the proper amount of the curing material is applied, the number of gallons of curing material in the spray container shall be noted and the correct footage for the gallonage laid off so that the area of application rate will be secured. Curing material shall be thoroughly agitated immediately previous to use. If the film is broken or damaged at any time during the specified curing period, the area or areas affected shall be given a complete duplicate treatment of the curing material applied at the same rate as the first treatment.

The surface area of concrete construction joints shall be cured in accordance with the requirements of Method (a) until the adjacent concrete is placed.

Unless adequate precautions are taken to protect the surface of the membrane, workmen, materials and equipment shall be kept off the membrane for the duration of the curing period.

If high-early-strength cement concrete is used, the curing shall be done in accordance with the provisions of Method (a) for a period of not less than three days and such additional time or by such methods as specified.

No load shall be applied or other work conducted that will damage new concrete or interfere with its curing. Where work is necessary on new concrete on new concrete to complete a structure, such as building forms on a footer, workmen and materials shall be kept off of such concrete until such time as it will not be damaged by the work in progress, but in no case shall the elapsed time between placing the concrete and working on same be less than 36 hours. No work that will interfere with the curing shall be done on concrete placed during cold weather unless insulating material to retain the heat in the mix is placed during period in the day when the presence of workmen interfere with the normal curing procedure. When this is done the normal protection shall be resumed immediately after work is suspended. Proper curing shall have preference and, if necessary, workmen shall be moved or temporarily removed so that the concrete may be thoroughly wetted and kept wet until the curing is completed. Great care shall be exercised to prevent the bond between new concrete and the embedded portion of reinforcing steel projecting from the new concrete from being damaged by bending or otherwise disturbing the steel.

All other loading shall be governed by the requirements given under Sec. 501.01 and under Sec. 503.09.

511.16 Surface Finish. Immediately after the removal of forms, all cavities produced by form ties and all other holes, honeycomb spots, broken corners or edges and other defects except air bubble holes, shall be cleaned and after having been kept saturated with water for a period of not less than two hours shall be completely filled, pointed and trued with a mortar of the same proportions as used in the concrete being finished. Form tie holes shall be completely filled and compacted.

On all exposed surfaces, all fins and irregular projections shall be removed with a stone or power grinder, care being taken to avoid contrasting surface textures. Sufficient white cement shall be substituted for the regular cement in the filling of holes and other corrective work to produce finished patches of the same color as the surrounding concrete.

All superstructure fascias, except those on bridges without curbs, all railing posts and parapets and all curb faces shall receive a rubbed finish.

Except as specified above, exposed surfaces which are satisfactory to the Engineer as to color, texture and smoothness need not be grout cleaned or rubbed. Exposed surfaces which are not satisfactory to the Engineer in these respects or because of excessive patching and/or other corrective work shall be grout cleaned or rubbed as required by the Engineer and other contiguous exposed surfaces on the structure shall be finished in a similar manner to the extent required to produce a uniform appearance.

Grout Cleaning. Where grout cleaning is called for on the plans or required by the Engineer because of unsatisfactory appearance, the surface, after wetting, shall be uniformly covered with a grout consisting of one part cement to 1½ parts fine sand, 703.03 and sufficient water to produce a consistency of thick paint. White Portland cement shall be used for all or part of the cement in the grout, as directed by the Engineer, to give the color required to match the concrete. The grout shall be uniformly applied with brushes or a spray gun, and all air bubbles and holes shall be completely filled. Immediately after the application of the grout, the surface shall be vigorously scoured with a cork or other suitable float. While the grout is still plastic the surface shall be finished with a sponge rubber or other suitable float removing all excess grout. This finishing shall be done at the time when grout will not be pulled from the holes or depressions after being allowed to thoroughly dry, the surface shall be vigorously rubbed with a dry burlap or completely remove any dried grout. There shall be no visible film or grout remaining on the surface after this rubbing and the entire cleaning operations of any area must be completed on the day it is started. If any dark spots or streaks remain after this operation, they shall be removed with a fine grained silicon carbide stone, but the rubbing shall not be sufficient to change the texture of the surface. Unless otherwise directed by the Engineer, grout cleaning shall be delayed until the final clean up of the project.

Rubbed Finish. Forms shall be removed, if possible, within two days time. Corrections shall be made as outlined above. Rubbing of concrete shall be started as soon as the conditions will permit. Immediately before starting this work the concrete shall be kept thoroughly saturated with water for a minimum period of two hours. Sufficient time shall have elapsed before wetting down to allow the mortar used in pointing insert holes and defects to be

thoroughly set. Surfaces to be finished shall be rubbed with a medium coarse silicon carbide stone until all form marks, projections and irregularities have been removed, all voids filled and a uniform surface has been attained. The paste produced by rubbing shall be left in place at this time. No additional material other than water shall be applied to the surface. After all concrete above the surface being finished has been placed, the final finish shall be obtained by rubbing with a fine silicone carbide stone and water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform in color. Any surfaces which have been given a rubbed finish, shall be protected from subsequent construction operations. Any surfaces not protected, shall be cleaned and again rubbed if necessary to secure a uniform and satisfactory surface.

No extra payment will be made for any type of surface finish, the cost being considered as included in the price bid for concrete.

511.17 Roadway Finish. Concrete deck slabs with monolithic concrete wearing surfaces shall be finished in accordance with the requirements of 451.09 and 451.12 except that construction joints shall not be edged.

When the plans specify the use of a finishing machine, the concrete shall be compacted and finished in accordance with 451.09 and 451.12. The finishing machine shall be self-propelled and shall be approved by the Engineer. It preferably shall be of sufficient size to finish the full width of the decks between curbs, but not less than the projected width of the approach pavement, except for slab bridges. For slab bridges, a longitudinal construction joint may be placed in the slab on the centerline of the approach pavement, or as shown on the plans; and each side placed and finished separately. The wheels of the finishing machine shall be supported on temporary riding rails. Temporary riding rails shall be adequately supported on structural steel or falsework and if such rails are placed within the roadway area, they shall be elevated a sufficient distance above the slab to permit a simultaneous finishing by hand of any portions not finished by the machine. Any rail supports which extend through the roadway area of the slab shall be made and installed in such manner as to permit their removal at least to inches below the top of the slab. Holes formed by the removal of such supports shall be filled during the final finishing of the slab. For structures on which steel expansion dams are specified with temporary erection bolts used to support the backwall portion of the dam, the backwall concrete shall be placed after the structural steel has been erected and before the deck slab is placed. This procedure is to avoid interference by the temporary bolts with the machine finishing operation. The concrete shall be delivered and distributed at a uniform and adequate rate ahead of the finishing machine by suitable mechanical equipment. The Contractor shall submit to the Engineer for approval, at least 15 days prior to placing of any deck slab, a complete description of the method proposed for the handling, placing and finishing of the slab, including equipment for transporting and distributing concrete, the finishing machine and complete details of supports for such equipment. Approval by the Engineer will not relieve the Contractor of the responsibility for the satisfactory performance of his methods and equipment.

When the slab is to serve as a base for a surface course, it shall be given a broom finish or as otherwise approved by the Engineer.

511.18 Sidewalk Finish. The concrete after placing shall be struck off with a template and finished with a float to produce a sandy texture.

511.19            Method of Measurement. The yardage shall be the number of cubic yards as determined by calculations from plan dimensions, in place, completed and accepted.

No deduction will be made for the volume of the reinforcing steel in the concrete, but a deduction will be made for the volume of any encased structural steel (including steel piling) and for the volume of encased timber or concrete piles, assuming the volume to be 0.8 cubic foot per linear foot of such timber and concrete piles.

511.20            Basis of Payment. Payment will be made at contract prices for:

| Item | Unit       | Description            |
|------|------------|------------------------|
| 511  | Cubic yard | Class C Concrete _____ |
| 511  | Cubic yard | Class E Concrete _____ |

Item 512 – WATERPROOFING

- 512.01            DESCRIPTION
- 512.02            MATERIALS
- 512.03            PREPARATION OF SURFACE
- 512.04            PRIMER COAT
- 512.05            TYPE A WATERPROOFING
- 512.06            TYPE B WATERPROOFING
- 512.07            TYPE C WATERPROOFING
- 512.08            PREMOLDED SEALING STRIP
- 512.09            METHOD OF MEASUREMENT
- 512.10            BASIS OF PAYMENT

512.01            Description. This item consists of furnishing the necessary labor, material, and equipment required to apply the designated type of waterproofing to structures as indicated on the plans.

Bituminous materials shall be applied with brushes or spray equipment, care being taken to secure an even and uniform coating. Spraying equipment for applying asphalt materials, shall be of the portable power pressure type, that can be handled and moved to the direct location of the waterproofing operation. Before the primer is applied all surfaces of curb, header cur, gutters, marginal strips, sidewalks, balustrades, etc. shall be completely covered with canvas or other approved protective material for prevention of any accidental coating while using the spraying equipment.

Concrete surfaces not covered with waterproofing shall be protected from the spilling or otherwise marring of the surface with the bituminous materials.

The edge of any exposed application shall be sharply defined true to line and with a uniform exposure.

512.02            Materials. Waterproofing materials shall conform to the following:

|                                       |        |                    |
|---------------------------------------|--------|--------------------|
| Asphalt cement.....                   | 702.01 | 60-70 70-85, 85-?? |
| Asphalt primer for waterproofing..... | 702.02 | RC-70, RC-250, 702 |
| Emulsified asphalt primer.....        | 702.04 | MS-2, SS-1         |
| Asphalt for waterproofing.....        | 702.06 |                    |
| Creosote for priming coat.....        | 702.10 |                    |
| Coal tar pitch for waterproofing..... | 702.11 |                    |
| Waterproofing fabric.....             | 711.24 |                    |
| Hot applied joint sealer.....         | 705.01 |                    |
| Premolded sealing strip.....          | 711.25 |                    |

Either asphaltic or tar materials are to be used throughout for Type A or B no mixture of the two classes of materials will be permitted. The use of asphaltic or of tar materials is at the option of the Contractor, unless otherwise specified.

Only asphaltic materials are to be used for type C.

512.03 Preparation of Surface. Surfaces to be waterproofed, shall have all projections dressed off, and the outside film of cement, together with all dirt, removed with wire brushes and clear water. The concrete shall be clean and dry and the temperature of the concrete shall be not less than 40° F. when the bituminous materials are applied.

All joints to be sealed with premolded sealing strip shall be recessed to a depth of ¾ inches and a width of 13 inches, centered on the joint. The concrete recess shall be cleaned with a wire brush and at least surface dry before the primer coat is applied. The primer coat shall be thoroughly brushed on all surfaces of the recess and on the contact ends of abutting length of strip.

512.04 Primer Coat. All surfaces to be waterproofed shall be clean and dry when the primer coat, using 0.10 to 0.15 gallon of bituminous material per square yard, is applied.

For primer coats applied between June 1 and September 1, the bituminous material may be either 702.02 RC-70, RC-250; 702.04 MS-2, SS-1; 702.05; or 702.10.

For primer coats applied between September 1 and June 1, the bituminous material may be either 702.02 RC-70, RC 250; 702.05; or 702.10.

When asphalt emulsion is used as a primer coat it shall preferably applied with spray equipment.

The primer coat shall be sanded to protect it when subjected to traffic. Any excess sand shall be broomed off before waterproofing asphalt is applied.

512.05 Type A Waterproofing. This type of waterproofing consists, in addition to the primer coat, of applying not less than two coats of bituminous material 702.06 or 702.11 using a total of not less than one gallon of asphalt or pitch per square yard on flat areas and not less than ½ gallon on vertical or sloping surfaces. The application shall begin at the lowest point and progress to a higher elevation. The surface shall be uniformly covered at all points except that in corners and over construction joints a great amount of pitch or asphalt shall be used. The

bituminous material shall be applied at a temperature of not less than 250°F. nor more than 350°F.

512.06 Type B Waterproofing. This type of waterproofing consists in addition to the primer coat, of three coats of either bituminous material 702.06 or 702.11 and two layers of waterproofing fabric 711.24, using asphalt saturated fabric with pitch, applied as follows: On the cleaned dry and well primed surface there shall be applied a thorough coating of asphalt or pitch at a temperature of not less than 250°F., nor more than 350°F., using not less than  $\frac{1}{3}$  gallon per square yard of surface. Into this, while hot enough that the bitumen will penetrate the fabric shall be laid according to the following procedure: (1) Where the surface to be covered is of a width great than the width of normal fabric strip, there shall first be laid a half-width (normally 18 inches) of fabric. The second strip shall be full width and shall lap the entire width of the first strip. Each succeeding strip shall lap two inches more than half its full width. (2) Where the surface to be covered is of the same width as the fabric strip, the first strip laid shall be full width and the second strip also full width, covering the first. Each strip shall be laid without wrinkles, folds or pockets, and shall be given a thorough coating for the full width of the lap before the succeeding strip is laid. The final application shall provide a thorough covering for the fabric. Each application shall be complete and shall entirely conceal the texture of the fabric. Not less than a total of one gallon of bituminous waterproofing material per square yard shall be used for the three coats.

End laps shall break joints with each other and shall provide a lap of at least 12 inches.

512.07 Type C Waterproofing. This type of waterproofing consists of the application of 0.20 gallons of asphaltic material per square yard in addition the primer coat. Asphaltic materials shall meet the requirements of 702.01. The primer coat shall be dry at the time of application of the asphalt waterproofing. The asphalt shall be applied at a temperature of 275°F. to 325°F.

All horizontal surfaces so waterproofed shall immediately be sanded with dry sand to prevent the picking up of this waterproofing material by subsequent construction operations or in case of old structures by traffic. Immediately before placing the surface course alls and not firmly embedded in the bituminous waterproofing shall be carefully removed by brooming.

When this type of waterproofing is to be applied to a back slab or approach slab under a separate surface course it shall be applied to all surfaces of concrete, steel or other materials, which are to be in contact with the surface course, and if so specified it shall extend up the face of the curb to the height shown. Special care shall be taken to see that the top of the waterproofing is a neat line on the face of the curb.

512.08 Premolded Sealing Strip. The primer shall be applied to the recessed concrete surface at 0.10 to 0.15 gallons per square yard and allowed to dry to a tacky consistency. Then the coated side of the premolded sealing strip shall be pressed into recess, application being made immediately ahead of backfill.

512.09 Method of Measurement. The quantity of waterproofing shall be the number of square yards of Type A, Type B, or Type C and the number of linear feet of premolded sealing strip.



512.10 Basis of Payment. Payment will be made at contract price for:

| Item | Unit         | Description             |
|------|--------------|-------------------------|
| 512  | Square Yards | Type A waterproofing    |
| 512  | Square Yards | Type B waterproofing    |
| 512  | Square Yards | Type C waterproofing    |
| 512  | Linear Feet  | Premolded sealing strip |

SECTION 500

Item 513 – Structural Steel

The various sections of Item 513 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: Where references are made to The Director revise to Engineer.

SECTION 500

Item 514 – Painting

The various sections of Item 514 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: Where references are made to The Director revise to Engineer.

SECTION 500

Item 515 – Prestressed Concrete Bridge Members

The various sections of Item 515 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

SECTION 500

Item 516 – Expansion and Contraction Joints, Join Sealers and Bearing Devices

The various sections of Item 516 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

SECTION 500

## Item 517 – Railings

The various sections of Item 517 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

## SECTION 500

### Item 518 – Drainage of Structures

The various sections of Item 518 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

## SECTION 500

### Item 519 – Patching Concrete Structures

The various sections of Item 519 of the latest edition of the State of Ohio Department of Transportation Construction and material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

## SECTION 500

### Item 520 – Pneumatically Placed Mortar

The various sections of Item 520 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

## SECTION 500

### Item 521 – Bridge Timber

The various sections of Item 521 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

## SECTION 500

### Item 522 – Sectional Corrugated Metal Arch Structures

The various sections of Item 522 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

## SECTION 600 – INCIDENTALS

### Item 601 – Slope and Channel Protection

The various sections of Item 601 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

## 600 INCIDENTALS

### Item 602 – Masonry

The various sections of Item 602 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

## 600 INCIDENTALS

### Item 603 – Pipe Culverts, Sewers and Rains

The various sections of Item 603 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: Where references are made to The Director revise to Engineer.

### Item 604 – Manholes, Catch Basins and Inlets

|        |                               |
|--------|-------------------------------|
| 604.01 | DESCRIPTION                   |
| 604.02 | MATERIALS                     |
| 604.03 | CONSTRUCTION METHODS, GENERAL |
| 604.04 | EXCAVATION AND BACKFILL       |
| 604.05 | BRICK MASONRY                 |
| 604.06 | PRECAST SOLID CONCRETE BLOCK  |
| 604.07 | PRECAST CONCRETE RISERS       |
| 604.08 | CONCRETE (CAST-IN-PLACE)      |
| 604.09 | METHOD OF MEASUREMENT         |
| 604.10 | BASIS OF PAYMENT              |

604.01 Description. This work shall consist of furnishing all materials for manholes, catch basins and inlets of the types and sizes specified, and constructing or rebuilding

the same, or adjusting existing manholes, catch basins, inlets or water valve boxes to grade. This work shall also include constructing and adjusting cleanouts.

604.02        Materials. Materials shall be:

|        |   |                |
|--------|---|----------------|
| 706.08 | Extra strength clay pipe.....                 | ASTM C 700,    |
|        | Ductile Iron Pipe, Class 4.....               | ASA A 21.50    |
|        | Asbestos Cement Pipe, Class 2400 Type II..... | ASTM C428      |
|        | Structure Concrete.....                       | 499 and 511    |
|        | Mortar.....                                   | 602.0??        |
|        | Brick and Masonry Units.....                  | 70??           |
|        | Reinforcing Steel.....                        | 709            |
|        | Frames, Grates, Covers.....                   | 711.12         |
|        | Manhole Steps.....                            | 711.02, 711.12 |

604.03        Construction Methods, General. The construction for the item specified shall conform to the plans and be placed at the locations and elevations shown or ordered.

ALL CONNECTIONS FOR LATERAL SEWERS INCLUDING DROPS, LEADS AND STUBS WHERE SHOWN ON THE PLANS EXCEPT PIPE INCLUDED IN 603 AND 901, WILL BE CONSIDERED AS PART OF ALL MANHOLES, INLETS AND CATCH BASINS AND WILL BE INCLUDED IN THE PAYMENT FOR SAME. THE DIFFERENCE IN COST BETWEEN THE DUCTILE IRON PIPE AND LEAD REQUIRED IN A DROP MANHOLE AND ITS EQUIVALENT LENGTH OF THE MAIN SEWER LINE PIPE SHALL BE INCLUDED IN THE PRICE BID FOR A DROP MANHOLE AND NO EXTRA PAYMENT WILL BE MADE THEREFOR.

In lie of cast-in-place concrete, precast bottoms may be used provided the bottoms are constructed with lifting lugs and are reinforced for handling. They shall have a uniform bearing on at least three inches of compacted sand. The invert channel shall be true shape of the lower half of the pipe or sewer, and if required shall be line with split pipe.

Adequate precautions shall be taken to prevent concrete and/or mortar from freezing: Brick, concrete block, etc. having a temperature of 40°F. or less shall not be set with mortar until heated for a period sufficient to insure a temperature of 50° F. to 80° F. throughout the entire mass of the material.

Iron frames, tops and covers of the type called for on the plans shall be set in a mortar ??? at the locations indicated on the plans.

Special care shall be exercised to prevent the entrance of earth or debris into the pipe line connecting with the manhole, catch basin or inlet. All such earth or dirt resulting from construction operations shall be removed from the pipe line.

Where the rebuilding of a manhole, catch basin or inlet is shown on the plans, or directed by the Engineer, the rebuilding of same shall be in accordance with 202.08 if applicable, 604, and the standard drawings for the types an sizes applicable.

When it becomes necessary to rebuild an existing manhole, inlet or catch basin due to the negligence of the Contractor, such structure shall be rebuilt in accordance with 604 at the expense of the Contractor.

Unless otherwise provided for in 901, the cost of furnishing and installing all stubs for future connection, or for connecting to existing structures as shown on the plans or as directed by Engineer, shall be included in the price bid for the manhole an extra payment will be made therefore.

604.04 Excavation and Backfill. All excavation for ?? holes, catch basins, inlets, etc., shown on the plans, shall be in accordance with 901.03. All backfilling around these structures shall be in accordance with 203 and 901.08.

604.05. Brick Masonry. Brick walls shall be eight inches thick. Brick shall be thoroughly wetted before laying in the ??. Brick shall be laid up with full mortar joints. Mortar shall be specified in 602.03. Special shaping of walls and bottoms shall be included in the unit price bid.

Brick may be used for adjusting sanitary manholes to grad??? However, brick sanitary manhole construction is unacceptable.

The outside surfaces for all brick masonry shall be parget? with a 1/2-inch coat of mortar and shall be cured with we burlap for a period of 48 hours.

604.06 Precast Solid Concrete Block. Concrete blocks ?? be laid as specified for brick masonry under 604.05. Precast concrete blocks are unacceptable in sanitary manhole construction.

604.07 Precast Concrete Risers, Etc. (Pipe). Joints precast rings shall be sealed as prescribed under 901.06. All risers, cones and flat slabs shall be in accordance with ASTM.

604.08 Concrete (Cast-in-Place). Concrete shall be C??? and shall be as set forth under 499 and 511.

604.09 Method of Measurement. The number manholes basins, inlets, or water valve boxes will be actual number each, completed, rebuilt or adjusted to grade and accept.

604.10 Basis of Payment. Payment will be made at the contract price for:

| Item | Unit | Description                    |
|------|------|--------------------------------|
| 604  | Each | Standard Manholes              |
| 604  | Each | Drop Manholes                  |
| 604  | Each | Inlets, Type _____             |
| 604  | Each | Catch Basins, Type _____       |
| 604  | Each | Manholes Adjusted to Grade     |
| 604  | Each | Inlets Adjusted to Grade       |
| 604  | Each | Catch Basins Adjusted to Grade |

|     |      |                               |
|-----|------|-------------------------------|
| 604 | Each | Water Valve Boxes Rebuilt     |
| 604 | Each | Cleanouts as per Plan         |
| 604 | Each | Cleanouts Adjusted to Grade   |
| 604 | Each | _____ Manholes, Reconstructed |
| 604 | Each | Inlets, Reconstructed         |

600 INCIDENTALS

Item 605 – Underdrains

The various sections of Item 605 of latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

600 INCIDENTALS

Item 606 Guard Rail

The various sections of Item 607 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

600 INCIDENTALS

Item 607 – Fence

The various sections of Item 607 of the latest edition of the State of Ohio Department of Transportation Construction an ?? Material Specifications shall apply and are hereby considered part of these specifications by reference , with the following exceptions: NONE.

Item 608 – Walks and Steps

|        |                       |
|--------|-----------------------|
| 608.01 | DESCRIPTION           |
| 608.02 | MATERIAL              |
| 608.03 | CONCRETE WALKS        |
| 608.04 | CONCRETE STEPS        |
| 608.05 | METHOD OF MEASUREMENT |
| 608.06 | BASIS OF PAYMENT      |

608.01 \_\_\_\_\_ Description. This work shall consists of constructing walks and steps of specified materials in conformity with lines, grades, and dimensions shown on the plans or established by the Engineer.

608.02 Materials. All materials used in the concrete mixture, the proportioning and mixing shall conform to 499 and 511 Class C, Concrete.

Expansion joint material.....705.03

608.03 Concrete Walks.

- (a) Excavation shall be made to the required depth and to a width that will permit the installation and bracing of forms. The subgrade shall be shaped and compact to a firm surface conforming to the plans or as ordered.
- (b) Forms shall be of wood or metal and extend for the full depth of the concrete, and of sufficient strength to resist the pressure of the concrete without springing.
- (c) Placing and Finishing. The subgrade shall be moistened thoroughly immediately prior to placing concrete. The concrete shall be deposited in a single layer. It shall be struck off with a template and smoothed with a float to obtain a sandy texture. No plastering will be permitted. All outside edges and joints shall be edged with a ¼ inch radius edging tool. The surface of the walks shall be divided into blocks by grooves equally spaced at approximately five foot intervals, to form rectangular blocks. Construction joints shall be formed around all appurtenances such as manholes, or utility poles extending into and through the sidewalk. Transverse expansion joint strips ½ inch in thickness and extending the full depth of the walk shall be placed at intervals of not more than 30 feet. Expansion joint strips at least ½ inch in thickness shall also be installed between the junction of the walk with all curbs and any fixed structures, extending the full depth of the walk.
- (d) The surface of the walk shall have a transverse slope of ⅜ inch per foot, with the low side adjacent to the roadway.
- (e) Concrete shall be cured as required in 451.

608.04 Concrete Steps.

- (a) Excavation and forms shall conform to 608.03 (a) and (b).
- (b) Placing and finishing shall conform to 608.03 (b)
- (c) Slopes of step treads shall be ¼ inch ?? toward the next lower step.
- (d) Curing shall be in accordance with 451.
- (e) Hand railing, when specified, shall be in accordance with 517.

608.05 Method of Measurement. Walks will be measured by the square foot of finished surface complete in place. Steps to be measured by the linear foot, along the front edge

of each t???. Where the steps are constructed with integral walls, each tread will be considered to extend from out to out of such walls.

608.06 Basis of Payment. The accepted quantities of specific items of walks and steps will be paid for at the contractor price designated for each of the pay items listed. Excavation, backfill, hand railing, expansion joint material and other ???, miscellaneous items will not be paid for separately, but cost thereof shall be included in the cost of the walks or steps of which they are a part.

Payment will be made at contract price for:

| Item | Unit        | Description    |
|------|-------------|----------------|
| 608  | Square Foot | Concrete Walk  |
| 608  | Linear Foot | Concrete Steps |

#### 600 INCIDENTALS

##### Item 609 – Curbing

The various sections of Item 609 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

#### 600 INCIDENTALS

##### Item 610 – Cellular Retaining Walls

The various sections of Item 610 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

#### 600 INCIDENTALS

##### Item 611 – Approach Slabs

The various sections of Item 611 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions. None.

#### 600 INCIDENTALS

##### Item 612 – Concrete Median and Traffic Island

The various sections of Item 612 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.



600 INCIDENTALS

Item 613 – Traffic Dividers

The various sections of Item 613 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

600 INCIDENTALS

Item 615 – Temporary Roads and Pavements

The various sections of Item 615 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

600 INCIDENTALS

Item 616 – Dust Control

The various sections of Item 616 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

600 INCIDENTALS

Items 617 – Reconditioning Shoulders

The various sections of Item 617 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

600 INCIDENTALS

Item 618 – Guard Rail Painting

The various sections of Item 618 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

600 INCIDENTALS

Item 620 – Delineators

The various sections of Item 620 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

#### 600 INCIDENTALS

##### Item 621 – Paint Marking

The various sections of Item 621 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

#### 600 INCIDENTALS

##### Item 622 – Concrete Barrier

The various sections of Item 622 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

##### Item 623 – Construction Layout Stakes

623.01 Description. When this item is included in the proposal, it shall consist of furnishing, placing, and maintaining construction layout stakes necessary for the proper prosecution of the work under the contract, all in accordance with these specifications. (When the proposal does not include a pay item for construction layout stakes as set forth in this item, the Engineer will set construction stakes as described in 105.08.)

623.02 General. The Owner will locate and reference the centerline of the project and all intersecting streets and will establish benchmarks along the line of the improvement outside construction limits. One benchmark will be established by the Owner for use at each structure over 20 foot span. The centerline of short street intersection returns will not be located by the Owner. Locating and referencing the centerline shall consist of locating and referencing control points such as point of curve, point of tangent, and sufficient points on tangent to provide a line of sight. Reference points shall be set outside the construction limits in such a manner that they will be available to reestablish the control points at any time during the course of the work. Control points set by the Owner shall be identified in the field to the Contractor and the field notes shall be kept in the office of the Engineer.

The Contractor shall provide field forces and set all additional stakes for the project, including interchanges, which are needed to establish offset stakes, reference points, slope stakes, pavement and curb line and grade, stakes for bridges, culverts, sewers and drainage structures, paved gutters, wall, monuments, fence, right-of-way lines, and any other horizontal or vertical controls, including supplementary benchmark, necessary to secure a correct layout of the work. The location of the slope stakes for grading work shall be determined by a calculation method, and a copy of these calculations shall be made available to the Engineer for project records. Stakes for line and grade of pavement and/or curb shall be set at sufficient station

intervals (not to exceed 50 feet) to assure conformance to plan line and grade. Staking or right-of-way lines shall consist of placing tall stakes, properly identified and readily discernible, at points of change in width or direction of the right-of-way line and at points along the line so that at least two of the stakes can be seen distinctly from any point on the line. Right-of-way lines shall be staked at locations where construction is to be performed, prior to beginning construction. The Contractor will not be required to set additional stakes to locate a utility line which is not included as a pay item in the contract, or to determine the property line between the properties.

The Contractor shall be responsible for having the finished work conform to the lines, grades, elevations, and dimensions called for in the plans. Any inspection or checking of the Contractor's layout by the Engineer and the acceptance of all or any part of it shall not relieve the Contractor of his responsibility to secure the proper dimensions, grades, and elevations of the several parts of the work. The Contractor shall exercise care in the preservation of stakes and benchmarks, and shall have them reset at not additional cost to the Owner when any are damaged, lost, displaced, or removed. The Contractor shall use competent personnel and suitable equipment for the layout work required and shall provide that it be done under the supervision of a Registered Surveyor. The Contractor shall not engage the service of any person or persons in the employ of the Department for the performance of any of the work covered by this item.

It shall be the Contractor's responsibility to verify any survey information appearing in the plans, except for the centerline of the project, which he may use to lay out the work.

623.03 Basis of Payment. Construction layout stakes will be paid for at the contract lump sum bid, which price shall be compensation for all services, materials, labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

| Item | Unit     | Description               |
|------|----------|---------------------------|
| 623  | Lump Sum | Construction layout stake |

600 INCIDENTALS

Item 625 – Electrical Equipment

The various sections of Item 625 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

Item 640 – Driveway Approaches

|        |                                |
|--------|--------------------------------|
| 640.01 | DESCRIPTION                    |
| 640.02 | MATERIALS                      |
| 640.03 | CONCRETE DRIVEWAY APPROACHES   |
| 640.04 | BITUMINOUS DRIVEWAY APPROACHES |
| 640.05 | METHOD OF MEASUREMENT          |

640.06 BASIS OF PAYMENT

640.01 Description. This work shall consist of const??? driveway approaches of specified materials in reasonably close conformity with lines, grades and dimensions shown on the plans established by the Engineer.

640.02 Materials. Materials shall be:

|                               |                 |
|-------------------------------|-----------------|
| Concrete (Class C).....       | 499 and 511     |
| Bituminous Material.....      | 404.01 and 40?? |
| Crushed Aggregate.....        | 703.10          |
| Expansion Joint Material..... | 705.03          |

640.03 Concrete Driveway Approaches.

- (a) Excavation for this item shall be such as to provide for uniform thickness of six inches of co??? Where the excavation has been in excess of this subgrade shall be corrected and thoroughly com??? Before any concrete is placed, the subgrade sh??? Well sprinkled with water. Special care shall ?? in placing of the bituminous premolded expansion material to insure that the a complete separation approach and adjacent concrete curb and sidewalk ?? obtained. Contraction joints shall be as per Drawing.
- (b) Placing and Finishing. The concrete shall be in a single layer. It shall be struck off wit??? template and smoothed with a float. All outside edges and joints shall be edged with a l???? radius edging tool. The final finish may ??? “broom” or “dray” finish as directed by the Engineer but all approaches on any one project shall have the same finish.
- (c) Concrete shall be cured as required in 451.

640.04 Bituminous Driveway Approaches.

- (a) Excavation and forms shall conform to 611.03 (a).
- (b) Base course material shall be placed in layers not exceeding four inches in depth and each layer shall be thoroughly compact.
- (c) Bituminous material shall be placed in one or more courses to provide the required depth when compacted. Compaction shall be by means of power roller of a type and weight acceptable to the Engineer.

640.05 Method of Measurement. Driveway approaches will be measured by the square yard of finished surface complete in place.

640.06 Basis of Payment. The accepted quantities of specific items of driveway approaches will be paid for at the contract prices designated for each of the pay items listed. Excavation, backfill, base course material, expansion joint material and other related

miscellaneous items will not be paid for separately, but the cost thereof shall be included in the cost of the driveway approaches of which they are a part.

Payment will be made under:

| Item | Unit        | Description                  |
|------|-------------|------------------------------|
| 640  | Square Yard | Concrete Driveway Approach   |
| 640  | Square Yard | Bituminous Driveway Approach |

#### SECTION 650 – ROADSIDE

##### Item 651- Topsoil Stockpiled

The various sections of Item 651 of latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

#### 650 ROADSIDE

##### Item 652 – Placing Stockpiled Topsoil

The various sections of Item 652 of the latest edition of State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

#### 650 ROADSIDE

##### Item 653 – Topsoil Furnished and Placed

The various sections of Item 653 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered and part of these specifications by reference, with the following exceptions: NONE.

#### 650 ROADSIDE

##### Item 654 – Renovating Existing Soil

The various sections of Item 654 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

#### 650 ROADSIDE

##### Item 655 Seeding and Renovating Existing Sod

The various sections of Item 655 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered part of these specifications by reference, with the following exceptions: NONE.

650 ROADSIDE

Item 656 – Roadside Cleanup

The various sections of Item 656 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: NONE.

650 ROADSIDE

Item 657 – Riprap for tree Protection

The various sections of Item 657 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered part of these specifications by reference, with the following exceptions: NONE.

650 ROADSIDEITEM 658 – TREE ROOT AERIATION

The various sections of Item 658 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

ITEM 659 – SEEDING AND MULCHING

|        |                               |
|--------|-------------------------------|
| 659.01 | DESCRIPTION                   |
| 659.02 | AGRICULTURAL LIMING MATERIALS |
| 659.03 | COMMERCIAL FERTILIZER         |
| 659.04 | SEEDS                         |
| 659.05 | INOCULATING BACTERIA          |
| 659.06 | MULCHING MATERIAL             |
| 659.07 | INOCULATING LEGUMES           |
| 659.08 | FERTILIZING                   |
| 659.09 | SEEDING AND MULCHING          |
| 659.10 | METHOD OF MEASUREMENT         |
| 659.11 | BASIS OF PAYMENT              |

659.01 Description. This item shall consist of furnishing all seed, agricultural liming materials, commercial fertilizer, mulching material and placing and incorporating same as specified.

The areas to be seeded and paid for under this item shall include all areas designated by the Engineer within the right-of-way line and as described on the plans. All areas outside the specific limits where the vegetative growth has been injuriously disturbed or destroyed by the Contractor shall be restored and seeded in accordance with these specifications by the Contractor at his own expense.

Commercial fertilizers and agricultural liming materials shall be obtained by the Contractor from a dealer or manufacturer whose brands and grades are registered or licensed by the State of Ohio, Department of Agriculture.

659.02 Agricultural Liming Materials. Agricultural Ground Limestone with o of 90, and at least 40 per cent passing a No. 100 sieve, and at least 95 per cent passing a No. 8 sieve, is considered standard. Other agricultural liming materials may be used at the ratio determined by the Engineer.

659.03 Commercial Fertilizer. Commercial fertilizer may be dry or liquid in analysis specified or in the same ratio as specified.

659.04 Seeds. All seeds shall meet the following requirements:

Per cent Purity – 95

Per cent Germination – 67

The Contractor shall furnish the Engineer a letter of certification that all seeds to be used come from a source approved by the State of Ohio or an approved testing laboratory and meet the requirements of these specifications.



659.05 Inoculating Bacteria. The inoculant for treating leguminous seeds shall be a pure culture of nitrogen-fixing bacteria selected for maximum vitality, not more than one year old. All cultures shall be subject to the approval of the Engineer.

659.06 Mulching Material. Materials used for mulching shall be straw or other materials as may be processed or manufactured for this purpose. They shall be free of weed seed and such foreign materials as may detract from their effectiveness as a mulch or be injurious to desired plant growth.

659.07 Inoculating Legumes. All leguminous seeds shall be inoculated or treated with the proper amount of approved culture mixed with sufficient water to thoroughly wet the seed with the solution. When seed is sown hydraulically, four times the amount of inoculant required above shall be placed directly into the slurry and thoroughly mixed immediately before seeding. Seed shall be sown within 24 hours after treatment with the inoculant.

659.08 Fertilizing. The standard application of fertilizer shall be at the rate of 29 pounds per 1,000 square feet for the analysis specified. Another analysis, in the same ratio, may be used by varying the application rate to produce the same values specified. Either dry or liquid fertilizer may be used and shall be distributed in an even pattern over the specified area, then thoroughly disked, harrowed or raked into the soil to a depth of not less than one inch.

When agricultural liming material is required, agricultural ground limestone as specified under 659.02 is considered standard. It shall be applied on the surface at the rate of 100 pounds per 1,000 square feet of area and **thoroughly disked, harrowed or raked** into the soil to a depth of not less than one inch.

Other agricultural liming materials may be used and the rate of application shall be varied according to the per cent required of the standard rate of application specified under 659.02.

Fertilizer and agricultural liming material shall be applied not less than 24 hours nor more than 48 hours before the seed is to be sown.

When both are required on the same area, they must be applied separately, but can be disked or otherwise incorporated in the soil in the same operation.

659.09 Seeding and Mulching. All areas to be seeded shall be free of rock and other foreign material three inches or greater in any dimension and shall be satisfactorily shaped and finished as provided in 203. Areas in front of residences, between curb and sidewalk, and other areas indicated on the plans, shall be free of all stones one inch or greater in any dimension and shall have a smooth surface. In such areas hand raking will be required if inaccessible to machines, and may be required if machines do not provide results equivalent to hand raking. Payment for the work necessary for proper preparation of the seed bed shall be included in 203.

The seed shall be thoroughly mixed and then evenly sown over the prepared areas at the rate of four pounds per 1,000 square feet. Seed shall be sown dry or hydraulically.

All areas to be seeded which are considered to be urban in character, and any area immediately in front of a residence, shall be seeded with the following mixture: (Percentages are by weight)

35% Kentucky Bluegrass (*Poa pratensis*)  
 55% Creeping Red Fescue (*Festuca rubra*)  
 5% Red Top (*Agrostis alba*)  
 5% White Dutch Clover (*Tritplium repens*)

All other areas, except those previously mentioned, shall be seeded with the following mixture:

30% Kentucky Bluegrass (*Poa pratensis*)  
 60% Kentucky 31 Fescue (*Festuca clatior* var. Ky. 31)  
 10% Alsike Clover (*Trifolium hybridum*)

Immediately after sowing, the area shall be raked, dragged or otherwise treated so as to cover the seed to a depth of approximately  $\frac{1}{4}$  inch.

The operation of seed sowing shall be performed only during the period between March 15 and October 15 and shall not be performed when the ground is frozen or muddy, or when soil or weather conditions would prevent the proper soil preparation and subsequent operations as specified. When specifically permitted by the Engineer, seeding may be performed between the dates of October 15 and November 1. Within 48 hours after any given area is seeded, vegetative mulching material conforming to 659.06 shall be evenly placed over all seeded areas at the rate of approximately two tons per acre. Mulching materials shall be kept in place with asphalt emulsion applied at a minimum rate of 60 gallons per ton of mulch specified per acre or by methods as are approved or may be otherwise required to prevent displacement of material. Asphalt emulsion for vegetative mulch shall conform to 702.0 4, SS-1, except that the penetration at 25 C shall be 150-200. They shall be nontoxic to plants and shall be so prepared that they will not change in transportation or storage. Mulching which is displaced shall be replaced at once but only after the seeding or other work which preceded the mulching material has been acceptably repaired.

The Contractor shall maintain all seeded and mulched areas until final inspection. Maintenance shall also include providing protection for traffic by approved warning signs or barricades, and repairing any areas damaged following the seeding or mulching operations due to wind, water, fire or other causes. Such damaged areas shall be repaired to re-establish the condition and grade of the area prior to seeding and shall then be refertilized, reseeded and remulched as directed by the Engineer.

659.10 Method of Measurement. Commercial fertilizer and agricultural liming to be paid for shall be the number of tons of each calculated to standard, furnished, spread and incorporated. Seeding and mulching to be paid for shall be the number of square yards of the area seeded and mulched in accordance with these specifications.

659.11 Basis of Payment. Payment will be made at contract price for:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>    |
|-------------|-------------|-----------------------|
| 659         | Ton         | Commercial Fertilizer |
| 659         | Ton         | Agricultural Liming   |
| 659         | Square Yard | Seeding and Mulching  |

650 ROADSIDEITEM 660 – SODDING

The various sections of Item 660 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None

650 ROADSIDEITEM 661 – PLANTING VINES

The various sections of Item 661 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.

650 ROADSIDEITEM 662 – PLANTING SHRUBS

The various sections of Item 662 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions. None.

650 ROADSIDEITEM 663 – PLANTING TREES

The various sections of Item 663 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions. None.

650 ROADSIDEITEM 663 – PLANTING SALVAGED PLANTS

The various sections of Item 664 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions. None.



650 ROADSIDEITEM 665 – LARGE TREES MOVED AND RESET

The various sections of Item 665 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions. Where references are made to The Director revise to Engineer.

650 ROADSIDEITEM 666 – PRUNING EXISTING TREES

The various sections of Item 666 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions. None.

650 ROADSIDEITEM 667 – SEEDING AND JUTE MATTING

The various sections of Item 667 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions. None.

650 ROADSIDEITEM 668 – SEEDING AND EXCELSIOR MATTING

The various sections of Item 668 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions. None.

## SECTION 700 – MATERIAL DETAILS

### 700 – SAMPLING REQUIREMENTS

The various sub-sections of section 700.00 of the latest edition of the State of Ohio, Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

700.01 Material Sampling. Minimum requirements for sampling materials shall conform to the tables printed in the reference specification above, except that such sampling may be waived by the Engineer at his discretion or upon a certification of compliance by the material manufacturer or fabricator.

701 – HYDRAULIC CEMENT

The various sub-sections of section 701.00 of the latest edition of the State of Ohio, Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

None.

702 – BITUMINOUS MATERIALS

The various sub-sections of section 702.00 of the latest edition of the State of Ohio, Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

702.01

Large aggregate of surface course shall be all limestone.

702.02

Surface course asphalt shall be 100% virgin material.

703 – AGGREGATE

The various sub-sections of section 703.00 of the latest edition of the State of Ohio, Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

703.01 General. The stated requirements of the reference specifications shall apply except that the definition of “Crushed pieces” shall be as described in 511.02 for crushed gravel for superstructure concrete. Aggregate size shall conform to the following table.





**TABLE 703-1**  
**SIZES OF COARSE AGGREGATE ( AASHO M 43 )**

| Size No. | Nominal size Square Openings (1) | <u>Amounts finer than each laboratory sieve (square openings), percentage by weight</u> |           |      |           |           |           |           |           |           |           |           |           |         |        |        |          |
|----------|----------------------------------|---|-----------|------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|--------|--------|----------|
|          |                                  | 4   | 3-1/2     | 3    | 2-1/2     | 2         | 1-1/2     | 1         | 3/4       | 1/2       | 3/8       | No. 4     | No. 8     | No. 16  | No. 50 | No.100 |          |
| 1        | 3-1/2 to 1-1/2                   | 100   | 90 to 100 | ---- | 25 to 60  | -----     | 0 to 15   | -----     | 0 to 5    | -----     | -----     | -----     | -----     | -----   | -----  | -----  |          |
| 2        | 2-1/2 to 1-1/2                   | -----   | -----     | 100  | 90 to 100 | 35 to 70  | 0 to 15   | -----     | 0 to 5    | -----     | -----     | -----     | -----     | -----   | -----  | -----  |          |
| 24       | 2-1/2 to 3/4                     | -----   | -----     | 100  | 90 to 100 | -----     | 25 to 60  | -----     | 0 to 10   | 0 to 5    | -----     | -----     | -----     | -----   | -----  | -----  |          |
| 3        | 2 to 1                           | -----   | -----     | ---- | 100       | 95 to 100 | 35 to 70  | 0 to 15   | -----     | 0 to 5    | -----     | -----     | -----     | -----   | -----  | -----  |          |
| 357      | 2 to No. 4                       | -----   | -----     | ---- | 100       | 9t to 100 | -----     | 35 to 70  | -----     | 10 to 30  | -----     | 0 to 5    | -----     | -----   | -----  | -----  |          |
| 4        | 1-1/2 to 3/4                     | ----  | -----     | ---- | -----     | 100       | 90 to 100 | 20 to 55  | 0 to 15   | -----     | 0 to 5    | -----     | -----     | -----   | -----  | -----  |          |
| 467      | 1-1/2 to No. 4                   | ----  | -----     | ---- | -----     | 100       | 95 to 100 | -----     | 35 to 70  | -----     | 10 to 30  | 0 to 5    | -----     | -----   | -----  | -----  |          |
| 5        | 1 to 1/2                         | ----  | -----     | ---- | -----     | -----     | 100       | 90 to 100 | 20 to 55  | 0 to 10   | 0 to 5    | -----     | -----     | -----   | -----  | -----  |          |
| 56       | 1 to 3/8                         | ----  | -----     | ---- | -----     | -----     | 100       | 90 to 100 | 40 to 75  | 15 to 35  | 0 to 15   | 0 to 5    | -----     | -----   | -----  | -----  |          |
| 57       | 1 to No. 4                       | ----  | -----     | ---- | -----     | -----     | 100       | 95 to 100 | -----     | 25 to 60  | -----     | 0 to 10   | 0 to 5    | -----   | -----  | -----  |          |
| 6        | 3/4 to 3/8                       | ----  | -----     | ---- | -----     | -----     | -----     | 100       | 90 to 100 | 20 to 55  | 0 to 15   | 0 to 5    | -----     | -----   | -----  | -----  |          |
| 67       | 3/4 to No. 4                     | ----  | -----     | ---- | -----     | -----     | -----     | 100       | 90 to 100 | -----     | 20 to 55  | 0 to 10   | 0 to 5    | -----   | -----  | -----  |          |
| 68       | 3/4 to No. 8                     | ----  | -----     | ---- | -----     | -----     | -----     | 100       | 90 to 100 | -----     | 30 to 65  | 5 to 25   | 0 to 10   | 0 to 5  | -----  | -----  |          |
| 7        | 1/2 to No. 4                     | ----  | -----     | ---- | -----     | -----     | -----     | -----     | 100       | 90 to 100 | 40 to 70  | 0 to 15   | 0 to 5    | -----   | -----  | -----  |          |
| 78       | 1/2 to No. 8                     | ----  | -----     | ---- | -----     | -----     | -----     | -----     | 100       | 90 to 100 | 40 to 75  | 5 to 25   | 0 to 10   | 0 to 5  | -----  | -----  |          |
| 8        | 3/8 to No. 8                     | ----  | -----     | ---- | -----     | -----     | -----     | -----     | -----     | 100       | 85 to 100 | 10 to 30  | 0 to 10   | 0 to 5  | -----  | -----  |          |
| 89       | 3/8 to No. 16                    | ----  | -----     | ---- | -----     | -----     | -----     | -----     | -----     | 100       | 90 to 100 | 20 to 55  | 5 to 30   | 0 to 10 | 0 to 5 | -----  |          |
| 9        | No.4 to No.16                    | ----  | -----     | ---- | -----     | -----     | -----     | -----     | -----     | -----     | 100       | 85 to 100 | 10 to 40  | 0 to 10 | 0 to 5 | -----  |          |
| 10       | No. 4 to 0 (2)                   | ----  | -----     | ---- | -----     | -----     | -----     | -----     | -----     | -----     | -----     | 100       | 85 to 100 | -----   | -----  | -----  | 10 to 30 |

- (1) In inches, except where otherwise indicated. Numbered sieves are those of the United States Standard Sieve Series.
- (2) Screenings.
- (3) Where standard sizes of coarse aggregate designated by two or three digit numbers are specified, the specified gradation may be obtained by combining the appropriate single digit standard size aggregates by a suitable proportioning device which has a separate compartment for each coarse aggregate combined. The blending shall be done as directed by the Laboratory.

703.02 Aggregate for Portland Cement Concrete.

Coarse Aggregate. 1. The coarse aggregate shall be crushed stone, crushed air-cooled blast-furnace slag or gravel. Coarse aggregate for superstructure concrete must conform to 511.02.

2. Physical properties.

|   |      |
|---|------|
| Percentage of wear. Los Angeles Test, maximum             | 40.0 |
| Unit weight, minimum pounds (slag)                        | 70.0 |
| Loss, sodium sulfate soundness test,<br>percent, maximum: |      |
| 305   | 15.0 |
| 451, 452, 603, 604  | 12.0 |
| 515, 511, 519   | 10.0 |
| 613   | 5.0  |

Deleterious substances shall not exceed the following:

|  | <u>Percent by Weight</u> |                               |
|--|--------------------------|-------------------------------|
|  | <u>Superstructure</u>    | <u>All Other<br/>Concrete</u> |
| Soft Pieces  | 2.0                      | 3.0                           |
| Coal and Lignite   | 0.25                     | 1.0                           |
| Clay Lumps   | 0.25                     | 0.25                          |
| Amount finer than No. 200 Sieve  | 0.50                     | 1.0                           |
| If this material consists of the dust of<br>fracture, essentially free from clay<br>and shale  | 1.5                      | 1.5                           |
| Pieces having a length greater than<br>5 times the average thickness   | 10.0                     | 10.0                          |
| Shale and shaly material   | 0.5                      | 1.0                           |
| Other deleterious substances, such as<br>limonitic concretions, alkali and chert<br>which disintegrates in 5 cycles of the<br>soundness test | 0.5                      | 1.0                           |

704 – MASONRY UNITS

The various sub-sections of section 704.00 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

701.01 Clay or Shale Brick. ASTM C32, Grade MA, with exceptions as noted in the reference specifications.

706 – CONCRETE AND CLAY PIPE

The various sub-sections of Section 706.00 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

706.01 General. The interior of all pipe shall conform to the internal size specified, of true section and all pipe shall be free from fins, bulges, ridges, offsets, projections, defects or roughness of any kind. Any such defects or irregularities shall be corrected as directed. The Engineer shall have the right to reject defective pipe and such rejected pipe shall be removed from the project and disposed of at the contractor's expense. Pipe acceptable to the Engineer shall be substituted, at the contractor's expense, for any rejected pipe.

Special fittings as needed or required shall be made by the pipe manufacturer and shall conform in all respects to the requirements of these specifications for the type of pipe used. The ends (tongues, grooves, bells and spigots) of all pipe shall not be treated, painted, or covered with any application of asphalt, tar, aluminum, cement or other type paint unless approved by the Engineer.

All manufacturers of sewer pipe must have the necessary equipment and personnel required to perform all tests on the type and size of the pipe they propose to furnish under these specifications.

All reinforced concrete pipe 30 inch diameter and larger may be manufactured with suitable cast tapered handling holes in the pipe barrel. Suitable designed tapered plugs shall be used to close and seal the handling hole after the pipe is laid.

Where designs are not given in ASTM C76 and ASTM C507 for various sizes and strength classifications, pipe designs given in the latest approved revision of the Ohio Department of Transportation specifications may be used.

The provisions of paragraph 10 of ASTM C76 and paragraph 11 of ASTM C507 will not be permitted and designs will be limited to those specified herein.

**NO CONCRETE PIPE SHALL BE MOVED FROM THE CASTING YARD BEFORE SUCH PIPE HAS BEEN CURED A MINIMUM OF SEVEN DAYS; OR PASSES THREE POINT BEARING TEST.**

All concrete radius pipe shall be of the size, type and minimum strength classification shown or specified in the contract documents. If required, the contractor shall submit to the Engineer detailed layout drawings of the pipe to be used to construct the curved portion of the sewer line. The maximum deflection angle turned at either end of any pipe section shall be 5°.

Except for fittings and closure pieces, the minimum net laying length of concrete storm and sanitary sewer pipe shall be as listed below:

| <u>Storm Sewers</u> | <u>Minimum</u> |
|---------------------|----------------|
| 6" through 13 "     | 4 – feet       |
| 21" through 120 "   | 6 – feet       |
| 126" and larger     | 5 – feet       |
| Elliptical Pipe     | 6 – feet       |

| <u>Sanitary Sewers</u> | <u>Minimum</u> |
|------------------------|----------------|
| 6" through 18"         | 4 – feet       |
| 21" through 120"       | 8 – feet       |
| 126 " and larger       | 5 – feet       |
| Elliptical Pipe        | 6 – feet       |

| <u>Storm and Sanitary Sewers</u> | <u>Minimum</u>   |
|----------------------------------|--|
| Radius Pipe                      | Of such length that the shorter side is at least 2 – feet. |

All extra strength clay pipe shall meet the applicable requirements of ASTM C700 and ASTM C425 and shall have the following minimum laying lengths:

| <u>Size (Dia.)</u>        | <u>Minimum Laying Length</u> |
|---------------------------|------------------------------|
| <u>Pipe</u>               |                              |
| " through 36"             | 3 – feet                     |
| <u>Yard T. Branches</u>   |                              |
| 4" through 12"            | 2 – feet                     |
| 15" through 36"           | 3 – feet                     |
| Closure and Repair Pieces | As required                  |

Blisters shall not exceed one (1) inch in diameter and project no more than one-sixteenth (1/16) inch above the surrounding surface of the pipe.

706.002 Test Requirements. In addition to the requirements of 700, at least one (1) full length section of each size, class and wall thickness pipe will be tested for each project and no variation of these requirements will be allowed except as stated in 106.03 and as accepted in writing by the Engineer.

707 – STEEL PIPE

The various sub-sections of section 707.00 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions: None.



708 – PAINT

The various sub-sections of section 708.00 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

None.

709 – REINFORCING STEEL

The various sub-sections of section 709.00 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

None.

710 – FENCE AND GUIARD RAIL

The various sub-sections of section 710.00 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

None.

710 – FENCE AND GUIARD RAIL

The various sub-sections of section 711.00 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

None.

712 – MISCELLANEOUS

The various sub-sections of section 712.00 of the latest edition of the State of Ohio Department of Transportation Construction and Material Specifications shall apply and are hereby considered a part of these specifications by reference, with the following exceptions:

None.

713 – LIGHTING AND ELECTRICAL MATERIALS

All electrical materials and installations shall be in strict accordance with the latest revisions of N.E.C., N.F.P.A. and the Ohio Building Code.

720 – DUCTILE IRON PIPE AND CAST IRON PIPE

720.01 Standards. All ductile iron pipe shall be centrifugally cast and shall conform to the American National Standards Institute specifications A.N.S.I. A21.51 – 1976 as approved by the American Water Works Association, A.W.W.A. C-151 – 1976. Every pipe shall be marked in accordance with A.N.S.I. A21.51 with the letters A.W.W. All ductile iron pipe fittings shall be in accordance with A.N.S.I. 21.10.

All cast iron pipe shall conform to A.N.S.I. Specification A21.6. Every pipe shall be marked in accordance with A.N.S.I. A21.6 with the letters A.W.W. “Push-On” joints, mechanical and flanged joints shall conform to A.N.S.I. Specifications A21.11. Mechanical joint fittings shall conform to A.N.S.I. Specifications A21.10. “Push-On” joint fittings shall conform to A.N.S.I. Specification A21.11. Flanged fittings shall conform to A.N.S.I. Specifications A21.10 or B16.1 where A21.10 is not applicable.

Cement lining for pipe shall conform to A.N.S.I. Specification A21.4.

720.02 General. All pipe shall be coated on the outside with a standard bituminous coating in accordance with A.N.S.I. Specification A21.6 Section 6-8. Any pipe that is to be recoated shall first be thoroughly scraped and cleaned.

All pipe shall be thoroughly cleaned and subjected to a careful hammer inspection. No pipe shall be coated unless clean and free from rust and approved in these respects before being dipped or lined. Care should be taken in handling the pipe and fittings so as not to injure the coating and no material of any kind should be placed in the pipe and fittings during transportation or at any time after they receive the coating.

721 – REINFORCED CONCRETE PRESSURE PIPE

721.01 Standards. All reinforced concrete pressure pipe and fittings shall conform to A.W.W.A. C-301-64 or its latest revision. In addition to the standard test called for under A.W.W.A. C-301-64 the following test will be met:

1. Two specimen pipe of 24-inch, corresponding to the approved design, as submitted by the manufacturer, will be tested as follows after the concrete test cylinder has reached a minimum of 4500 p.s.i. strength.
2. The hydrostatic pressure shall be raised from zero to two hundred (200) p.s.i. for twenty (20) minutes. No apparent cracks in the body of the pipe larger than one one-hundredth (0.01) of an inch as measured with a standard feeler gauge will be allowed.

721.02 General. If, in the process of manufacture, transportation, or handling, any concrete pipe or fitting receives any indentation or deformation to the concrete, steel ends or connections, the removal of which will in any degree injure it, such pipe or fitting shall be rejected and replaced at the contractor's expense.

Each pipe and fitting shall have conspicuously painted in black on the inside, a serial number for the purpose of identification. Serial numbers shall agree with lists to be furnished to the Engineer. **The top center line** of all fittings and each pipe that has a beveled end shall have a white ring painted in the shop around the mark both on the inside and the outside of the pipe.



722 – ASBESTOS CEMENT PRESSURE PIPE

722.01 Standards. Asbestos cement pressure pipe shall be manufactured in accordance with ASTM Specification C-296 Type 11 and A.W.W.A. Specification C-400, Class as indicated on the proposal.

722.02 General. Pipe joints shall consist of cylindrical couplings of the same material as the pipe using two solid vulcanized rubber rings retained in machined grooves inside the coupling and mating, when compressed, with the machined end of the pipe to form a tight seal. Automatic end separation and accessibility of rings for position gauging are required.

Standard pipe length shall be:

- a) Ten feet (10') or thirteen feet (13') for six inch (6") diameter pipe.
- b) Thirteen feet (13') for eight inch (8") diameter pipe and larger.

Fittings for asbestos cement pressure pipe shall be cast iron or ductile iron (Item 720) and shall have bells with "Weld-Tite", "Ring-Tite", or "Fluid'Tite" profiles using the same rubber rings for sealing as those supplied with the pipe coupling. Mechanical joints may be used with the appropriate adapter.

SECTION 800 – WATER PIPE & ACCESSORIESITEM 801 – WATER PIPE – GENERAL

|        |  |
|--------|--|
| 801.01 | DESCRIPTION                              |
| 801.02 | MATERIALS                                |
| 801.03 | EXCAVATION                               |
| 801.04 | BEDDING                                  |
| 801.05 | LAYING                                   |
| 801.06 | PIPE JOINTS                              |
| 801.07 | REMOVAL OF WATER                         |
| 801.08 | BACKFILLING                              |
| 801.09 | SURFACE SOIL AND RESTORATION OF SURFACES |
| 801.10 | DISINFECTION OF WATER PIPES              |
| 801.11 | TESTING                                  |
| 801.12 | METHOD OF MEASUREMENT                    |
| 801.13 | BASIS OF PAYMENT                         |

801.01 Description. This work shall consist of constructing water pipe complete in place and shall be in accordance with these specifications and in conformity with the lines and grades shown on the plans and established by the Engineer. This work shall include: all necessary equipment, labor and materials required for the furnishing and laying of the various sizes and kinds of water pipe; all excavating for pipes and bedding for same, including clearing and grubbing, fill or embankment and the removal and/or replacement of all materials necessary for placing the pipe except for removals and/or replacements listed separately; furnishing and laying pipe in the trench and jointing it; furnishing and placing concrete backing and granular or concrete backfill as required; protecting, repairing, or replacing head walls, existing concrete blocking, drains, sewer, gas, electric and water connections or mains and any other structures that may be disturbed or damaged by the Contractor's operations unless otherwise noted on the plans; constructing and subsequently removing all necessary coffer dams, cribs and sheeting; removal of water; disposing of surplus excavation; testing and chlorinating all necessary pipe of the types specified or shown on the plans; restoration of disturbed facilities and surfaces; maintenance of traffic, drainage, and existing structures and utilities, all as shown on the drawings and as specified.

801.02 Materials. Pipe shall be of the size and kind specified in the proposal and shown on the plans and shall meet the requirements of the pertinent sections of 706 and as follows:

|    |   |        |
|----|---|--------|
| a. | Concrete for cradle, backing and backfill – Class C ..... | 499    |
| b. | Granular material for bedding and backfilling.....        | 310.02 |
| c. | Cement for mortar .....                                   | 701    |
| d. | Sand for mortar .....                                     | 703.03 |

|    |  |     |
|----|--|-----|
| e. | Gaskets for cement asbestos pipe .....                     | 722 |
| f. | Gaskets for cast iron pipe.....                            | 720 |
| g. | Gaskets for ductile iron pipe .....                        | 720 |
| h. | Ductile iron pipe with “Push-on Joints”, cement lined..... | 720 |
| i. | Concrete pressure pipe.....                                | 721 |

801.03 Excavation. The Contractor shall excavate all materials of whatever nature encountered, including rock in place, necessary for the construction of the work as shown on the plans and as specified. All excavation, except as otherwise required, permitted or ordered in writing by the Engineer shall be in open trench. All excavation work shall be included in the price bid for pipe unless specifically itemized for payment in the proposal.

801.031 Limit as to Width of Trench. The width of trench below the elevation of the outside top of the barrel of the pipe shall not exceed a width equal to the outside diameter of the pipe plus two feet unless permitted or ordered in writing by the Engineer. Sufficient sheeting, bracing and timbering shall be provided, installed and used by the Contractor to maintain the sides of the trench in a substantially vertical position wherever it is deemed necessary by the Engineer to protect and preserve life, property or the use of such property and no payment will be made for such sheeting, bracing and timbering unless ordered left in place in writing by the Engineer. Payment for this sheeting and bracing left in place will be made under 807.

801.032 Unauthorized Excavation. All excavation outside or below the limiting lines for excavation as shown on the detail drawings shall be classed as unauthorized excavation and shall be filled by the Contractor at his own cost and expense in a manner and with material approved by the Engineer.

801.033 Subgrade. It is expected that satisfactory material will be found at the subgrade of the trench if adequate water removal facilities are provided. If soft, spongy, unsuitable or similarly unacceptable material is encountered at the subgrade upon which this pipe is to be placed, this unsuitable material shall be removed or dewatered to provide a stable foundation acceptable to the Engineer. The following will govern the prosecution of the work involved:

a. If the dewatering of the subgrade materials, by whatever means is used by the Contractor, produces a subgrade acceptable to the Engineer for placing the pipe, no additional payment will be made for the work and the payment for this work will be included in this item.

b. If the unstable material is removed by order of the Engineer, it shall be replaced by stone foundation as specified in 806. The Contractor shall remove the unstable material and place the required stone foundation at his expense. No additional payment will be made for the additional excavation or material required as long as the material does not extend more than two feet below the bottom of the pipe.

c. If dewatering and placing stone foundation as specified in 806 up to one (1) foot on each side of the pipe and up to one (1) foot below the bottom of the pipe does not provide a stable foundation acceptable to the Engineer, the Contractor, if directed by the Engineer in writing, shall remove additional unsuitable material and shall replace it with stone foundation as specified in 806 and shall be paid as indicated therein less the quantity within the above described limits.

No payment will be made for additional stone foundation unless ordered by the Engineer in writing. No payment will be made for stone foundation outside the pay limits set by the Engineer in writing.

801.034 Excavated Material. All excavated material in excess of that required for backfilling shall be disposed of by the Contractor. Public or private property shall not be used for this purpose without the written permission of the owner. A copy of the written permission shall be approved by and filed with the Engineer. No trespass on private property shall be made until this has been done. Excavated material required for backfill, except a hereinafter provided for under Surface Soil, may be stored on the bank of the trench immediately adjacent to the work under construction where space is available within the right-of-way acquired for the work, provided, however, that such storage shall not interfere with the access to and maintenance of traffic, drainage and utilities as herein specified.

In all cases satisfactory ingress and egress to all properties along the line of the work shall be maintained.

801.035 Removal of Obstructions. The removal of any obstructions, including abandoned sewer, which may be encountered or is necessary for the construction of the work, shall be done by the Contractor at his own expense under the direction of the Engineer.

801.036 Maintaining Drainage. The flow of all sewers, drains, streets, gutters and water courses encountered shall be provided for by the Contractor at his own expense and wherever such water courses and drains are disturbed or destroyed during the prosecution of the work, they shall be restored by the Contractor at his own cost and expense to a condition satisfactory to the Engineer.

801.037 Maintenance of Service in Existing Structures. All publicly owned existing overhead, surface or subsurface structures, together with all appurtenances and service connections, except those otherwise provided for herein, encountered or affected in any way during the construction of any of the work under this contract, shall be maintained in service by the Contractor at all times unless other arrangements, satisfactory to the authority responsible for their operation, are made with such authority.

The cost of this work shall be included in the prices bid for all the various items of the contract.

801.04 Bedding. All waterline pipes shall be laid on a good earth foundation and adequate means shall be taken to prevent settlement. All pipe, when laid in the trench, shall be bedded firmly along the entire length of the pipe. When unsuitable sub-grade material is encountered, the Contractor shall provide a foundation as required in 801.033 at his own expense. In rock excavation the pipe shall be embedded in granular material with a minimum thickness of six inches (6") on all sides. Where granular bedding is required at the bottom of the trench, it shall be thoroughly compacted before the pipe is laid in the trench. The cost of all the bedding shall be included in the price bid for the various pipe items.

801.05 Laying. The excavation and preparation of the trench and the laying of the pipe shall be done to conform to the applicable parts of the latest revision of the standard specifications for installing ductile or cast iron pipe AWWA C-600 or AWWA C-603 for cement asbestos pipe.

The laying shall also be in accordance with the requirements of Item 801 of these Specifications. The Contractor's particular attention is directed to 801.09 concerning his responsibility for restoration of surfaces when for which no specific items are included and for which no separate or additional payment will be made to the Contractor therefor.

Piping materials shall be carefully lowered into the trench in a manner that will prevent damage to materials, protective coatings and linings. Pipe and fittings shall be clean when laid and open ends shall be kept plugged with bulkheads during construction. Precautions shall be taken to prevent floating.

Concrete blocking, supports and/or buttresses shall be provided at all tees, bends and valves and at any other locations shown on the plans or directed by the Engineer. The above concrete structures shall be built to the lines, grades and dimensions shown on the standard construction drawings, constructed with Class C concrete per 499 and paid for as hereinafter provided. The cost of concrete or timber blocking supports and for buttresses both permanent and temporary and the cost of excavating to line and grade shown for the supports shall be included in the unit price bid for the various pipe fittings and assemblies.

Whenever cement asbestos pipe passes under a creek bed it shall be encased in concrete at least twelve inches (12") thick on all sides of the pipe in accordance with the requirements of Item 810 of these Specifications. The cost of concrete encasement to be included in the unit price bid for Item 801.

Whenever it becomes necessary to cut a length of pipe for any purpose, care shall be taken to leave a smooth and uniform surface and the cut shall be performed so that the cut surface is at right angles to the pipe axis.

Asbestos-cement pipe shall be cut in accordance with the manufacturer's specifications and recommendations. Field machining tools approved by the Engineer must be used for machining the rough pipe barrel.

The contractor shall furnish all material and labor to set grade bars every fifty feet (50') where noted on the plans. Every pipe shall be laid at each end by line and grade indicated by a line drawn between the grade bars, by using a rod or pole of fixed length as a gauge between working line and pipe in trench. A plumb bob shall be used to check the line of pipe. If the grades are flat and the Engineer so orders, the Contractor shall place intermediate bars, between those set at stakes of Engineer, to avoid sag in the working line. Such additional bars shall be placed at the Contractor's expense.

In lieu of the line and batter board method, a laser beam alignment system approved by the Engineer may be used.

Where concrete bedding is used, the trench or excavation shall not be backfilled for at least 24 hours after placing of the concrete except that pipe may be covered to a depth of not to exceed 36 inches (36") in order to afford protection. The method employed in depositing the backfill shall be such as to prevent damage to the pipe or other structures. Concrete structures built in place shall not be backfilled until permitted by the Engineer.

Except where other requirements are noted on the plans, or provided for in the specifications or are ordered by the Engineer, all open trench backfill above the elevation of the bedding material of the water main shall be done with materials that, subject to other provisions of the specifications for compaction or special fill have the same as or better soils characteristics than the adjacent undisturbed soil or materials and in a manner satisfactory to the Engineer. All backfilling operations and placement of the backfill material shall be conducted by such means as to eliminate damage to the pipe, its appurtenant structures and other adjacent structures.

Where settlement of the backfill is to be done by flushing or ponding, it shall be so shown by notes on the plans.

With bell and pipe, suitable bell-holes shall be excavated for the bell of each pipe so that the weight of the pipe will not be supported by the bells only. The pipes shall be fitted and matched so that when laid in the work, they will form a conduit with a smooth and uniform invert. All possible care shall be used when shoving the pipe together so that the joints will not be unnecessarily large and pipe ends shall be carefully cleaned before pipes are laid.

All connections with existing structures or pipes shall be made in a thorough, first class, neat and workmanlike manner. The cost of this work shall be included in the price bid for the various pipe items unless specifically itemized for payment elsewhere in the plans or proposal.

801.06 Pipe Joints. All joint surfaces shall be cleaned and dried before joint lubricants are applied. Joints shall be made in accordance with the manufacturer's recommendations and procedures in accordance with the latest revisions of AWWA C-600 and AWWA C-

No joints shall be made under water.

All pipe joints shall be checked using an approved feeler gauge entirely around the joint to check the gasket for proper alignment. If any irregularity is found, the joint shall be taken apart and remade using a new gasket if necessary.

Cement-asbestos pipe joints shall be rubber ring type conforming to the requirements of 722.

Cast iron or ductile iron pipe joints shall be rubber ring type conforming to the requirements of 720.

Concrete pressure pipe joints shall be "Rubber and Steel Ring" type, AWWA C-301. Joints shall be made according to the manufacturer's recommendations.

801.07 Removal of Water. The Contractor shall, at all times during construction, provide proper and satisfactory means and devices for the removal of all water entering the excavations and shall remove all such water as fast as it may collect in such manner as shall not interfere with the prosecution of the work or the proper placing of masonry or other work. No pipe shall be laid under water. No water shall be allowed to enter the pipe being laid.

801.08 Backfilling. All trenches and excavations shall, in general, be backfilled, as hereinafter specified, as soon after the pipes or other structures built therein are completed, and as the particular type of construction and the circumstances will, in the opinion of the Engineer, permit.

Earth backfilling of open trench excavating shall be done with the best of excavated earth, which shall be free from stones larger than two inches in their greatest dimensions, rubbish, or frozen material; provided, however, that occasional boulders or stones not larger than one cubic foot may be deposited at least two feet (2') above the top of the pipe and subject to the approval of the Engineer.

Except where other requirements are noted on the plans, or provided for in the specifications or are ordered by the Engineer, all open trench backfill above the elevation of the foundation material of the pipe shall be done with materials that, subject to other provisions of the specifications for compaction or special fill, have the same as, or better soils characteristics than the adjacent undisturbed soil or materials and in a manner satisfactory to the Engineer. All backfilling operations and placement of the backfill material shall be conducted by such means as to eliminate damage to the waterline, its appurtenant structures and other adjacent structures.

Where the proposed waterline will be within the roadway of any street (paved or unpaved), sidewalk, drive approach or similar structure, or as designated on the Construction Plans, the BACKFILL SHALL CONSIST OF GRANULAR MATERIAL AS APPROVED BY THE ENGINEER. This material shall be HAND BACKFILLED to a depth of two foot (2') above the top of the pipe, the backfill being placed in LAYERS NOT EXCEEDING 8 INCHES IN THICKNESS. Each layer shall be compacted to 95 percent of maximum laboratory dry weight with special care exercised to insure thorough compaction under and around sides of pipe. The remainder of the backfill may be placed mechanically, however, it shall also be placed in layers not exceeding 8 inches and be compacted to 95 percent of maximum laboratory dry weight. The moisture content of the backfill material shall generally range between 3 percent below optimum to 2 percent over optimum for the material being used. Where additional water is required it shall be sprinkled uniformly over the material. THE COST of such granular backfill and any additional water required shall be included in the price bid per lineal foot of pipe unless specifically itemized for payment in the proposal.

In trench areas from rock, the trench shall be backfilled to a depth of two feet (2') above the top of the pipe with approved granular material placed in layers not exceeding eight inches (8") in thickness. Each layer shall be compacted to 95 percent of maximum laboratory dry weight with special care exercised to insure thorough compaction under and around sides of pipe. The trench may then be backfilled with approved site material.

In trench areas other than those described above, hand backfill with approved site material shall be performed to a depth of two feet (2') above the top of the pipe and shall be thoroughly mechanically compacted with special care exercised to insure thorough compaction under and around the sides of the pipe. The remainder of the backfill may be placed mechanically, but shall be done in depths of two feet (2') and shall be mechanically compacted at each two foot interval.



The cost of the backfill shall be included in the price bid for the pipe.

Where ordered by the Engineer, sections of the trench other than those specified above or called for on the plans or where changes in alignment require increased quantities of granular backfill, may also be backfilled with granular backfill. Any such additional backfill ordered by the Engineer will be placed as specified in 812 and paid for as indicated therein.

Any settlement in the open trench backfill taking place within the guarantee period shall be refilled with satisfactory materials and the affected surface properly repaired by the Contractor all at his own cost and expense and no extra payment shall be made therefor.

801.09 Surface Soil and Restoration of Surfaces. Except where otherwise specifically exempted or provided, the Contractor shall, before starting trench excavation, remove the surface soil to a depth of not less than 12 inches below the original surface of the ground within the limits to be excavated and then aggregate and store it separately from the remaining stored excavated material. If necessary, he shall acquire additional area to provide for such separate storage of surface soil. After the completion of pipe construction and basic trench backfill, the Contractor shall replace and redistribute surface soil in the affected areas to a depth of 12 inches and shall make due allowance where embankment is required and shall re-excavate the basic trench backfill where necessary to allow for the surface soil fill. Where surface soil is replaced, any settlement below the original ground surface occurring within the guarantee period shall be refilled with surface soil equivalent to the original material. The cost of all work and other expenses connected with the surface soil operation shall be included in the price bid for the various water pipe items and no extra payment shall be made therefor.

All surfaces, including grass or lawn, pavement, sidewalk, curbing and other surfaces disturbed or destroyed during and as a result of the construction of the work, shall be replaced by the Contractor as hereinafter specified under the respective items therefor, providing such items are herein included. All such types of surfaces disturbed, destroyed or damaged including grassed and cultivated areas, for which specific items have not been included herein, shall be restored by the Contractor at his own expense and no separate or additional payment will be made therefor.

The Contractor's particular attention is directed to the provision of the above paragraph pertaining to his responsibility for restoration of surfaces for which no specific items are included and for which no separate or additional payment will be made to the Contractor therefor.

The Contractor will be required under this provision to reseed all grassed and cultivated areas disturbed above and adjacent to the work after reasonable lapse of time to allow for settlement of trench and final grading over trench. The seeding operation shall be done in conformity with the requirements set forth under 659 of these specifications.

Suitable surface soil shall be obtained and applied over excavated area to a depth of not less than 12 inches and over adjacent disturbed areas to sufficient depth for proper leveling and for preparation of adequate bed to support growth. All seeded surfaces shall be watered and maintained so as to provide a satisfactory surface and bare spots shall be reseeded and cared for in the same manner.

The Contractor shall include in the prices bid for the water pipe items, the cost of all such restoration in all areas involved above and adjacent to the work and no separate or additional payment shall be made therefor unless specifically provided for under other items.

#### 801.10 Disinfection of Water Pipes.

801.101 General. All disinfection of water pipes, fittings, and appurtenances shall be in accordance with the latest revision of AWWA C-601.

The Contractor shall furnish all equipment, labor and material and laboratory tests required to disinfect the lines and shall provide all tests necessary to certify that the disinfection is acceptable. The complete disinfecting procedure proposed by the Contractor and all equipment, materials, and testing agencies must be approved by the Engineer prior to starting any work.

#### 801.102 Basic Procedure.

The basic procedure comprises:

1. Preventing contaminating materials from entering the water mains during construction or repair and removing by flushing materials that may have entered the water main.
2. Disinfecting any residual contamination that may remain.
3. Determining the bacteriologic quality by laboratory test after disinfection.

801.103 Preventative Measures During Construction.

1. Keeping Pipe Clean and Dry - Precautions shall be taken to protect pipe interiors, fittings, and valves against contamination. Pipe delivered for construction shall be strung so as to minimize entrance of foreign material. When pipelaying is not in progress, as, for example, at the close of the day's work, all openings in the pipeline shall be closed by water-tight plugs. Joints of all pipe in the trench shall be completed before work is stopped. If pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

Note: Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipelaying, the less this delay.

If dirt, that enters the pipe will not in the opinion of the Engineer be removed by the flushing operation, then the interior of the pipe shall be cleaned and swabbed as necessary, with a 5 per cent hypochlorite disinfecting solution.

2. Packing Materials and Joints – No contaminated material or any material capable of supporting prolific growth of micro-organisms shall be used for sealing joints. Packing material shall be handled in such a manner as to avoid contamination.

Where applicable, packing materials must conform to AWWA standard

TABLE 801.05  
Required Openings to Flush Pipelines \*  
(40-psi Residual Pressure)

| Pipe Size<br>In. | Flow Required to<br>Produce 2.5 fps<br>Velocity<br>gpm | Orifice<br>Size<br>In. | <u>Hydrant Outlet Nozzles</u> |             |
|------------------|--|------------------------|-------------------------------|-------------|
|                  |  |                        | Number                        | Size<br>In. |
| 4                | 100  | 15/16                  | 1                             | 2-1/2       |
| 6                | 220  | 1-3/8                  | 1                             | 2-1/2       |
| 8                | 390  | 1-7/8                  | 1                             | 2-1/2       |
| 10               | 610  | 2-5/16                 | 1                             | 2-1/2       |
| 12               | 880  | 2-13/16                | 1                             | 2-1/2       |
| 14               | 1,200  | 3-1/4                  | 2                             | 2-1/2       |
| 16               | 1,565  | 3-5/8                  | 2                             | 2-1/2       |
| 18               | 1,980  | 4-3/16                 | 2                             | 2-1/2       |

\* With 40 psi residual pressure, a 2-1/2 in. hydrant outlet nozzle will discharge approximately 1,000 gpm and a 4-1/2 in. hydrant nozzle will discharge approximately 1,500 gpm.

Packing material for cast iron pipe must conform to AWWA C600. Yarning or packing material shall consist of molded or tubular rubber rings, rope of asbestos or treated paper. Materials such as jute or hemp shall not be used.

The lubricant used in the installation of sealing gaskets shall be suitable for use in portable water. It shall be delivered to the job in closed containers and shall be kept clean.

801.104 Preliminary Flushing. The main shall be flushed prior to disinfection. The sites and velocities of flushing shall be as approved by the Engineer.

Note 1: The flushing velocity shall not be less than 2.5 ft/sec. The rate of flow required to produce this velocity in various diameter is shown in Table 801.05. No site for flushing should be chosen until it is determined that drainage is adequate at that site.

Note 2: Flushing is no substitute for preventative measures taken before and during pipe laying. Certain contaminants, especially in caked deposits, resist flushing at any velocity. Furthermore, with diameters of 16 in. or more, even the minimum recommended flushing velocity of 2.5 ft/sec is sometimes difficult to achieve. It shall be the responsibility of the Contractor to prevent caked deposits or contaminants or to remove them.

801.105 Form of Chlorine for Disinfection. The allowed forms of chlorine used in the disinfecting solutions shall be liquid chlorine (gas at atmospheric pressure) or calcium hypochlorite granules or sodium hypochlorite solutions.

1. Liquid Chlorine – Shall be used only when suitable equipment is available and only under the direct supervision of a person familiar with the physiological, chemical, and physical properties of this element and who is properly trained and equipped to handle any emergency that may arise. Introduction of chlorine-gas directly from the supply cylinder is unsafe and shall not be permitted.

Note: The preferred equipment consists of a solution feed chlorinator in combination with a booster pump for injecting the chlorine-gas water mixture into the main to be disinfected. Direct feed chlorinators are not recommended because their use is limited to situations where the water pressure is lower than the chlorine cylinder pressure.

2. Hypochlorites.

a. Calcium Hypochlorite – Calcium hypochlorite containing 70 percent available chlorine by weight. It is either granular or tabular in form. A chlorine-water solution is prepared by dissolving the granules in water in the proportion requisite for the desired concentration.

b. Sodium Hypochlorite – Sodium hypochlorite is supplied in strengths from 5.25 to 16 per cent available chlorine. It is packaged in liquid form. The chlorine-water solution is prepared by adding hypochlorite to water. Product deterioration must be reckoned with in computing the quantity of sodium hypochlorite required for the desired concentration.

c. Application – The hypochlorite solution shall be applied to the water main with a gasoline or electrically powered chemical feed pump designed for feeding chlorine solutions. Feed lines shall be of such material and strength as to withstand safely the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the hypochlorite solution is applied to the main.

801.106 Methods of Chlorine Application.

1. Continuous Feed Method.

TABLE 801.106  
Chlorine Required to Produce 50 Mg/1  
Concentration in 100 ft of Pipe –  
by Diameter

| Pipe Size<br>In. | 100 Per Cent Chlorine<br>Lb. | 1 Per Cent Chlorine Solutions<br>Gal. |
|------------------|------------------------------|---------------------------------------|
| 4                | 0.027                        | 0.33                                  |
| 6                | 0.061                        | 0.33                                  |
| 8                | 0.103                        | 1.30                                  |
| 10               | 0.170                        | 2.04                                  |
| 12               | 0.240                        | 2.88                                  |

Water from the existing distribution system or other approved sources of supply shall be made to flow at a constant, measured rate into the newly-laid pipeline. The water shall receive a dose of chlorine, also fed at a constant, measured rate. The two rates shall be proportioned so that the chlorine concentration in the water in the pipe is maintained at a minimum of 50 mg/1 available chlorine. To assure that this concentration is maintained, the chlorine residual shall be measured at regular intervals in accordance with the procedures described in the latest edition of Standard Methods and AWWA M12 – Simplified Procedures for Water Examination.

Table 801.106 gives the amount of chlorine residual required for each 100 ft of pipe of various diameters. Solutions of 1 per cent chlorine may be prepared of sodium mypochlorite or calcium hypochlorite. The latter solution requires approximately 1 lb. of calcium hypochlorite in 8.5 gal. of water.

During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from going back into the line supplying the water. Chlorine application shall not cease until water shall be retained in the line for at least 24 hours, during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24 hour period, the treated water shall contain no less than 5 mg/1 chlorine throughout the length of the main.

2. Slug Method – This method is suitable for use with mains of large diameter for which, because of the quantities of water involved, the continuous feed method is not practical.

Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate into the newly laid pipeline. The water shall receive a dose of chlorine, also fed at a constant, measured rate. The two rates shall be proportioned so that the concentration in the water entering the pipeline is maintained at no less than 300 mg/1. The chlorine shall be applied continuously and for a sufficient period to develop a solid column or “slug” of chlorinated water that will, as it passes along the line, expose all interior surfaces to a concentration of at least 300 mg/1 for at least 3 hours. The application shall be checked at a tap near the upstream end of the line by chlorine residual measurements made according the the Specifications.

As the chlorinated water flows past tees and crosses, related valves and hydrants shall be operated so as to disinfect appurtenances.

801.107 Final Flushing. After the applicable retention period the heavily chlorinated water shall be flushed from the main until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system, or less than 1 mg/1. Chlorine residual determination shall be made to ascertain that the heavily chlorinated water has been removed from the pipeline.

801.108 Alternate Disinfection Procedures. With the written approval of the Engineer, the Contractor may elect to use an alternate disinfection procedure. Any alternatives shall, however, conform to acceptable methods of waterline disinfection. Before an alternate method is approved, the Contractor shall submit a written description of the method he proposes to use. Such description shall include the types of chemicals to be used and the method for applying them. If an alternate disinfection procedure as approved by the Engineer is used, the waterline must pass the tests as described in 801.109. If the line fails to meet the requirements of 801.109 at the direction of the Engineer, either the disinfection procedures outlined in 801.104 through 801.107 shall be performed or the alternative procedure chosen by the Contractor shall be repeated as described in 801.1010.

801.109 Bacteriologic Tests.

1. After final flushing, and before the water main is placed in service, a sample or samples shall be collected from the end of the line and tested for bacteriologic quality and shall show the absence of coliform organisms. If the number and frequency of samples is not prescribed by the public health authority having jurisdiction, at least one sample shall be collected from chlorinated supplies where a chlorine residual is maintained throughout the new main. From unchlorinated supplies at least two samples shall be collected at least 24 hours apart.

Note: In the case of extremely long mains, samples shall be collected at 2,500 foot intervals over the length of the line as well as at all ends.

2. Samples for bacteriologic analysis shall be collected in sterile bottles treated with sodium thiosulphate. No hose or fire hydrant shall be used in collection of samples. A suggested sampling tap consists of a standard corporation cock installed in the main with a copper tube gooseneck assembly. After samples have been collected, the gooseneck assembly may be removed and retained for future use. All samples taken shall be inspected and approved by the Engineer.

3. The samples shall be tested at an approved testing laboratory and four certified copies of the results shall be sent to the Engineer for approval.

The cost of collecting samples and testing samples shall be included in the unit prices bid for Item 801.

801.1010 Repetition of Procedure. If the initial disinfection fails to produce satisfactory samples, disinfection shall be repeated until satisfactory samples have been obtained. When the samples are satisfactory, the main may be approved. The cost of repeated disinfections will be paid by the Contractor and no additional costs shall be paid for. The Contractor in all cases shall take all necessary precautions to keep the water lines from freezing.

801.1011 Procedure After Cutting Into or Repairing Existing Main The procedures outlined in this section apply primarily when mains are wholly or partially dewatered. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under press present little danger of contamination and require no disinfection.

1. Trench "Treatment" – When an old line is opened, either by accident or by design, the excavation will likely be wet and badly contaminated from nearby sewers. Liberal quantities of hypochlorite shall be applied to open trench areas to lessen the danger from such pollution. Tablets have the advantage in such a situation because they dissolve slowly and continue to release hypochlorite as water is pumped from the excavation.

2. Main Disinfection.

a. Swabbing With Hypochlorite Solution – The interior of all pipe and fittings used in making the repair (particularly couplings and tapping sleeves) shall be swabbed with a 5 per cent hypochlorite solution before they are installed.

b. Flushing – Thorough flushing is the most practical means of removing contamination introduced during repairs. If valving and hydrant locations permit, flushing from both directions is recommended. Flushing shall be started as soon as the repairs are completed and continued until discolored water is eliminated.

c. Slug Method – Where practicable, in addition to the procedure of a. and b., a section of main in which the break is located shall be isolated, all service connections shut off, and the section flushed and chlorinated as previously described except that the dose may be increased to as much as 500 mg/l, and the contact time reduced to as little as ½ hour. After chlorination, flushing shall be resumed and continued until discolored water is eliminated.

3. Sampling – Bacteriologic samples shall be taken after repairs to provide a record by which the effectiveness of the procedures can be determined. If the direction of flow is unknown, samples shall be taken on each side of the main break.

801.1012 Chlorine Residual. The drop dilution method of approximating total residual chlorine is suitable for concentrations above 10 mg/l, such as are applied in the disinfection of water mains or tanks. It is taken from AWWA M12 – Simplified Procedures For Water Examination, Page 29.

A comparator kit containing a suitable range of standards equal to that manufactured by W. A. Taylor and Company shall be approved.

801.11 Testing.

801.1101 General. After pipe has been laid, all hydrant assemblies installed and all pipe hydrant assemblies and appurtenances completely backfilled except as approved by the Engineer, all newly laid pipe or any valved section thereof, shall be subjected to the Hydrostatic Pressure in the following.

801.1102 Duration. The duration of each pressure test shall be a minimum of one (1) hour.

801.1103 Procedure. Each valved section of pipe shall be slowly filled with water and the specified test pressure, based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gage, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The pump, pipe connection, gages, taps and all necessary apparatus shall be furnished by the Contractor.



801.1104 Air Removal Before Test. Before applying the specified test pressure, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks at such points so the air can be expelled as the line is filled with water. After all the air has been expelled, the corporation cocks shall be closed and a test pressure of 150 PSI or 50 PSI over maximum static line pressure, (whichever is greater) applied.

801.1105 Examination Under Pressure. Any cracked or defective pipe, fittings, valves or hydrants discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material, and the test shall be repeated until satisfactory to the Engineer.

801.1106 Leakage Test. A leakage test shall be conducted after the pressure test has been satisfactorily completed. The Contractor shall furnish the pump, pipe, gage, measuring device, connections and all other necessary apparatus, and shall furnish the necessary assistance to conduct the test. The duration of each leakage test shall be a minimum of two (2) hours and during the test the main shall be subjected to the pressure specified in 801.1104, whichever is greater.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

No pipe installation will be accepted if the leakage is greater than that determined by the formula (801.11):

$$L = \frac{ND \sqrt{P}}{3,700}$$

for mechanical joints and push-on joints in which L is the allowable leakage, in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pound per square inch gage.

(Note: The formula for mechanical joints and push-on joints is based on an allowable leakage of 23.3 GPD per mile of pipe per inch of nominal diameter, for pipe in 13-ft. lengths evaluated at a pressure of 150 PSI.)

The allowable leakage for 1,000 ft. of 18-ft. lengths of mechanical joint or push-on joint pipe at various pressures and diameters is shown in Table 801.11. If a line contains fittings, or pipe lengths other than 18-ft. nominal, Table 801.11 should not be used and the allowable leakage should be computed by the applicable formula given above.

The owner shall be furnished a written report of the results of the leakage test that identifies the specific length of pipe tested, the pressure, the duration of the test, and the amount of leakage. The report shall be signed by the Contractor and the Engineer.

Exception: All sections of pipe tested less than 1,000 feet in total length excluding fire hydrant assemblies and water services shall have allowable leakage of only 25 per cent (%) of that shown in Table 801.11 or 25 per cent (%) of that determined by formula 801.11.

801.1107 Variation From Permissible Leakage. If any test of pipe laid discloses leakage greater than that specified, the Contractor shall at his own expense locate and repair the defective joints until the leakage is within the specified allowance.

801.1108 Backing. Where any section of a main is provided with concrete reaction backing, the hydrostatic pressure test shall not be made until at least five (5) days have elapsed after the concrete reaction backing was installed. If high-early-strength cement is used in the concrete reaction backing, the hydrostatic pressure test shall not be made until at least two (2) days have elapsed.

TABLE 801.11

## Allowable Leakage for Mechanical-Joint or Push-on Pipe in 18-ft. Nominal Lengths \*

| Avg. Test Pressure<br>PSI             |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
|---------------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
|                                       | 2    | 3    | 4    | 6    | 8    | 10   | 12   | 14   | 16   | 18   | 20   | 24   | 30   | 36   | 42   | 48    |
| Allowable Leakage per 1,000 ft. - GPH |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
| 250                                   | 0.48 | 0.71 | 0.95 | 1.42 | 1.90 | 2.38 | 2.85 | 3.33 | 3.80 | 4.28 | 4.75 | 5.70 | 7.13 | 8.55 | 9.98 | 11.40 |
| 225                                   | 0.45 | 0.68 | 0.90 | 1.35 | 1.80 | 2.25 | 2.70 | 3.15 | 3.60 | 4.05 | 4.50 | 5.40 | 6.76 | 8.11 | 9.46 | 10.81 |
| 200                                   | 0.42 | 0.64 | 0.85 | 1.27 | 1.70 | 2.12 | 2.55 | 2.97 | 3.40 | 3.82 | 4.25 | 5.10 | 6.37 | 7.64 | 8.92 | 10.19 |
| 175                                   | 0.40 | 0.60 | 0.79 | 1.19 | 1.59 | 1.99 | 2.38 | 2.78 | 3.18 | 3.58 | 3.97 | 4.77 | 5.96 | 7.15 | 8.34 | 9.54  |
| 150                                   | 0.37 | 0.55 | 0.74 | 1.10 | 1.47 | 1.84 | 2.20 | 2.58 | 2.94 | 3.31 | 3.68 | 4.41 | 5.52 | 6.62 | 7.72 | 8.83  |
| 140                                   | 0.36 | 0.53 | 0.71 | 1.07 | 1.42 | 1.78 | 2.13 | 2.49 | 2.84 | 3.20 | 3.55 | 4.26 | 5.33 | 6.40 | 7.46 | 8.53  |
| 130                                   | 0.35 | 0.51 | 0.69 | 1.03 | 1.37 | 1.71 | 2.06 | 2.40 | 2.74 | 3.08 | 3.42 | 4.11 | 5.14 | 6.61 | 7.19 | 8.22  |
| 120                                   | 0.33 | 0.49 | 0.66 | 0.99 | 1.32 | 1.64 | 1.98 | 2.30 | 2.63 | 2.96 | 3.29 | 3.95 | 4.93 | 5.92 | 6.91 | 7.89  |
| 110                                   | 0.31 | 0.47 | 0.63 | 0.94 | 1.26 | 1.58 | 1.89 | 2.21 | 2.52 | 2.83 | 3.15 | 3.78 | 4.72 | 5.67 | 6.61 | 7.56  |
| 100                                   | 0.30 | 0.45 | 0.60 | 0.90 | 1.20 | 1.50 | 1.80 | 2.10 | 2.40 | 2.70 | 3.00 | 3.60 | 4.50 | 5.40 | 6.31 | 7.21  |
| 90                                    | 0.28 | 0.43 | 0.57 | 0.86 | 1.14 | 1.42 | 1.71 | 1.99 | 2.28 | 2.56 | 2.85 | 3.42 | 4.27 | 5.13 | 5.98 | 6.84  |
| 80                                    | 0.27 | 0.40 | 0.54 | 0.80 | 1.08 | 1.34 | 1.61 | 1.88 | 2.15 | 2.42 | 2.69 | 3.22 | 4.03 | 4.84 | 5.64 | 6.45  |
| 70                                    | 0.25 | 0.38 | 0.50 | 0.75 | 1.00 | 1.26 | 1.51 | 1.76 | 2.01 | 2.26 | 2.51 | 3.01 | 3.77 | 4.52 | 5.28 | 6.03  |
| 60                                    | 0.23 | 0.35 | 0.46 | 0.70 | 0.93 | 1.16 | 1.39 | 1.63 | 1.86 | 2.09 | 2.32 | 2.79 | 3.49 | 4.19 | 4.89 | 5.58  |
| 50                                    | 0.21 | 0.32 | 0.42 | 0.64 | 0.85 | 1.06 | 1.28 | 1.49 | 1.70 | 1.91 | 2.12 | 2.55 | 3.19 | 3.82 | 4.46 | 5.10  |
| 40                                    | 0.19 | 0.28 | 0.38 | 0.57 | 0.76 | 0.95 | 1.14 | 1.33 | 1.52 | 1.71 | 1.90 | 2.28 | 2.85 | 3.42 | 3.99 | 4.56  |

\*The allowable leakage for a pipeline is calculated by multiplying the leakage per hour per 1,000 ft. at the average test pressure and for the diameter of pipe tested as obtained from the above table by the duration of the test in hours and the total length of the line being tested divided by 1,000. If the line under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

801.12 Method of Measurement. The lengths for which payment will be made for furnishing and laying will be measured lengths along the centerline of the main pipe lines in place, from the ends of spigots or shoulders of hub ends to which connections are made, to the ends of spigots or shoulders of hub end at which the new lines terminate. Excluded from this measurement will be all bends, curves, special fittings and special assemblies itemized elsewhere for payment.

801.13 Basis of Payment. The payment of all work done under these items shall be at the unit price per foot bid, which payment shall be full compensation for all labor, material, and equipment required to furnish, excavate, lay, backfill, test, disinfect the pipe and maintain all public and private structures and utilities and make all restoration as herein specified.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>   |
|-------------|-------------|--|
| 801         | Linear Foot | _____” Dia. Ductile Iron Pipe<br>Water Line, Class _____                 |
| 801         | Linear Foot | _____” Dia. Ductile Iron Pipe<br>Water Line, Class _____<br>Cement Lined |
| 801         | Linear Foot | _____” Dia. Asbestos Cement<br>Pressure Pipe Water Line                  |
| 801         | Linear Foot | _____” Dia. Reinforced Concrete<br>Pressure Pipe Water Line              |

ITEM 802 – INCREASED OR DECREASED EARTH EXCAVATION

|        |                            |
|--------|----------------------------|
| 802.01 | DESCRIPTION                |
| 802.02 | EXCAVATION AND BACKFILLING |
| 802.03 | METHOD OF MEASUREMENT      |
| 802.04 | BASIS OF PAYMENT           |

802.01 Description. This work shall consist of performance or non-performance of excavation, and backfilling with suitable material, for water lines or other appurtenant structures, where ordered by the Engineer, due to poor soils and deviation from the line and grades shown on the plans.

802.02 Excavation and Backfilling. The applicable sections of 801.03 and 801.08 will govern this work unless otherwise specified or directed in writing.

802.03 Method of Measurement. The number of cubic yards of increased or decreased earth excavation will be measured vertically below or above the structure subgrade and will be limited by vertical planes twelve (12) inches outside of the structure surfaces. The number of cubic yards of increased earth excavation due to deviation from the line and grade shown on the plans will be measured by multiplying the total length of trench involved by the product of the trench width as shown in the plans and the average depth of increase or decrease involved.

802.04 Basis of Payment. The accepted quantities of increased or decreased earth excavation ordered in writing by the Engineer will be paid for or deducted from monies due the Contractor at the contract unit price per cubic yard.

Payment will be made or deducted under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>                      |
|-------------|-------------|---|
| 802         | Cubic Yard  | Increased or Decreased Earth Excavation |

ITEM 803 – ROCK EXCAVATION

|        |                       |
|--------|-----------------------|
| 803.01 | DESCRIPTION           |
| 803.02 | BLASTING              |
| 803.03 | ESTIMATED QUANTITIES  |
| 803.04 | METHOD OF MEASUREMENT |
| 803.05 | BASIS OF PAYMENT      |

803.01 Description. This work shall consist of furnishing all labor, equipment and materials for removing rock from the specified work limits of the trench or tunnel, disposing of same, and backfilling where such is not otherwise provided.

803.02 Blasting. When and if it is necessary, for the prosecution of the work to be done under this contract, to resort to blasting with explosives, the Contractor shall use the highest degree of care and adequate protective measures so as not to endanger life, completed portions of this contract project, and all other property both public and private. Before conducting any blasting operations, he shall furnish the Engineer, in writing, a schedule of intended blasting operations and he shall give the Engineer prior written notification of any changes in such schedule.

The use, handling, storage and transportation of explosives shall conform and be in accordance with the applicable requirements and/or provisions: (a) of the latest revision of “Bulletin No. I.C.-3, Specific Safety Requirements Relating to Building and Construction Work,” issued by the Department of Industrial Relations and the Industrial Commission of the State of Ohio, (b) of the Ohio Explosives Laws, Section 3743.01 – 3743.26 of the Ohio Revised Code and amendments thereto, (c) of local regulations, (d) of Federal regulations, and (e) as specified herein.

All blasting operations shall be covered by public liability and property damage insurance as elsewhere specified herein. Except in the case of continuous tunnel operations, all blasting shall be conducted during daylight hours only, with the provision that, when required by the Engineer, blasting shall be limited to certain daylight hours.

All firing shall be done by electrical means only, and the Contractor shall make suitable provisions to prevent the scattering of broken rock, earth, stones or other material during blasting operations.

803.03 Estimated Quantities. Where no data is available as to actual presence of rock, the quantity of rock listed in the estimate is intended only as an allowance for bid purposes in event random rock is encountered. Where available data indicates that rock will be encountered, the quantity listed in the estimate include the estimated amount based on such data, plus some additional amount as an allowance for possible excess of actual quantity over estimated quantity.

803.04 Method of Measurement. No hardpan or boulders will be measured for payment under this item. The volume of rock in the water line trench for which payment is to be made will be computed on the basis of the specified trench width and a bottom limiting plans at the level of the subgrade as shown on the applicable standard construction drawings. The upper limit for payment will be determined by one of the following methods:

- a. By stripping – All earth and other materials shall be removed from the rock surface prior to blasting and the volume will be computed by measured rock profile elevations.
- b. By core drilling – Cores will be taken at least four (4) feet into the rock prior to blasting and the profile elevation of the rock will be determined as the point at which 90 per cent core recovery is made from four (4) feet of drilling.
- c. By the Engineer – After blasting and excavation have been accomplished, the Engineer will determine the profile of the rock to be measured for payment.

Rock, if encountered in tunnel, will be measured for payment in the following manner:

- a. For partial rock face, the volume above a horizontal plane located eight (8) inches below the outside barrel of the pipe, between two (2) vertical planes located on each side and twelve (12) inches from the barrel of the water line and below a horizontal plane locate at the surface of the rock on the centerline of the water line pipe.

803.05 Basis of Payment. The computed number of cubic yards of rock excavation measured for payment will be paid for at the contract unit price per cubic yard.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u> |
|-------------|-------------|--------------------|
| 803         | Cubic Yard  | Rock Excavation    |

ITEM 804 – FITTINGS

|        |                       |
|--------|-----------------------|
| 804.01 | DESCRIPTION           |
| 804.02 | MATERIALS             |
| 804.03 | GENERAL               |
| 804.04 | METHOD OF MEASUREMENT |
| 804.05 | BASIS OF PAYMENT      |

804.01 Description. This work shall consist of furnishing and installing all bends, tees, reducers, crosses and special castings for the water line where shown on the plans, where ordered by the Engineer or as specified herein.

804.02 Materials. Generally, the type of material shall be the same as that of the main water line unless specified or shown differently on the plans. All materials furnished and installed shall conform in all respects to the applicable provisions of 801.

Specific Materials shall be as follows:

|                                      |     |
|--------------------------------------|-----|
| a. Cast iron reducers .....          | 720 |
| b. Cast iron tees.....               | 720 |
| c. Cast iron crosses .....           | 720 |
| d. Cast iron bends.....              | 720 |
| e. Cast iron plugs .....             | 720 |
| f. Cast iron sleeves .....           | 720 |
| g. Reinforced concrete reducers..... | 721 |
| h. Reinforced concrete tees.....     | 721 |
| i. Reinforced concrete elbows.....   | 721 |
| j. Reinforced concrete crosses ..... | 721 |
| k. Concrete, Class “C” .....         | 499 |
| l. Reinforcing steel .....           | 509 |

804.03 General. Where shown on the plans, directed by the Engineer, or as specified, all fittings shall be furnished and installed according to the manufacturer’s recommendations and acceptable construction standards.

Joints for water line pipe fittings shall be made with lead where applicable and, where shown on the plans or directed by the Engineer, mechanical joints may be used.

Thrust blocks shall be constructed of Class “C” Concrete to the dimensions as indicated on the plans or as directed by the Engineer. The cost of furnishing the materials for and the construction thrust blocks shall be in the price bid for the adjoining tees, bends, or elbows and no extra payment will be made therefor.



All fittings specified herein and necessary for the installation of the water main shall be paid for in this Item unless specifically included for payment under another Item.

Where a fitting is shown in the plans to be connected to an existing water line, the cost of furnishing the fitting and the cost of preparing the existing water line for the installation shall be included in the price bid for the fitting and no extra payment shall be made therefor.

804.04 Method of Measurement. The number of fittings of each kind and size shall be those installed and accepted.

804.05 Basis of Payment. The number of each kind and size of fitting accepted will be paid for at the unit price for each.

Payment will be made under:

| ITEM | UNIT | DESCRIPTION  |
|------|------|--|
| 804  | Each | _____” x _____” Cast Iron Reducer  |
| 804  | Each | _____” x _____” Reinforced Concrete Reducer  |
| 804  | Each | _____” x _____” Cast Iron Reducer On Existing _____” Water Line                        |
| 804  | Each | _____” x _____” x _____” Cast Iron Tee With Thrust Block                               |
| 804  | Each | _____” x _____” x _____” Cast Iron Tee With Thrust Block on Existing _____” Water Line |
| 804  | Each | _____” x _____” x _____” Reinforced Concrete Tee                                       |
| 804  | Each | _____” x _____” Cast Iron Cross  |
| 804  | Each | _____” x _____” Cast Iron Cross With _____” Sleeves on Existing _____” Water Line      |
| 804  | Each | _____” x _____” Reinforced Concrete Cross  |
| 804  | Each | _____” Dia. Cast Iron _____ Degree Bend With Thrust Block                              |
| 804  | Each | _____” Dia. Reinforced Concrete Elbow  |
| 804  | Each | _____” Cast Iron Plug With Thrust Block  |
| 804  | Each | _____” Cast Iron Plug With Existing _____” Water Line With Thrust Block                |

ITEM 805 – VALVES AND VALVE BOXES FOR WATER MAINS

|        |                       |
|--------|-----------------------|
| 805.01 | DESCRIPTION           |
| 805.02 | MATERIALS             |
| 805.03 | GENERAL               |
| 805.04 | METHOD OF MEASUREMENT |
| 805.05 | BASIS OF PAYMENT      |

805.01 Description. This work shall consist of furnishing and installing valves and valve boxes of the kind specified, shown on the drawings, or as directed by the Engineer including any necessary excavation and backfill.

805.02 Materials.

- a. Cast Iron Butterfly Valves ..... AWWA C-504  
and Valve Boxes
- b. Cast Iron Gate Valves ..... AWWA C-500  
and Valve Boxes

805.03 General. All gate valves shall be of the gate disc type. All butterfly valves shall be of the rubber seated, tight closing type. Valves shall be of bell end, designed for three hundred pound (300#) working pressure. The direction of opening of the valve shall be as required by the local water utility. Each valve shall be installed with a complete valve box assembly including bonnet, box, extensions, if necessary, and top.

Where a valve is shown in the plans to be connected to an existing water line, the cost of furnishing the valve and valve box and the cost of preparing the existing water line for the installation shall be included in the price bid for the valve and no extra payment will be made therefor.

805.04 Method of Measurement. The number of each kind and size of valve complete with valve box shall be those installed and accepted.

805.05 Basis of Payment. The number of each kind and size of valves complete with boxes accepted will be paid for at the contract unit price for each.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>   |
|-------------|-------------|--|
| 804         | Each        | _____” Cast Iron Gate Valve and Box  |
| 804         | Each        | _____” Cast Iron Butterfly Valve and Box   |
| 804         | Each        | _____” Cast Iron Gate Valve and Box<br>With _____”Cast Iron Sleeves on<br>Existing _____” Water Line |

ITEM 806 – STONE FOUNDATION

- 806.01 DESCRIPTION
- 806.02 MATERIALS
- 806.03 METHOD OF MEASUREMENT
- 806.04 BASIS OF PAYMENT

806.01 Description. This work shall consist of the excavation for and the placing of specified stone material and the disposal of the surplus excavated material as shown on the plans or described in these specifications and where placed as ordered in writing by the Engineer. The purpose of this work is to provide a suitable subgrade for the pipe and appurtenant structures.

The Contractor will receive no compensation because of the following:

- a. Work necessitated or stone foundation placed to provide the water free trench as specified by 801.07.
- b. Work necessitated or stone foundation placed which is included in the price bid for pipe under 801.33.

806.02 Materials. Materials shall be as follows:

- a. Stone for foundations, No. 2 . . . . . (crushed) . . . . . 703
- b. Stone for foundations, No. 467 . . . (crushed) . . . . . 703
- c. Gravel, slag, or limestone as approved by the Engineer.

806.03 Method of Measurement. Stone foundation will be measured by the number of tons placed, calculated within the authorized excavation limits, as shown on the plans or as ordered by the Engineer.

The method of calculation will be as follows:

$\frac{W \times L \times D \times Wt.}{2000}$       Where W = authorized width of trench in feet, L = linear footage of pipe on the stone foundation, D = authorized depth of stone foundation in feet; and Wt. = the weight in pounds/cubic foot of the stone foundation.

306.04 Basis of Payment. The accepted number of tons of stone foundation calculated for payment will be paid for at the contract unit price per ton. No payment will be made for excavation or material outside the authorized limits.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u> |
|-------------|-------------|--------------------|
| 806         | Tons        | Stone Foundation   |

ITEM 807 – SHEETING AND BRACING LEFT IN PLACE

|        |                       |
|--------|-----------------------|
| 807.01 | DESCRIPTION           |
| 807.02 | METHOD OF MEASUREMENT |
| 807.03 | BASIS OF PAYMENT      |

807.01 Description. This item shall consist of all sheeting, bracing and other supports left in place where specifically ordered in writing by the Engineer, regardless of the reason or purposes for which installation was made.

807.02 Method of Measurement. Only sheeting and bracing and other supports actually left in place by written order of the Engineer will be measured for payment. No measurement will be made of any sheeting and bracing or other supports cut off, wasted, and extending below the top elevation of the concrete bedding, concrete backing, concrete backfill, or subgrade or left in place without a written order from the Engineer.

807.03 Basis of Payment. The quantities of sheeting, bracing and other supports measured for payment will be paid for at the contract unit price per thousand feet board measure (M.Ft.B.M.) left in place.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>                 |
|-------------|-------------|------------------------------------|
| 806         | M.Ft.B.M.   | Sheeting and Bracing left in place |

ITEM 808 – TUNNEL

|        |                       |
|--------|-----------------------|
| 808.01 | DESCRIPTION           |
| 808.02 | MATERIALS             |
| 808.03 | GENERAL               |
| 808.04 | EXCAVATION            |
| 808.05 | TUNNEL LINING         |
| 808.06 | GROUTING              |
| 808.07 | FILL MATERIAL         |
| 808.08 | METHOD OF MEASUREMENT |
| 808.09 | BASIS OF PAYMENT      |

808.01 Description. This work shall consist of furnishing and installing a tunnel liner of sufficient size to permit the planning of the water line therein and encasing the water line as shown on the plans and as specified herein.

808.02 Materials. Materials shall be as follows:

|    |                        |          |
|----|------------------------|----------|
| a. | Tunnel Liner .....     | 808.05   |
| b. | Cement for grout ..... | 701      |
| c. | Sand for grout .....   | 703.03   |
| d. | Concrete, Class A..... | 499, 805 |

808.03 General. Tunneling within the right-of-way of private companies and public agencies shall conform to the requirements and secure the necessary permits and crossing rights from the respective authorities involved. Before proceeding with the tunneling work, the Contractor shall prepare and submit to the Engineer, for his approval, a work schedule, shop drawings, a description of the type of materials to be used and the methods of construction to be utilized. This information shall be furnished in the number of copies required and all copies to be forwarded by the Engineer to the authority involved for its approval. One approved copy will be returned to the Contractor. The Contractor shall be responsible for the payment of any costs which may result due to the authority’s requirements, of whatever nature, including the furnishing of watchman and supervision by its forces.

Where work under this item involves the crossing under of railroad tracks, all operations of the Contractor or his agents and employees must be subordinate to the free and unobstructed use and conduct of the railroad company’s business without delay or danger to life, equipment or property. The Contractor shall save harmless the railroad company against all claims, suits, or judgments arising because of or resulting from the operations, actions or omissions of the Contractor or his agents and employees. The Contractor shall carry on his operations in such a manner that all work shall be performed below track level and without obstructions on the railroad roadbed.

808.04 Excavation.

- a. Earth excavation for tunnel will be included for payment under 801.
- b. Rock excavation for tunnel will be included for payment as specified in 803.

808.05 Tunnel Lining. The tunnel lining installed by the Contractor shall provide strength commensurate with the tunnel diameter and depth of cover and in accordance with the design requirements of the private or public authority involved.

808.06 Grouting. Grout holes shall be provided in the tunnel lining with a spacing not to exceed four and one-half (4.5') feet measured longitudinally. The location of holes shall be varied around the periphery of the tunnel lining to suit field conditions which will permit the proper grouting sequence to insure complete filling of void spaces outside the tunnel lining. The Contractor shall fill all the void space outside the tunnel lining with 1 to 3 Portland Cement grout. The machine used for grouting shall permit the application of a pressure up to seventy-five (75) pounds per square inch in excess of any external water pressure. A gage shall be provided which will accurately indicate working pressure and this gage shall be carefully watched during grouting operations. The pressure shall at no time be allowed to exceed that considered safe or which would distort the tunnel lining. Grout pipes shall be one and one-half (1-1/2) inches inside diameter.

808.07 Fill Material. After installation of the water main in the tunnel lining, the Contractor shall completely fill the space between the tunnel liner and the water line with 1 to 5 Portland Cement grout or Class A concrete, or dry sand as shown on the plans.

808.08 Method of Measurement. The length of tunnel to be paid for will be the actual number of linear feet accepted, as measure along the centerline of the water line, complete in place.

808.09 Basis of Payment. The accepted number of linear feet of tunnel for the sizes of pipe specified will be paid for at the contract unit prices per linear foot complete in place. Payment for the encased water line pipe will be made under 801.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>           |
|-------------|-------------|------------------------------|
| 808         | Linear Foot | Tunnel for ___ in. Dia. Pipe |

ITEM 809 – TUNNEL – JACKED LINER

809.01 DESCRIPTION  
 809.02 MATERIALS  
 809.03 GENERAL  
 809.04 TUNNEL LINING  
 809.05 GROUTING  
 809.06 FILL MATERIAL  
 809.07 METHOD OF MEASUREMENT  
 809.08 BASIS OF PAYMENT

809.01 Description. This work shall consist of furnishing and installing a tunnel liner, by jacking methods, of sufficient diameter to permit the installation of the water line therein and encasing the water line as shown on the plans and as specified herein.

809.02 Materials. Materials shall be as follows:

|    |                        |        |
|----|------------------------|--------|
| a. | Tunnel liner .....     | 809.04 |
| b. | Cement for grout.....  | 701    |
| c. | Sand for grout .....   | 703.03 |
| d. | Concrete, Class A..... | 499    |

809.03 General. The requirements of 809.03 shall apply to work in jacked tunnels. Jacking will be allowed in one direction on. The excavation ahead of the leading pipe shall be approximately the outside diameter of the pipe but in no case shall it be permitted to be greater than one (1”) larger than the outside diameter of the pipe. The excavation shall not be carried ahead of the pipe unless some adequate means of supporting the earth to the rear of the face is used. Excavated material shall be promptly removed from the heading and disposed of off the site.

809.04 Tunnel Lining. The tunnel lining to be jacked into place by the Contractor shall provide strength commensurate with the tunnel diameter, depth of cover, jacking thrust and shall have adequate buckling resistance, all in accordance with the design requirements of the private or public authority involved.

809.05 Grouting. The requirements as stated in 808.05 apply.

809.06 Fill Materials. The requirements as stated in 808.06 apply.

809.07 Method of Measurement. The length of tunnel – jacked liner to be paid for will be the actual number of linear feet accepted as measured along the centerline of water line complete in place.



809.08

809.08 Basis of Payment. The accepted number of linear feet of tunnel – jacked liner of the sizes specified will be paid for at the contract unit prices per linear foot complete in place. Payment for the encased water line pipe will be made under 801.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>                               |
|-------------|-------------|--|
| 809         | Linear Feet | Tunnel – Jacked Liner for<br>_____ in. Dia. Pipe |

ITEM 810 – CONCRETE ENCASUREMENT FOR WATER LINE

- 810.01 DESCRIPTION
- 810.02 MATERIALS
- 810.03 EXCAVATION
- 810.04 PIPE
- 810.05 METHOD OF MEASUREMENT
- 810.06 BASIS OF PAYMENT

810.01 Description. This work shall consist of furnishing and installing reinforced or plain concrete encasement of water line as shown on the plans or standard construction drawings and as specified herein.

810.02 Materials. Materials shall be as follows:

- a. Concrete, Class C ..... 499, 511
- b. Reinforcing steel ..... 709

810.03 Excavating and Backfilling. Excavating and backfilling shall be as specified under 801.09 and will be paid for under 801.

810.04 Pipe. Pipe to be encased shall be as specified under all the applicable parts of 801 pertaining to the furnishing and installing of pipe, and will be paid for thereunder.

810.05 Method of Measurement. The length of encasement of water line to be paid for will be the actual number of linear feet accepted as measured along the centerline of the water line complete in place.

810.06 Basis of Payment. The accepted number of linear feet of reinforced or non-reinforced encasement work of the sizes specified will be paid for at the contract unit price per liner foot complete in place.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>                                    |
|-------------|-------------|---|
| \$10        | Linear Foot | Plain Concrete Encasement of _____ in Dia. Pipe       |
| \$10        | Linear Foot | Reinforced Concrete Encasement of _____ in. Dia. Pipe |

ITEM 810 – CONCRETE ENCASEMENT FOR WATER LINE

- 811.01 DESCRIPTION
- 811.02 MATERIALS
- 811.03 GENERAL
- 811.04 METHOD OF MEASUREMENT
- 811.05 BASIS OF PAYMENT

811.01 Description. This work shall consist of compacting backfill where shown on the plans or ordered by the Engineer and as specified herein. The pertinent sections of 203 shall govern the selecting, placing and compacting of backfill material.

811.02 Materials. Materials shall be as follows:

Gravel Grits ..... 812

811.03 General. Where excavated material available for compacting proves to be unsuitable or the Contractor finds it impracticable to use the excavated material to meet the requirements of this item, the Contractor shall, at no extra compensation, procure suitable backfill material elsewhere and dispose of the unsuitable material.

In the event that conditions encountered in portions of the work are such that the Contractor requests and is authorized to substitute the use of suitable granular backfill material in such portions of the work, then such material shall be gravel grits as specified in 812, adequate vibration will be required, and no extra payment will be made therefor under this or any other item.

Backfilling shall conform in every respect with the provisions of 801.08 and shall be governed by the results of such tests as may be ordered by the Engineer to determine that the compaction requirements have been met.

811.04 Method of Measurement. The number of cubic yards of compacted backfill to be paid for will be computed on the following basis:

Volume in cubic yards equals W times L times D divided by twenty-seven (27) where W is the specified trench width in feet, L is the length of trench in feet as specified or ordered to be compacted and D is the distance in feet from 1) the top of the bedding or encasement on six through 27-inch pipe or 2) the top of the outside barrel of the pipe or encasement on 30-inch and larger pipe to a point one foot below the existing ground elevation. These definitions for the D measurement may be varied as indicated or as specified or ordered by the Engineer. The length of trench will be measured along the centerline of the water line in place without deduction for structures built in the open trench. No extra payment will be made for compacted backfill in the extra excavation widths necessary at structures along the centerline of the work. At existing structures, where the work connects, the measurement for this item will be made from the centerline of the existing structure. At terminal structures, being constructed as part of the work, the measurement for this item will be through the structure to a point one (1) foot beyond the

structure base. Where structures are built over existing water lines, as part of the work, compacted backfill will be measured along the centerline of the water line between two points one (1) foot beyond and on either side of the structure base. Where water line trenches intersect, at different elevations or at a structure being constructed as part of the work, a length equal to the specified width of trench for the lesser diameter pipe shall be deducted from the above measurement for the length of the intersection.

The Contractor will receive no compensation because of the following:

- a. For substitution of granular or any other material for backfill material.
- b. For being required to procure suitable backfill material elsewhere.
- c. Work necessitated or material placed outside of the payment limit defined above, which is necessary to secure the required compaction within the length of trench specified or ordered, due to unauthorized excavation.

811.05 Basis of Payment. The computed number of cubic yards of compacted backfill measured for payment will be paid for at the contract unit price per cubic yard.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u> |
|-------------|-------------|--------------------|
| 811         | Cubic Yard  | Compacted Backfill |

ITEM 812 – GRANULAR BACKFILL

|        |                       |
|--------|-----------------------|
| 812.01 | DESCRIPTION           |
| 812.02 | MATERIALS             |
| 812.03 | GENERAL               |
| 812.04 | METHOD OF MEASUREMENT |
| 812.05 | BASIS OF PAYMENT      |

812.01 Description. This work shall consist of furnishing, placing and compacting granular material for backfill or other use where shown on the plans, specified or ordered by the Engineer, including the disposal of excess material. The pertinent sections of 203 and 801.08 shall govern the placing and compacting of backfill material.

812.02 Materials. Materials shall be as follows: 304-02, 310.02 Grading B, or Gravel Grits shall be in accordance with the following sieve graduation:

| <u>Passing</u> | <u>Percentages</u> |
|----------------|--------------------|
| ¼" Sieve       | 100                |
| No. 4 Sieve    | 85 - - -100        |
| No. 8 Sieve    | 10 - - -15         |
| No. 16 Sieve   | 0 - - -5           |

812.03 General. Where gravel grits are used for backfilling they shall be adequately vibrated and all surplus excavated material shall be removed and disposed of by the Contractor at his own cost and expense.

812.04 Method of Measurement. The number of tons of backfill, at one hundred (100) pounds per cubic foot, will be computed on the following basis:

The number of tons is equal to W times L times D divided by twenty (20) where W is the specified trench width in feet, L is the length of trench in feet specified or ordered to be backfilled with granular material and D is the distance in feet from the top of the foundation of the pipe, to a point one foot below the existing ground surface. These definitions for the D measurement may be varied as indicated on the plans or as specified or ordered by the Engineer. The length of trench will be measured along the center line of the water line in place without deduction for structures built in the open trench. No extra payment will be made for compacted backfill in the extra excavation widths necessary at structures along the center line of the work. At existing structures, where the work connects, the measurement for this item will be made from the center line of the existing structure. At terminal structures being constructed as part of the work, the measurement for this item will be through the structure to a point one (1) foot beyond the structure base. Where structures are built over existing water lines, as part of the work, compacted backfill will be measured along the centerline of the water line between two points one (1) foot beyond and on either side of the manhole or structure base. Where water line trenches intersect at different elevations or at a structure being constructed as

812.05

part of the work, a length equal to the specified width of trench for the lesser diameter pipe shall be deducted from the above measurement for the length of the intersection.

The Contractor will receive no compensation because of the following:

- a. Work necessitated or material placed outside of the payment limits defined above, within the length of trench specified or ordered, due to unauthorized excavation.
- b. Work necessitated or material placed which is included in the price bid for pipe under 801.08.

812.05 Basis of Payment. The computed number of tons of granular backfill measured for payment will be paid for at the contract unit price per ton.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u> |
|-------------|-------------|--------------------|
| 812         | Ton         | Granular Backfill  |

## ITEM 813 – FIRE HYUDRANT ASSEMBLY

|         |                        |
|---------|------------------------|
| 813.01  | DESCRIPTION            |
| 813.02  | FIRE HYDRANTS          |
| 813.021 | MATERIALS              |
| 813.022 | DESIGN                 |
| 813.023 | PAINTING AND MARKING   |
| 813.024 | WORKMANSHIP            |
| 813.025 | HYDROSTATIC TEST       |
| 813.03  | VALVES AND VALVE BOXES |
| 813.04  | FITTINGS AND PIPE      |
| 813.05  | INSTALLATION           |
| 813.06  | BACKFILLING            |
| 813.07  | AFFIDAVIT              |
| 813.08  | SHOP DRAWINGS          |
| 813.09  | BASIS OF PAYMENT       |

813.01 Description. The Contractor shall furnish all labor, tools, materials and equipment necessary to furnish and install new fire hydrant assemblies complete and of the type shown on the Drawings, at the locations shown on the Drawings, or as ordered by the Engineer.

This item shall include all excavation, furnishing and installing the new fire hydrant, 6-inch valve and valve box and 6-inch hydrant leads complete; joints, blocking, backfilling, disinfection, testing, restoration of site, and all other incidentals necessary to complete this item of work.

813.02 Fire Hydrants. All fire hydrants furnished under this contract shall conform to AWWA C502 and shall conform to the specifications of the local government agency in which the project is located.

813.021 Materials.

a) General. All materials designated hereinafter shall when used in hydrants produced under this standard, conform to the requirements of AWWA, C502.

b) Paint. Paint used in coating the hydrant as specified in Section 6.1 shall conform to the requirements of Federal Specification TT-V-51A asphalt varnish or Army-Navy Specification JAN-P-450. Exterior coating above the ground line (Section 6.2) shall conform to Federal Specification TT-P-86A (Type IV), or equal.

813.0922 Design.

a) Working Pressure. Shall be 150 PSI or as shown on the Plans.

b) Size. The size of the hydrant is designated by the nominal diameter of the main valve opening. In no case shall the diameter of the main valve opening be less than 5 inches.

c) Valve Facing. The valve facing shall be clamped to the gate or bottom plate so that the valve will not leak at the stem. The bottom stem threads may be protected by a suitable cap nut.

d) Waterway. Changes in the shape or size of the waterway shall be accomplished by means of easy curves. The junctions of hose and pumper outlet nozzles with the barrel shall be rounded to ample radii. Exclusive of the main valve opening, the net area of the waterway of the barrel and footpiece at the smallest part shall be not less than 120 percent of that of the net opening of the main valve.

e) Inlet. The base of the Hydrant, known as the footpiece or elbow, shall have a side or bottom inlet, provided with a bell, a flange or other type of connection as required for connecting the hydrant to the branch from the main. The inlet shall be suitable for connection to pipe or 6-inch nominal diameter. Hydrant connections with slip on bells, flanges, or mechanical joints shall meet the dimensional requirements of AWWA C110.

f) Lugs. Lugs, if required, for harnessing the hydrant to the connecting pipe from the street main shall be provided on the bell of the inlet.

g) Joining outlet nozzles to barrel. Outlet nozzles shall be fastened into the barrel by a threaded connection. All outlet nozzles shall be safeguarded against blowing out, a pin or other approved means shall be employed to prevent the nozzle from turning or backing out.

h) Outlet nozzle caps. Outlet nozzle caps shall be provided for all outlets. The threads shall conform to those of the nozzle. The cap nut shall have dimensions similar to those of the operating nut. A recess shall be provided at the inner end of the threads in which a suitable gasket shall be placed.

i) Outlet nozzle cap chains. Unless otherwise ordered, caps shall be securely chained to the barrel with a metal chain having links made from stock not less than 1/8 inch in diameter, or of equivalent cross-sectional area.

j) Valves readily removable. The hydrant shall be so designed that, when it is in place, no excavation is required to remove the main valve and the movable parts of the drain valve.

k) Main valve remains closed after accident. The barrel and operating mechanism shall be so designed that, in the event of accident, damage, or breaking of the hydrant above or near the grade level, the main valve will remain closed and reasonably tight against leakage.



l) Drain outlet. An outlet for drainage shall be provided in the base or barrel, or between the base and barrel, or the hydrant. If the outlet is not an integral part of the drain valve, it shall be bronze (or other corrosion-resistant metal) bushed completely from the valve to the outside of the hydrant.

m) Drain valve mechanism. A positive-operating drain valve or valves, shall be provided to drain the hydrant properly by opening as soon as the main valve is closed. The drain valve shall close when the main valve is opened. The drain valve shall close when the main valve is opened. The seat of the drain valve shall be bronze (or other corrosion-resistant metal), fastened securely in the hydrant.

n) Hydrant top. The hydrant top or bonnet shall be free-draining and of a type that will maintain the operating mechanism in readiness for use under freezing conditions. It shall be so designed as to make tampering difficult and shall be provided with convenient means to afford lubrication to insure ease of operation and the prevention of wear and corrosion.

o) Operating and outlet nozzle cap nuts. The operating nut and the outlet nozzle cap nuts shall conform to the Supplemental Specifications. The opening between the wrench nut and the top of the bonnet shall be protected to prevent rain or dirt from entering by installing a seal ring.

p) Direction of opening. The direction of rotation of the operating nut to open the hydrant shall conform to the Supplement Specifications. Unless otherwise ordered by the purchaser, the hydrant shall be opened by turning the operating nut counterclockwise. An arrow and the word "Open" shall be cast in relief, so as to be clearly visible on the top of the hydrant to designate the direction of opening.

q) O ring seals. A seal making use of O rings shall be used in place of conventional stuffing box construction. Other types of pressure actuated seals may be used if approved by the Engineer.

#### 813.023 Painting and Marking.

a) Coating. All iron parts of the hydrant, inside and outside shall be thoroughly cleaned and all surfaces inside and outside (except the exterior portion above the ground line) shall be coated with asphalt varnish. They shall be covered with two coats, the first being allowed to dry thoroughly before the second is applied.

b) Shop coating above ground line. The outside of the hydrant above the finished ground line shall be thoroughly cleaned and thereafter painted in the shop with two coats of paint of a durable and weatherproof composition that shall produce a surface to which later coats having a linseed oil or other approved base will readily adhere. The color or colors used shall be those in the Supplemental Specifications or as approved by the Engineer.

c) Marking. All hydrants shall have permanent markings identifying the manufacturer by name, initials or abbreviations and designating the size of the main valve opening and the year of manufacture. Markings shall be so placed as to be readily discernible and legible after hydrants have been installed.

813.024 Workmanship.

a) Watertight joints. All joints shall be faced true and shall be watertight when subjected to the water pressure for which the hydrant is designed.

b) Castings. All castings shall be clean and sound, without defects that will impair their service. No plugging, welding, or repairing of such defects will be allowed.

c) Interchangeable parts. All like parts of hydrants of the same model and size produced by the same manufacturer shall be interchangeable.

813.025 Hydrostatic Test. Hydrants shall be subjected, after assembly to two shop tests under a hydraulic pressure of 300 psi..

813.03 Valves and Valve Boxes. Valves and Valve Boxes shall be in accordance with Item 805 but shall be paid for under this item.

813.04 Fittings and Pipe. Fittings and pipe shall be in accordance with AWWA C-104, AWWA C-106, AWWA C-110, AWWA C-111, AWWA C-112 and AWWA C-151 as applicable.

813.05 Installation. Hydrants and accessories shall be furnished and installed at the locations shown on the plans or as directed. They shall be of the proper length to suit the depth of cover over the water line at the location shown on the plans or ordered for the installation of the Fire Hydrant assemblies. The Contractor shall furnish the necessary extensions to obtain the proper length. These extensions shall be paid for as part of the unit price bid for Item 813.

The pit or trench for the fire hydrant shall be so excavated that when the hydrant is installed, the base shall rest on an 18-inch square concrete or stone 3 inches thick and the hydrant shall be plumb. Hydrants shall be set as shown on the Drawings.

After the hydrants are installed and the joints made, a concrete thrust block shall be poured between the base of the hydrant. The volume of the concrete thrust block shall be a minimum of one-half (1/2) cubic yard. The cost of furnishing and placing the thrust blocks shall be included in the price bid for Item 813.

813.06 Backfilling. The hydrant shall receive a ballast of  $\frac{3}{4}$  cubic yard of #3 or #57 wash gravel. A layer of visqueen shall be laid over the gravel. The balance of the backfill shall be the original soil. The soil shall be placed in layers of not more than nine inches and compacted by means of mechanical tamping devices to a density equal to that of the undisturbed earth.

Where existing material is unsuitable, selected backfill shall be used, the excavated material shall be disposed of by the Contractor and backfill as described in Item 812 shall be furnished and placed as directed. Cost of premium backfill shall be included in the unit price bid for Item 813 and no additional payments shall be made.

813.07 Affidavit of Compliance. The manufacturer (s) shall furnish five copies of notarized affidavit (s) of compliance to the Engineer covering all items in the fire hydrant assembly stating that the item supplied does conform to all applicable requirements of the owners standard.

813.08 Shop Drawings. The Contractor shall submit a minimum of five (5) corrected copies of shop drawings of each item of the fire hydrant assembly proposed for approval and for the use of the Engineer along with five (5) copies of the operations and instruction manual (s) parts list (s) and price list (s) and location of the two (2) nearest parts distributors. Additional copies in the number required by the Contractor shall be submitted to be returned approved to the Contractor.

No work shall be done on hydrants, valves, valve boxes, fittings, blocking or pipe supplied which is not in accordance with the approved drawings.

813.09 Basis of Payment. Fire Hydrant Assemblies shall be paid for at the contract unit price bid for each hydrant assembly complete, with accessories, which price and payment shall constitute full compensation for all excavation, joints, jointing materials, special backfill and for all labor, equipment, tools, materials, and incidentals necessary to furnish and install the fire hydrants and valves as shown, ordered or specified.

Payment for repaving and restoration will be included in the item unit price bid.

Payment will be made at contract price for:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>                  |
|-------------|-------------|-------------------------------------|
| 813         | Each        | Fire Hydrant Assembly<br>Type _____ |

ITEM 814 SPECIAL ASSEMBLIES & STRUCTURES

- 814.01 DESCRIPTION
- 814.02 MATERIALS
- 814.03 GENERAL
- 814.04 METHOD OF MEASUREMENT
- 814.05 BASIS OF PAYMENT

814.01 Description. This work shall consist of furnishing, installing and testing all special assemblies and structures complete in place as shown on the plans and as specified, or where directed by the Engineer.

814.02 Materials. Materials for this item shall be as indicated on the drawings for the special assemblies and structures. The materials indicated shall conform to the applicable provisions in these specifications.

814.03 General. The methods of installing special assemblies and structures shall be in accordance with the standards of A.W.W.A. Such assemblies shall include air release valve assemblies, Blow-off assemblies, valve manholes or pits, large meter pits, stream crossing structures or as otherwise indicated on the plans or proposal.

The cost of furnishing and installing all materials, excavation, bedding, backfill and other incidentals necessary for the completion of the assembly or structure as indicated on the plans, shall be included in the price bid for this item.

814.04 Method of Measurement. The number of each type of special assembly or structure shall be those installed and accepted.

814.05 Basis of Payment. The number of each kind special assembly or structure accepted will be paid for at the unit price bid for each.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>                    |
|-------------|-------------|---------------------------------------|
| 814         | Lump Sum    | <u>(name of assembly) (location)</u>  |
| 814         | Lump Sum    | <u>(name of structure) (location)</u> |
| 814         | Each        | <u>(name of assembly)</u>             |

ITEM 815 – WATER SERVICES

|        |                       |
|--------|-----------------------|
| 815.01 | DESCRIPTION           |
| 815.02 | MATERIALS             |
| 815.03 | INSTALLATION          |
| 815.04 | METER BOXES           |
| 815.05 | METHOD OF MEASUREMENT |
| 815.06 | BASIS OF PAYMENT      |

815.01 Description. This work shall consist of furnishing all labor, equipment and materials including excavation backfilling, and surface restoration to construct water service connections where shown in the plans or specifications or as directed by the Engineer.

815.02 Materials. Under this item the contractor shall furnish all corporation stops; all curb stops; all curb service boxes including rings and stems; all type K copper tubing of the size indicated; and all meter boxes and covers if required by the plans or proposal.

All materials furnished shall meet the specifications and/or the requirements of the water utility exercising jurisdiction over the project.

815.03 Installation. The water service pipe may be installed by either the jacking method or open cut unless specifically called for on the plans. If the service is installed using the jacking method it must be performed in such a manner so as not to produce a bending or kinking of the service. Care also must be taken during the installation so as not to cause a strain on the joints of the service. In either method of installation, restoration of the road surface, berm and surrounding area must be in accordance with these specifications, and the cost of said restoration work included in the price bid for water services.

Service pipes shall be blown out with water pressure following completion of installation; and shall be tested under normal water pressure, and all leaks stopped before being backfilled.

No taps for water services shall be made until after the main line has been tested and sterilized.

The corporation cock shall not be installed in the bottom one-half (1/2) of the water main.

The contractor's attention is directed to the fact that some water utilities insist that their forces perform all or part of the work required under this item. It is the responsibility of the contractor to determine the extent of this work, and include any monetary charges made by the local water utility for their services into his unit price bid for this item.

815.04 Meter Boxes. Where indicated in the plans or specifications or as directed by the Engineer, the contractor shall furnish and install a meter box and cover. The cost of furnishing and installing same shall be included in the price bid for the water service connection.

815.06

815.05      Method of Measurement.    The number of water services will be the actual number of lineal feet completed and accepted.

815.06      Basis of Payment.    The work included in this item, including excavation, backfill, tapping the main, furnishing and installing the corporation cock, copper pipe, curb stop and box and work done by utility company forces shall be paid for at the contract unit price, complete in place.

| <u>Item</u> | <u>Unit</u> | <u>Description</u>                    |
|-------------|-------------|---------------------------------------|
| 815         | Lin. Ft.    | _____ Water Service                   |
| 815         | Lin. Ft.    | _____ Water Service with<br>Meter Box |

ITEM 816 – TAPPING EXISTING WATER MAINS

|        |  |
|--------|--|
| 816.01 | DESCRIPTION                            |
| 816.02 | VALVES AND SLEEVES FOR CAST IRON MAINS |
| 816.03 | INSTALLATION                           |
| 816.04 | VALVE BOXES                            |
| 816.05 | VALVE SUPPORTS                         |
| 816.06 | SURFACE RESTORATION                    |
| 816.07 | BASIS OF PAYMENT                       |

816.01 Description. The Contractor shall furnish all labor, materials, tools, and equipment necessary for tapping the existing in-service water main complete, located where and as shown on the Detailed Drawings and/or required. This item provides for the tee, cross, gate valve and box and the tapping. The gate valve is covered and paid for under Item 814. This item does not include house service.

816.02 Valves and Sleeves for Cast Iron Mains. Split tapping sleeves shall be Clow F-5203, equal Mueller H-615 or H-616 as required or American Darling No. 1004.

816.03 Installation. Tapping sleeves (crosses or tees) are to be furnished and installed on the water mains at the locations shown or specified.

After the sleeves are installed at the designated locations, but before any cut is made or any concrete supports or backs installed, the sleeves and valves shall be tested under 150 pounds per square inch water pressure to check for leaks. Whenever the valves and sleeves show no leaks under this pressure, **the Contractor shall make the cut through the wall of the pipe to be tapped under pressure,** furnishing all labor, tools and equipment required, and pour the concrete supports and backers specified, shown or required. Excavation and backfill shall be as per Item 801.

816.05 Valve Supports. Concrete piers, backers and supports of the sizes and at the locations shown on the plans or designated by the Engineer, shall be provided and included in the unit prices bid.

816.06 Surface Restoration. The required surface restoration shall be included in the unit prices bid unless specifically itemized for payment in the proposal.

816.07 Basis of Payment. The payment for all work under this item shall be at the unit price bid therefor, which shall be full compensation for furnishing al labor, material, tools and equipment required to make a complete installation, including concrete thrust blocks.

Payment will be made at the contract price for:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>                         |
|-------------|-------------|--|
| 816         | Each        | Tap Existing _____” (Mat’l) For _____” Mat |

ITEM 817 – REPAVING PROVISIONS

Repaving work for water line construction shall be performed as shown on the plans, as ordered in writing by the Engineer and in accordance with the detail specifications referred to herein. Repaving and related operations are included in the price bid for pipe under 801.13 unless itemized separately on the proposal.

Dimensions for payment will be as shown on the plans and payment will be made in units specified herein at the contract unit price for the various payment items listed below.

Pavement, beyond the specified payment limits and which has settled, cracked or become damaged by reason of the Contractor's operations or by reason of settlement subsequent to construction, shall be replaced by the Contractor in accordance with pertinent specifications at his own cost and expense, and will not be measured for payment. Any repaving ordered by the Engineer outside the specified payment lines will be measured for payment to the limits ordered.

Payment will be made under the following:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>                        |
|-------------|-------------|---|
| 817-301     | Tons        | Waterproofed Aggregate Base               |
| 817-304     | Square Yard | Aggregate Base                            |
| 817-305     | Square Yard | Portland Cement Concrete Base             |
| 817-310     | Cubic Yard  | Subbase                                   |
| 817-402     | Square Yard | Asphalt Concrete Intermediate Course      |
| 817-403     | Square Yard | Type 403 Asphalt Concrete Leveling Course |
| 817-404     | Square Yard | Type 404 Asphalt Concrete Surface Course  |
| 817-405     | Square Yard | Bituminous Cold Mix                       |
| 817-407     | Gallon      | Type 407 Tack Coat                        |
| 817-452     | Square Yard | Plain Portland Cement Concrete Pavement   |
| 817-608     | Square Feet | Concrete Sidewalks Replacement            |
| 817-608     | Linear Foot | Steps Replacement                         |
| 817-609     | Linear Foot | Concrete Curbing Replacement              |
| 817-640     | Square Yard | Asphalt Driveway Replacement              |
| 817-640     | Square Yard | Concrete Driveway Replacement             |
| 817-409     | Square Yard | Seal Coat Resurfacing                     |
| 817-703     | Tons        | No. 8 Limestone for Driveways             |



ITEM 818 – ROAD CROSSING WITH CASING

|        |                       |
|--------|-----------------------|
| 818.01 | DESCRIPTION           |
| 818.02 | MATERIALS             |
| 818.03 | CONSTRUCTION          |
| 818.04 | DETAILED DRAWINGS     |
| 818.05 | PERMITS               |
| 818.06 | INSURANCE             |
| 818.07 | METHOD OF MEASUREMENT |
| 818.08 | BASIS OF PAYMENT      |

818.01 Description. The Contractor shall make all highway or railroad crossings, where indicated on the Contract Drawings, by boring a casing and placing the water line within the casing. This Item shall also include all necessary excavation, water removal, casing and water line pipe, and the furnishing of all labor, material, tools, equipment and accessories to complete the work as specified, shown on the Contract Drawings, or as directed by the Engineer.

818.02 Materials. The casing pipe shall be a minimum one-fourth (1/4") thick smooth bore steel pipe. All casing shall meet the requirements of the Ohio Department of Transportation, the Engineering Department of any and all railroads affected and the Public Utilities Commission of the State of Ohio governing such. The inside diameter of the casing shall be at least two (2") inches greater than the largest diameter of the joints on the water line, or as otherwise shown on the plans.

818.03 Construction. The steel casing shall be bored and/or jacked to the line and grade as furnished by the Engineer. After the casing is installed, the water line pipe shall be pushed or pulled through the casing. This operation shall be done only in the presence of the Engineer or his authorized representative. After the water line pipe is installed in casing, each end shall be sealed with brick and cement for a depth of not less than three (3") inches after being filled with dry sand. The areas at the ends of the casing shall be carefully backfilled with approved material and compacted with mechanical vibrators to ensure a satisfactory bed for the joining water line pipe.

Prior to sealing this casing, the Engineer may elect that the encased water line pipe be tested to insure compliance with the specifications.

All backfilled materials within the right-of-way limits of the street, roadway or railroad shall be placed, compacted and restored in accordance with the plans and specifications.

The Contractor shall perform all required operations in such a manner as to ensure no obligations, hazards, or interference with traffic or normal operations on said street, roadway or railroad right-of-way.

818.04 Detailed Drawings. The Contractor shall furnish five (5) copies of detailed drawings describing all materials he proposes to use, a list of the workmen and their experience in such work that are intended to perform the work and the method of construction intended in his performance of the work of this Section.

818.05 Permits. The owner will obtain all State Highway and Railroad permits necessary for working within the State Highway or railroad right-of-way. The Contractor shall notify the appropriate agency or utility at least forty-eight (48) hours in advance of commencing any construction work on the encasement or as noted on the permit.

The Contractor shall be responsible for the payments which may result due to the agency or utility requirements relative to the furnishing of watchmen and supervision by their forces.

818.06 Insurance. The Contractor shall be responsible for obtaining any and all insurance required by the proper authorities to perform this work at his own expense. The Contractor shall save harmless any railroad affected by this Contract for work performed under this Section from any claims, damages or injury and shall immediately make whatever repairs are necessary to correct any damage to any highway or railroad property.

818.07 Method of Measurement. The length of casing including water pipe to be paid for under this Item shall be the actual number of lineal feet or casing including water pipe within the limits of the crossing placed in conformance with these Specifications, and as shown on the Contract Drawings or as ordered by the Engineer.

818.08 Basis of Payment. The unit price stipulated per lineal foot shall include the furnishing of all labor and material necessary to complete a highway or railroad crossing according to these Specifications and as shown on the drawings, including excavation, sheeting, shoring, removal of water and furnishing and installing the casing and water pipe.

No extra payment will be made for the water pipe installed within the steel casing.

Payment will be made at contract price for:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>               |
|-------------|-------------|----------------------------------|
| 818         | Linear Foot | _____” Road Crossing with Casing |

ITEM 819 – ROAD CROSSING WITHOUT CASING

|        |                       |
|--------|-----------------------|
| 819.01 | DESCRIPTION           |
| 819.02 | MATERIAL              |
| 819.03 | CONSTRUCTION          |
| 819.04 | PERMITS               |
| 819.05 | INSURANCE             |
| 819.06 | METHOD OF MEASUREMENT |
| 819.07 | BASIS OF PAYMENT      |

819.01 Description. The Contractor shall make all highway crossings, where indicated on the Contract Drawings, by boring without a casing and placing the pipe within the bored hole. This Item shall also include all necessary excavation, water removal, pipe, and the furnishing of all labor, material, tools, equipment and accessories to complete the work as specified, shown on the Contract Drawings, or as directed by the Engineer.

The Contractor shall provide all shoring, blocking or other special supports required to maintain uninterrupted traffic flow, together with all watchman, flagman and other services necessary to complete the work.

819.02 Materials. The carrier pipe shall be asbestos cement pressure pipe, couplings, and fittings conforming to 722, or cast iron pipe, 720. In addition, the wall thickness of the pipe shall be increased so that the outside diameter of the pipe shall be equal to the outside diameter of the coupling.

Suitable fittings, adaptors, and plugs shall be used to provide a water-tight system meeting the leakage requirements of 801.11.

Joints shall be rubber ring type conforming to the latest requirements of ASTN Standard D-1869, for asbestos cement pipe or ASA 21.11 for cast iron pipe.

819.03 Construction. The contractor shall engage the services of workmen thoroughly experienced in making such highway crossings.

The hole shall be a maximum of 2 inches larger than the outside diameter of the carrier pipe.

The hole shall be bored to the line and grade furnished by the Engineer. After the hold is bored the water pipe shall be carefully pushed through to prevent injury to pipe or joints. Every precaution shall be taken to insure that the joints are and will remain in perfect condition.

Excavated material, construction material and equipment shall be placed so as not to interfere with the traffic flow of the highway. If necessary, excavated material shall be removed from the site of the work and brought back for backfilling after the pipe is installed.

819.04 Permits. The owner will obtain all State Highway permits necessary for working within the State Highway right-of-way. The Contractor shall notify the appropriate agency or utility at least forty-eight (48) hours in advance of commencing any construction work on the boring.

The Contractor shall be responsible for the payments which may result due to the agency or utility requirements relative to the furnishing of watchmen and supervision by their forces.

819.05 Insurance. The Contractor shall be responsible for obtaining any and all insurance required by the proper authorities to perform this work at his own expense. The Contractor shall save harmless any utility affected by this Contract for work performed under this Section from any claims, damages or injury and shall immediately make whatever repairs are necessary to correct any damage to any highway or utility property.

819.06 Method of Measurement. The length of boring including pipe to be paid for under this Item shall be the actual number of linear feet of boring including pipe within the limits of the crossing placed in conformance with these Specification, and as shown on the Contract Drawings or as ordered by the Engineer.

819.07 Basis of Payment. The unit price stipulated per linear foot shall include the furnishing of all labor and material necessary to complete a highway crossing according to these Specifications and as shown on the drawings, including boring excavation, sheeting, shoring, removal of water and furnishing and installing the pipe.

No extra payment will be made for the water line pipe within the limits of the crossing.

Payment will be made at contract price for:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>   |
|-------------|-------------|--|
| 819         | Linear Ft.  | _____ In. _____<br>(Pipe Material)<br>Bored Without Casing |

SECTION 900 – SEWERAGE WORK

ITEM 901 – CONCRETE, CLAY, ASBESTOS CEMENT A.B.S. PLASTIC PIPE,  
AND P.V.C. SEWERS COMPLETE IN PLACE.

|        |  |
|--------|--|
| 901.01 | DESCRIPTION                              |
| 901.02 | MATERIALS                                |
| 901.03 | EXCAVATION                               |
| 901.04 | BEDDING                                  |
| 901.05 | LAYING PIPE                              |
| 901.06 | PIPE JOINTS                              |
| 901.07 | REMOVAL OF WATER                         |
| 901.08 | BACKFILLING                              |
| 909.09 | SURFACE SOIL AND RESTORATION OF SURFACES |
| 901.10 | INFILTRATION AND EXFILTRATION            |
| 901.11 | METHOD OF MEASUREMENT                    |
| 901.12 | BASIS OF PAYMENT                         |

901.01 Description. This work shall consist of the construction of pipe sewers complete in place. The work shall be in accordance with these specifications and in conformity with the lines and grades shown on the plans and established by the Engineer. This work shall include: excavating for pipes and bedding for same, including clearing and grubbing, fill or embankment, and the removal of all materials necessary for placing the pipe except removals listed separately in the proposal; furnishing and placing concrete or granular bedding, concrete backing, and granular or compacted backfill as required unless any are listed for payment separately in the proposal; constructing and subsequently removing all necessary cofferdams, cribs and sheeting, unless it is specifically itemized for payment in the proposal; removal of water; all pipe joints; furnishing, installing, and testing all necessary pipe of the types specified, shown on the drawings, or bid; joining to existing and proposed sewers and appurtenances as required; restoration of disturbed facilities and surfaces except those listed separately in the proposal; maintenance or traffic, drainage and existing structures all as shown on the drawings and as specified.

901.02 Materials. Pipe shall be of the size and kind specified in the proposal and shown on the plans and shall meet the requirements of the pertinent sections of 706.

Specific materials shall be as follows:

|  |                 |
|--|-----------------|
| a. Concrete for cradle, backing and backfill – Class A ..... | 499, 90         |
| b. Concrete for blocking .....                               | Class C ... 499 |
| c. Granular material for backfilling – Grading B .....       | 310.02          |
| d. Cement for mortar .....                                   | 701             |
| e. Sand for mortar .....                                     | 703.03          |
| f. Lime for mortar .....                                     | 712.04          |
| g. Gaskets for Concrete Pipe Joints .....                    | 901.06          |
| h. Gaskets for Vitrified Clay Pipe-Joints .....              | 901.06          |
| i. Reinforced Concrete Pipe .....                            | 706.001         |

- j. Reinforced Elliptical Concrete Pipe..... 706.011
- k. Extra Strength Clay Pipe ASTM C700 706.001
- l. Cement-Asbestos Pipe and Fittings .....The latest revision of ASTM C-428,  
Class 2400, Type II, unless otherwise specified on plans.
- m. A.B.S. Plastic Pipe and Fittings .....The latest revision of ASTM D2680,  
unless otherwise specified on plans.
- n. Ductile Iron Pipe, Class 3 .....ASA, A21.50,  
ASA, A21.51
- o. Gaskets for Flexible Joint D.I.P. ....ASTM A148
- p. Cast Iron Pipe and Fittings..... ASA A21.6
- q. Reinforced Concrete Radius Pipe .....706.001
- r. P.V.C. Sewer Pipe.....ASTM D-3034
- s. Ball Joint Ductile Iron Pipe, CL.5 ..... ASA 21.50

901.03 Excavation. The Contractor shall excavate all material of whatever nature encountered, excluding rock in place if a separate item is provided for rock excavation in the proposal, necessary for the construction of the work as shown on the plans and as specified. All excavation, except as otherwise required, permitted or ordered by the Engineer shall be in open trench.

901.031 Limit as to Width of Trench. The width of trench below the elevation of the outside top of the barrel of the sewer shall not exceed the width shown in the detail drawings unless permitted or ordered by the Engineer. Sufficient sheeting, bracing and timbering shall be provided, installed and used by the Contractor to maintain the sides of the trench in a substantially vertical position wherever it is deemed necessary by the Engineer to protect and preserve life, property or the use of such property and no payment will be made “or such sheeting, bracing and timbering unless ordered left in place in writing by the Engineer. Payment for this sheeting and bracing left in place will be made under 907.

901.032 Unauthorized Excavation. All excavation outside or below the limiting lines for excavation as shown on the detail drawings shall be classed as unauthorized excavation and shall be filled by the Contractor at his own cost and expense in a manner and with material approved by the Engineer.

901.033 Subgrade. It is expected that satisfactory material will be found at the subgrade of the trench if adequate water removal facilities are provided. If soft, spongy, unsuitable or similarly unacceptable material is encountered at the subgrade upon which the bedding material is to be placed, this unsuitable material shall be removed or dewatered to provide a stable foundation acceptable to the Engineer. The following will govern the prosecution of the work involved:

a. If the dewatering of the subgrade materials, by whatever means is used by the Contractor, produces a subgrade acceptable to the Engineer for placing the bedding material, no additional payment will be made for the work and the payment for this work will be included in this item.

b. If the unstable material is removed by order of the Engineer, it shall be replaced by stone foundation as specified in 906. The Contractor shall remove the unstable material and place the required stone foundation at his expense. No additional payment will be made for the additional excavation or material required.

c. If dewatering and placing stone foundation as specified in 906 up to one (1) foot on each side of the pipe and up to the Type I bedding depth applicable to the size of pipe does not provide a stable foundation acceptable to the Engineer, the Contractor, if directed by the Engineer, shall remove additional unsuitable material and shall replace it with stone foundation as specified in 906 and shall be paid as indicated therein less the quantity within the above described limits.

No payment will be made for additional stone foundation unless ordered by the Engineer in writing. No payment will be made for stone foundation outside the pay limits set by the Engineer in writing.

901.034 Excavated Material. All excavated material in excess of that required for backfilling shall be disposed of by the Contractor. Public or private property shall not be used for this purpose without the written permission of the owner. Excavated material required for backfill, except as hereinafter provided for under Surface Soil, may be stored on the bank of the trench immediately adjacent to the work under construction where space is available within the right-of-way acquired for the work, provided however, that such storage shall not interfere with the access to and maintenance of traffic, drainage and utilities as herein specified.

In all cases satisfactory ingress and egress to all properties along the line of the work shall be maintained.

901.035 Removal of Obstructions. The removal of any obstructions, including abandoned sewer, which may be encountered or is necessary for the construction of the work, shall be done by the Contractor at his own expense under the direction of the Engineer.

Where a portion of an existing sewer is to be abandoned and removed under this contract, the Contractor will be required to construct brick or concrete bulkheads in the undisturbed section of the abandoned sewer as directed. The locations of bulkheads may be, but are not necessarily, shown on the drawings. No separate payment will be made for this work unless such items are specifically designated for payment in the proposal.

901.036 Maintaining Drainage. The flow of all sewers, drains, streets, gutters and water courses encountered shall be provided for by the Contractor at his own expense and wherever such water courses and drains are disturbed or destroyed during the prosecution of the work, they shall be restored by the Contractor at his own cost and expense to a condition satisfactory to the Engineer.

901.037 Maintenance of Service in Existing Structures. All existing overhead, surface or subsurface structures, together with all appurtenances and service connections, except those otherwise provided for herein, encountered or affected in any way during the construction of any of the work under this contract, shall be maintained in service by the Contractor at all times unless other arrangements, satisfactory to the authority responsible for their operation, are made with such authority.

Where connections are to be made to existing sewers, the Contractor shall make suitable provisions for handling the flow in the existing sewer until the completion of the connection.

The cost of this work shall be included in the prices bid for all the various items of the contract.

901.04 Bedding. All pipe sewers shall have Type I (Standard Bedding) unless otherwise shown on the plans or ordered by the Engineer.

Type I (Standard Bedding)

The bottom of the trench shall be excavated below the bottom of the sewer pipe not less than six inches (6") and the pipe shall then be bedded in Item 310 Subbase aggregate placed at a minimum depth of 6" and extending up around the sides of the pipe so that the lower half of the pipe is supported its entire length as shown on the standard drawings.

Type II (Concrete Bedding)

Where called for on the plans, or when ordered by the Engineer, the bottom of the trench shall be excavated below the bottom of the sewer pipe a minimum thickness of six (6) inches and the pipe shall then be bedded in Class "C" concrete extending up around the sides of the pipe so that the lower half of the pipe is supported its entire length as shown on the standard drawings or in the plans. The concrete should be a "stiff mixture" so as not to cause flotation of the pipe.

All the space within the width of the trench excavation, inside or outside the authorized limits, shall be filled with the same material as specified herein and on the drawings between the elevation limits.

The Contractor shall be paid the unit price bid for the various sizes of pipe using Type I and Type II Bedding which payment shall include the cost of the Type I and Type II Bedding.

901.05 Laying Pipe. The laying of pipes in finished trenches shall be commenced at the lowest point so that the spigot ends point in the direction of flow.

All sewers shall be laid and maintained to the required lines and grade, with "Y" branches, "T" branches, and openings left for manholes at the required locations.

The contractor shall furnish all material and labor to set grade bars every fifty feet. Every pipe shall be laid at each end by line and grade indicated by a line drawn between the grade bars,



by using a rod or pole of fixed length as a gauge between the working line and pipe in trench. A plumb bob shall be used to check the line of pipe. If the grades are flat and the Engineer so orders, the Contractor shall place intermediate bars, between those set at stakes of Engineer, to avoid sag in the working line. Such additional bars shall be placed at the Contractor's expense.

In lieu of the line and batter board method, a Laser beam alignment system approved by the Engineer, may be used.

Where necessary with bell and pipe, suitable bell-holes shall be excavated for the bell of each pipe so that the weight of the pipe will not be supported by the bells only. The pipes shall be fitted and matched so that when laid in the work, they will form a conduit with a smooth and uniform invert. All possible care shall be used when shoving the pipe together so that the joints will not be unnecessarily large and pipe ends shall be carefully cleaned before pipes are laid. Gaskets shall be installed in accordance with manufacturer's recommendations. All connections with existing structures shall be made in a thorough, first class nest and workmanlike manner. The cost of this work shall be included in the price bid for the various pipe items.

901.06      Pipe Joints.

Sanitary Sewers. All clay pipe for sanitary sewers shall have a joint meeting the requirements of a A.S.T.M. C-425, except "wedge-lock" which is not acceptable.

Cement-asbestos pipe joints shall be rubber ring type conforming to the requirements of the latest ASTM Standard D-1869.

A&S Plastic pipe joints shall be chemically bonded joints per manufacturers recommendations.

Concrete pipe joints for sanitary sewers shall conform to the requirements of C-443 as it pertains to the use of a confined gasket. All joints shall consist of confined rubber gaskets placed in groves in the spigots of the pipe such that the gaskets will be enclosed on all four sides when the pipe is laid and the joints are completed. All gaskets used in sanitary sewers shall conform to the requirements of ASTM C-443.

901.07      Removal of Water. The Contractor shall, at all times, during construction, provide proper and satisfactory means and devices for the removal of all water entering the excavations and shall removal all such water as fast as it may collect in such manner as shall not interfere with the prosecution of the work or the proper placing of masonry or other work.

901.08      Backfilling. All trenches and excavations shall, in general, be backfilled, as hereinafter specified, as soon after the sewers or other structures built therein are completed and as the particular type of construction and the circumstances will, in the opinion of the Engineer, permit.

Earth backfilling of open trench excavations shall be done with the best of excavated earth, which shall be free from stones larger than the two inches in their greatest dimensions, rubbish, or frozen material, provided, however, that the occasional boulders or stones not larger than one cubic foot may be deposited at least two (2) feet above the top of the sewer and subject to the approval of the Engineer.

Where concrete bedding is used, the trench or excavation shall not be backfilled for at least 24 hours after placing of the concrete, except that pipe may be covered to a depth of not to exceed 36 inches in order to afford protection. The method employed in depositing the backfill shall be such as to prevent damage to the sewer or other structures. Concrete structures built in place shall not be backfilled until permitted by the Engineer.

Except where other requirements are noted on the plans, or provided for in the specifications or are ordered by the Engineer, all open trench backfill above the elevation of the bedding material of the sewer shall be done with materials that, subject to other provisions of the specifications for compaction or special fill have the same as or better soils characteristics than the adjacent undisturbed soil or materials and in a manner satisfactory to the Engineer. All backfilling operations and placement of the backfill material shall be conducted by such means as to eliminate damage to the sewer, its appurtenant structures and other adjacent structures.

Where the proposed sewer will be within the roadway of any street (paved or unpaved), sidewalk, drive approach or similar structure, or as designated on the Construction Plans, the BACKFILL SHALL CONSIST OF GRANULAR MATERIAL AS APPROVED BY THE ENGINEER. This material shall be HAND BACKFILLED to a depth of two feet above the top of the pipe, the backfill being placed in LAYERS NOT EXCEEDING 8 INCHES IN THICKNESS. Each layer shall be compacted to 95 percent of maximum laboratory dry weight with special care exercised to insure thorough compaction under and around sides of pipe. The remainder of the backfill may be placed mechanically, however, it shall also be placed in layers not exceeding 8 inches and be compacted to 95 percent of maximum laboratory dry weight. The moisture content of the backfill material shall generally range between 3 percent below optimum to 2 percent over optimum for the material being used. Where additional water is required it shall be sprinkled uniformly over the material. THE COST of such granular backfill and any additional water required shall be included in the price bid per linear foot of sewer unless specifically itemized for payment in the proposal.

In trench areas excavated from rock the trench shall be backfilled to a depth of two feet (2') above the top of the pipe with approved granular material placed in layers not exceeding eight inches (8") in thickness. Each layer shall be compacted to 95 percent of maximum laboratory dry weight with special care exercised to insure thorough compaction under and around sides of pipe. The trench may then be backfilled with approved site material.

In trench areas other than those described above, hand backfill with approved site material shall be performed to a depth of two feet (2') above the top of the pipe and shall be thoroughly mechanically compacted with special care exercised to insure thorough compaction under and around the sides of the pipe. The remainder of the backfill may be placed

mechanically, but shall be done in depths of two feet (2') and shall be mechanically compacted at each two foot interval.

The cost of the backfill shall be included in the price bid for the pipe.

Where ordered by the Engineer, sections of the trench other than those specified above or called for on the plans or where changes in alignment require increased quantities of granular backfill, may also be backfilled with granular backfill. Any such additional backfill ordered by the Engineer will be placed as specified in 912 and paid for as indicated therein.

Any settlement in the open trench backfill taking place within the guarantee period shall be refilled with satisfactory materials and the affected surface properly repaired by the Contractor all at his own cost and expense and no extra payment shall be made therefor.

901.09 Surface Soil and Restoration of Surfaces. In areas that will be re-seeded when the work is completed, the Contractor shall, before starting trench excavation, remove the surface soil to a depth of not less than 12 inches below the original surface of the ground within the limits to be excavated and then segregate and store it separately from the remaining stored excavated material. If necessary, he shall acquire additional area to provide for such separate storage of surface soil. After the completion of sewer construction and basic trench backfill, the Contractor shall replace and redistribute surface soil in the affected areas to a depth of 12 inches and shall make due allowance where embankment is required and shall re-excavate the basic trench backfill where necessary to allow for the surface soil fill. Where surface soil is replaced, any settlement below the original ground surface occurring within the guarantee period shall be refilled with surface soil equivalent to the original material. The cost of all work and other expenses connected with the surface soil operation shall be included in the price bid for the various sewer items and no extra payment shall be made therefor.

All surfaces, including grass or lawn, pavement, sidewalk, curbing, and other surfaces disturbed or destroyed during and as a result of the construction of the work, shall be replaced by the Contractor as hereinafter specified under the respective items therefor, providing such items are herein included. All such types of surfaces disturbed, destroyed or damaged including grassed and cultivated areas, for which specific items have not been included herein, shall be restored by the Contractor at his own cost and expense and no separate or additional payment will be made therefor.

The Contractor's particular attention is directed to the provision of the above paragraph pertaining to his responsibility for restoration of surfaces for which no specific items are included and for which no separate or additional payment will be made to the Contractor therefor.

The Contractor will be required under this provision to reseed all grassed and cultivated areas disturbed above and adjacent to the work after reasonable lapse of time to allow for settlement of trench and final grading over trench. The seeding operations shall be done in conformity with the requirements set forth under 659 of these specifications.

Suitable surface soil shall be obtained and applied over excavated area to a depth of not less than 12 inches and over adjacent disturbed areas to sufficient depth for proper leveling and for preparation of adequate bed to support growth. All seeded surfaces shall be watered and maintained so as to provide a satisfactory surface and bare spots shall be reseeded and cared for in the same manner.

The Contractor shall include in the prices bid for the sewer items, the cost of all such restoration in all areas involved above and adjacent to the work and no separate or additional payment shall be made therefor unless specifically provided for under other items.

901.10 Tests

Deflection Test: All flexible pipes – (ASTM Standard C-423, D-3033, D-3034) leakage test and deflection test required.

Deflection tests shall be run not less than 30 days after final full backfill has been placed.

Sophisticated, electronic equipment has been developed to measure and record deflection in flexible pipe. No pipe shall exceed a deflection of 5%.

If such equipment is not available, the deflection test can be run by use of rigid balls or mandrels, having diameters equal to 95% of the inside diameter of the pipe, pulled through the sewer line. If rigid balls or mandrels are used, tests shall be performed without mechanical pulling devices.

The deflection test may be waived if the pipe has a stiffness of 200 p.s.i. or greater.

All pipe which does not meet the testing requirements must be repaired or replaced and then retested until it meets the requirements.

The allowable leakage is based on a maximum difference in elevation of eight feet between the Level of water in the upper manhole and the invert of the pipe of the closed end in the lower manhole. If the difference in elevation exceeds eight feet, the allowable leakage shall be increased five percent for each one foot in excess of eight feet.

The testing equipment, procedures and actual testing must be approved by and conducted under the supervision of the Engineer or his authorized representatives.

Should the constructed pipe line fail to pass or meet the required air pressure holding time, the infiltration or exfiltration requirements, the Contractor shall locate the fault or defective construction, remove, replace or repair same and retest the pipe to ensure compliance with the specifications.

901.11 Method of Measurement. The length of pipe to be paid for will be the actual number of linear feet accepted, as measured along the centerline of the sewer, complete in place, including lengths through manholes and inlets and to the center of manholes and inlets in the case of sewer size change thereat. Since the basis of bids for manholes is to be the difference between the price of the affected length of sewer at manholes and the price of similar lengths of sewers not affected by manholes, no deductions in the length of pipe measured will be made at manholes.

901.12 Basis of Payment. The accepted quantities of sewer of the sizes and types specified will be paid for at the contract unit prices per linear foot, complete in place.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>  |
|-------------|-------------|---|
| 901         | Linear Foot | _____ In. Dia. Clay Pipe with<br>Type _____ Bedding                           |
| 901         | Linear Foot | _____ In. Dia. Class 2400<br>Asbestos-Cement Pipe with<br>Type _____ Bedding  |
| 901         | Linear Foot | _____ In. Dia. Class _____<br>Reinf. Concrete Pipe with<br>Type _____ Bedding |
| 901         | Linear Foot | _____ In. Dia. ABS Plastic Pipe<br>with Type _____ Bedding                    |
| 901         | Linear Foot | _____ In. Dia. C.I. Pipe<br>Class _____ with _____ Bedding                    |
| 901         | Linear Foot | _____ In. Dia. D.I. Pipe<br>Class _____ with _____ Bedding                    |

Leakage tests shall be performed as follows:

#### Low Pressure Air Test

The low pressure air test shall be made in accordance with the requirements of the Ramseier Procedure and the National Clay Pipe Institute Air Test Tables, which are attached hereto as a part of these specifications.

#### Optional Test Methods

The Engineer may elect to require the infiltration or exfiltration tests as specified. Leakage through the joints of all sewer pipe, sanitary and storm, shall not exceed the following allowable limits:

Sanitary Sewers: 200 gallons per inch of tributary pipe diameter per 24 hours per mile of length or the computed equivalent for shorter lengths and shorter periods of time. All sanitary sewers shall be tested.

Infiltration Test: This test is to be conducted when the height of ground water table is two foot or more above the elevation of the inside crown of pipe at the upstream limit of the section being tested. In general, a test section shall include the distance between two (2) successive manholes.

The infiltration test shall be made by installing a weir or other measuring device approved by the Engineer in the lower end of the sewer section to be tested. The incoming sewer or sewers in the upper end of the test section shall be securely sealed. The quantity of ground water infiltration into the rear section shall be measured and shall not exceed the allowable leakage.

Exfiltration Test: This test is to be conducted when the height of the ground water table is less than two foot above the elevation of the inside crown of pipe at the upstream limit of the section being tested. In general, a test section shall include the distance between two (2) successive manholes.

The exfiltration test shall be conducted between two manholes by sealing with pipe stopper the lower end of the test section and all inlet sewers at the upper manhole. The length of sewer to be tested shall be filled with water to a point two foot above the elevation of the inside crown of pipe at the upper manhole. The water may stand in the pipe and manhole up to 24 hours prior to measurement of leakage. If the water level in the upper manhole has dropped during the 24 hour waiting period the level shall be raised to the test elevation prior to measurement of leakage. However, if at any time during the waiting period the Contractor elects to test, the water shall be set at the prescribed elevation and the test made.

The elevation of the level of water in the manhole and the drop in the level of the water in the upper manhole shall be carefully measured at the start and finish of the test period. The test period shall be a minimum of 30 minutes duration.

ITEM 902 – INCREASED OR DECREASED EARTH EXCAVATION

- 902.01 DESCRIPTION
- 902.02 EXCAVATION AND BACKFILLING
- 902.03 METHOD OF MEASUREMENT
- 902.04 BASIS OF PAYMENT

902.01 Description. This work shall consist of performance or nonperformance of excavation, and backfilling with suitable material, for sewers or other appurtenant structures, where ordered by the Engineer, due to poor soils and deviation from the line and grades shown on the plans.

902.02 Excavation and Backfilling. The applicable sections of 901.03 and 901.08 will govern this work unless otherwise specified or directed in writing.

902.03 Method of Measurement. The number of cubic yards of increased or decreased earth excavation will be measured vertically below or above the structure subgrade and will be limited by vertical planes twelve (12) inches outside of the structure surfaces. The number of cubic yards of increased earth excavation due to deviation from the line and grade shown on the plans will be measured by multiplying the total length of trench involved by the product of the trench width as shown in the plans and the average depth of increase or decrease involved.

902.04 Basis of Payment. The accepted quantities of increased or decreased earth excavation ordered in writing by the Engineer will be paid or deducted from monies due the Contractor at the contract unit price per cubic yard.

Payment will be made or deducted under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>                      |
|-------------|-------------|---|
| 902         | Cubic Yard  | Increased or Decreased Earth Excavation |

ITEM 903 – ROCK EXCAVATION

|        |                       |
|--------|-----------------------|
| 903.01 | DESCRIPTION           |
| 903.02 | BLASTING              |
| 903.03 | ESTIMATED QUANTITIES  |
| 903.04 | METHOD OF MEASUREMENT |
| 903.05 | BASIS OF PAYMENT      |

903.01 Description. This work shall consist of furnishing all labor, equipment and materials for removing rock from the specified work limits of the trench or tunnel, disposing of same, and backfilling where such is not otherwise provided.

As mentioned in 901.01, payment for this item shall be included in the price bid per linear foot of pipe unless “rock excavation” is specifically listed as a pay item in the proposal.

903.02 Blasting. When and if it is necessary, for the prosecution of the work to be done under this contract, to resort to blasting with explosives, the Contractor shall use the highest degree of care and adequate protective measures so as not to endanger life, completed portions of this contract project, and all other property both public and private. Before conducting any blasting operations, he shall furnish the Engineer, in writing, a schedule of intended blasting operations and he shall give the Engineer prior written notification of any changes in such schedule.

The use, handling, storage and transportation of explosives shall conform and be in accordance with the applicable requirements and/or provisions: (a) of the latest revision of “Bulletin No. I.C.-3 Specific Safety Requirements Relating to Building and Construction Work,” issued by the Department of Industrial Relations and the Industrial Commission of the State of Ohio, (b) of the Ohio Explosives Laws, Section 3743.01 – 3743.06 of the Ohio Revised Code and amendments thereto, (c) of local regulations, and (d) as specified herein.

All blasting operations shall be covered by public liability and property damage insurance as elsewhere specified herein. Except in the case of continuous tunnel operations, all blasting shall be conducted during daylight hours only, with the provision that, when required by the Engineer, blasting shall be limited to certain daylight hours.

All firing shall be done by electrical means only, and the Contractor shall make suitable provisions to prevent the scattering of broken rock, earth, stones or other material during blasting operations.

903.03 Estimated Quantities. Where no data is available as to actual presence of rock, the quantity of rock listed in the estimate is intended only as an allowance for bid purposes in event random rock is encountered. Where available data indicates that rock will be encountered, the quantity listed in the estimate includes the estimated amount based on such data, plus some additional amount as an allowance for possible excess of actual quantity over estimated quantity.



903.04 Method of Measurement. No hardpan or boulders will be measured for payment under this item. The volume of rock in the sewer trench for which payment is to be made will be computed on the basis of the specified trench width and a bottom limiting plane at the level of the subgrade as shown on the applicable standard construction drawings. The upper limit for payment will be determined by one of the following methods:

- a. By stripping – All earth and other materials shall be removed from the rock surface prior to blasting and the volume will be computed by measured rock profile elevations.
- b. By core drilling – Cores will be taken at least four (4) feet into the rock prior to blasting and the profile elevation of the rock will be determined as the point at which 90 percent core recovery is made from four (4) feet of drilling.
- c. By the Engineer – After blasting and excavation have been accomplished, the Engineer will determine the profile of the rock to be measured for payment.

Rock, if encountered in tunnel, will be measured for payment in the following manner:

- a. For partial rock face, the volume above a horizontal plane located eight (8) inches below the outside barrel of the sewer pipe, between two (2) vertical planes located on each side and twelve (12) inches from the barrel of the sewer pipe and below a horizontal plane located at the surface of the rock on the centerline of the sewer pipe.
- b. For full rock face, the volume of a cylinder having a diameter twenty-four (24) inches greater than the diameter of the barrel of the sewer pipe.

903.05 Basis of Payment. The computed number of cubic yards of rock excavation measured for payment will be paid for at the contract unit price per cubic yard.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u> |
|-------------|-------------|--------------------|
| 903         | Cubic Yard  | Rock Excavation    |

ITEM 904 – MISCELLANEOUS CONCRETE AND MASONRY STRUCTURES

- 904.01 DESCRIPTION
- 904.02 MATERIALS
- 904.03 GENERAL
- 904.04 EXCAVATION AND BACKFILL
- 904.05 METHOD OF MEASUREMENT
- 904.06 BASIS OF PAYMENT

904.01 Description. This work shall consist of furnishing all labor, equipment and material including excavation and backfill, form work, concrete and steel reinforcement to construct the miscellaneous concrete and masonry structures where shown on the plans and as specified. Such structures shall include junction chambers, brick bulkheads, etc.

904.02 Materials. Materials shall be as follows:

|    |                        |       |                |
|----|------------------------|-------|----------------|
| a. | Concrete Class C       | ..... | 499, 511       |
| b. | Reinforcing Steel      | ..... | 709            |
| c. | Manhole Steps          | ..... | 711.02, 711.12 |
| d. | Frames, Grates, Covers | ..... | 711.12         |
| e. | Manhole Risers         | ..... | 604            |
| f. | Masonry                | ..... | 704            |
| g. | Cement for Mortar      | ..... | 701            |

904.03 General. All concrete or masonry structures under this item shall be constructed to the lines and grades as shown on the plans or specified herein. Forms shall be in accordance with 508.02 and construction joints shall be in accordance with 511.10.

904.04 Excavation and Backfilling. All excavation for structures shown on the plans shall be in accordance with 901.03 or 503. All backfilling around structures shall be in accordance with sections 203 and 901.08 or 503.

904.05 Method of Measurement. The number of structures will be the number of each type completed and accepted. Pipe connecting to the structures built under this item will be measured for payment under 901 or 603 to the inside face of the structure wall.

904.06 Basis of Payment. The number of each type of structure completed and accepted will be paid for at the contract lump sum price for each structure.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>  |
|-------------|-------------|---------------------|
| 904         | Lump Sum    | _____               |
|             |             | (Type of Structure) |
|             |             | (Location)          |

ITEM 905 – CONCRETE

905.01 DESCRIPTION  
 905.02 MATERIALS  
 905.03 GENERAL  
 905.04 METHOD OF MEASUREMENT  
 905.05 BASIS OF PAYMENT

905.01 Description. This work shall consist of furnishing and placing Portland Cement concrete consisting of a mixture of Portland cement, fine aggregate, coarse aggregate and water, properly proportioned of the various classes of concrete noted on the plans, in accordance with these specifications and to the lines, grades and dimensions shown on the plans, or ordered in writing by the Engineer.

905.02 Materials. Materials shall be as follows:

- a. Concrete, Class A ..... 499
- b. Concrete, Class C ..... 499

905.03 General. Frequent tests of cylinders as specified in 700 may be made by the Engineer throughout the work to determine the quality and strength of the concrete. The Contractor shall furnish free of charge all the materials required for testing and shall cooperate in every way to the end that concrete of the desired quality and strength may be obtained. Concrete shall not be placed in water, unless it is done in accordance with 511-12, nor shall water be allowed to rise on or flow over any concrete until it has set at least twenty-four (24) hours. Immediately before placing concrete, all water, softened material and debris shall be removed from the excavation.

905.04 Method of Measurement. Concrete shown on the plans will be paid for under the respective items 901 or 904 and no additional payment will be made under this item.

Concrete to be paid for under this item will be measured within the limits, as ordered in writing by the Engineer, on the standard drawings or as specified by the Engineer.

905.05 Basis of Payment. The accepted quantities of Portland Cement concrete ordered in writing by the Engineer will be paid for at the contract unit price per cubic yard.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u> |
|-------------|-------------|--------------------|
| 905         | Cubic Yard  | Concrete, Class A  |
| 905         | Cubic Yard  | Concrete, Class C  |

ITEM 906 – STONE FOUNDATION

- 906.01 DESCRIPTION
- 906.02 MATERIALS
- 906.03 METHOD OF MEASUREMENT
- 906.04 BASIS OF PAYMENT

906.01 Description. This work shall consist of the excavation for and the placing of specified stone material and the disposal of the surplus excavated material as shown on the plans or described in these specifications and where placed as ordered in writing by the Engineer. The purpose of this work is to provide a suitable subgrade for the pipe and appurtenant structures.

The Contractor will receive no compensation because of the following:

- a. Work necessitated or stone foundation placed to provide the water free trench as specified by 901.07.
- b. Work necessitated or stone foundation placed which is included in the price bid for pipe under 901.033.

906.02 Materials. Materials shall be as follows:

- a. Stone for foundations ..... Slag

906.03 Method of Measurement. Stone foundation will be measured by the number of tons placed, calculated within the authorized excavation limits, as shown on the plans or as ordered by the Engineer.

The method of calculation will be as follows:

$$\frac{W \times L \times D \times 90}{2000}$$

Where W = authorized width of trench in feet;  
 L = linear footage of pipe on the stone foundation;  
 D = authorized depth of stone foundation in feet.

906.04 Basis of Payment. The accepted number of tons of stone foundation calculated for payment will be paid for at the contract unit price per ton. No payment will be made for excavation or material outside the authorized limits.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u> |
|-------------|-------------|--------------------|
| 906         | Tons        | Stone Foundation   |

ITEM 907 – SHEETING AND BRACING LEFT IN PLACE

- 907.01 DESCRIPTION
- 907.02 METHOD OF MEASUREMENT
- 907.03 BASIS OF PAYMENT

907.01 Description. This item shall consist of all sheeting, bracing and other supports left in place where specifically ordered in writing by the Engineer, regardless of the reason or purposes for which installation was made.

907.02 Method of Measurement. Only sheeting and bracing and other supports actually left in place by written order of the Engineer will be measured for payment. No measurement will be made of any sheeting and bracing or other supports cut off, wasted, and extending below the top elevation of the concrete bedding, concrete backing, concrete backfill, or subgrade or left in place without a written order from the Engineer.

907.03 Basis of Payment. The quantities of sheeting, bracing and other supports measured for payment will be paid for at the contract unit price per thousand feet board measure (M.Ft.B.M.) left in place.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>                 |
|-------------|-------------|------------------------------------|
| 907         | M.Ft.B.M.   | Sheeting and Bracing left in place |

ITEM 908 – TUNNEL

908.01 DESCRIPTION  
 908.02 MATERIALS  
 908.03 GENERAL  
 908.04 EXCAVATION  
 908.05 TUNNEL LINING  
 908.06 GROUTING  
 908.07 FILL MATERIAL  
 908.08 METHOD OF MEASUREMENT  
 909.09 BASIS OF PAYMENT

908.01 Description. This work shall consist of furnishing and installing a tunnel liner of sufficient size to permit the placing of the sewer therein and encasing the sewer as shown on the plans and as specified herein.

908.02 Materials. Materials shall be as follows:

a. Tunnel Liner ..... 908.05  
 b. Cement for grout ..... 701  
 c. Sand for grout ..... 703.03  
 d. Concrete, Class A ..... 499, 905

908.03 General. Tunneling within the rights-of-way of private companies and public agencies shall conform to the requirements and regulations of the respective companies or agencies. The owner will secure the necessary permits and crossing rights from the respective authorities involved. Before proceeding with the tunneling work, the Contractor shall prepare and submit to the Engineer, for his approval, the necessary working schedule, shop drawings, a description of the type of materials to be used and the methods of construction to be utilized. This information shall be furnished in triplicate and all copies will be forwarded by the Engineer to the authority involved for its approval. One approved copy will be returned to the Contractor. The Contractor shall be responsible for the payment of any costs which may result due to the authority’s requirements, of whatever nature, including the furnishing of watchmen and supervision by its forces.

Where work under this item involves the crossing under of railroad tracks, all operations of the Contractor or his agents and employees must be subordinate to the free and unobstructed use and conduct of the railroad company’s business without delay or danger to life, equipment or property. The Contractor shall save harmless the railroad company agent all claims, suits or judgments arising because of or resulting from the operations, actions or omissions of the Contractor or is agents and employees. The Contractor shall carry on is operation in such a manner that all work shall be performed below track level and without obstructions on the railroad roadbed.

908.04 Excavation.

- a. Earth excavation for tunnel will be included for payment under 901.
- b. Rock excavation for tunnel will be included for payment as specified in 903.

908.05 Tunnel Lining. The tunnel lining installed by the Contractor shall provide strength commensurate with the tunnel diameter and depth of cover and in accordance with the design requirements of the private or public authority involved.

908.06 Grouting. Grout holes shall be provided in the tunnel lining with a spacing not to exceed four and one-half (4.5) feet measured longitudinally. The location of holes shall be varied around the periphery of the tunnel lining to suit field conditions which will permit the proper grouting sequence to insure complete filling of void spaces outside the tunnel lining. The Contractor shall fill all the void space outside the tunnel lining with 1 to 3 Portland Cement grout. The machine used for grouting shall permit the application of a pressure up to seventy-five (75) pound per square inch in excess of any external water pressure. A gauge shall be provided which will accurately indicate working pressure and this gauge shall be carefully watched during grouting operations. The pressure shall at no time be allowed to exceed that considered safe or which would distort the tunnel lining. Group pipes shall be one and one-half (1-1/2) inches inside diameter.

908.07 Fill Material. After installation of the sewer in the tunnel lining, the Contractor shall completely fill the space between the tunnel liner and the sewer with 1 to 5 Portland Cement grout or Class A concrete.

908.08 Method of Measurement. The length of tunnel to be paid for will be the actual number of linear feet accepted, as measured along the centerline of the sewer, complete in place.

908.09 Basis of Payment. The accepted number of linear feet of tunnel for the sizes of pipe specified will be paid for at the contract unit prices per linear foot complete in place. Payment for the encased sewer pipe will be made under 901.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>             |
|-------------|-------------|--------------------------------|
| 908         | Linear Foot | Tunnel for _____ in. Dia. Pipe |

ITEM 909 – TUNNEL – JACKED LINER

909.01 DESCRIPTION  
 909.02 MATERIALS  
 909.03 GENERAL  
 909.04 TUNNEL LINING  
 909.05 GROUTING  
 909.06 FILL MATERIAL  
 909.07 METHOD OF MEASUREMENT  
 909.08 BASIS OF PAYMENT

909.01 Description. This work shall consist of furnishing and installing a tunnel liner, by jacking methods, of sufficient diameter to permit the installation of the sewer therein and encasing the sewer as shown on the plans and as specified herein.

909.02 Materials. Materials shall be as follows:

a. Tunnel liner ..... 909.04  
 b. Cement for grout ..... 701  
 c. Sand for grout ..... 703.03  
 d. Concrete, Class A ..... 499, 905

909.03 General. The requirements of 908.03 shall apply to work in jacked tunnels. Jacking will be allowed in one direction only. The excavation ahead of the leading pipe shall be approximately the outside diameter of the pipe but in no case shall it be permitted to be greater than one (1) inch larger than the outside diameter of the pipe. The excavation shall not be carried ahead of the pipe unless some adequate means of supporting the earth to the rear of the face is used. Excavated material shall be promptly removed from the heading and disposed of off the site.

909.04 Tunnel Lining. The tunnel lining to be jacked into place by the Contractor shall provide strength commensurate with the tunnel diameter, depth of cover, jacking thrust and shall have adequate buckling resistance, all in accordance with the design requirements of the private or public authority involved.

909.05 Grouting. The requirements as stated in 908.05 apply.

909.06 Fill Material. The requirements as stated in 908.06 apply.

909.07 Method of Measurement. The length of tunnel – jacked liner to be paid for will be the actual number of linear feet accepted, as measured along the centerline of sewer complete in place.



909.08

909.08 Basis of Payment. The accepted number of linear feet of tunnel – jacked liner of the sizes specified will be paid for at the contract unit prices per linear foot complete in place. Payment for the encased sewer pipe will be made under 901.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>                               |
|-------------|-------------|--|
| 909         | Linear Feet | Tunnel – Jacked Liner for<br>_____ in. Dia. Pipe |

ITEM 910 – CONCRETE ENCASEMENT FOR SEWERS

- 910.01 DESCRIPTION
- 910.02 MATERIALS
- 910.03 EXCAVATION AND BACKFILLING
- 910.04 PIPE
- 910.05 METHOD OF MEASUREMENT
- 910.06 BASIS OF PAYMENT

910.01 Description. This work shall consist of furnishing and installing reinforced or plain concrete encasement of sewer pipes as shown on the plans and as specified herein unless specifically itemized elsewhere.

910.02 Materials. Materials shall be as follows:

- a. Concrete, Class C ..... 499, 511
- b. Reinforcing Steel ..... 709

910.03 Excavating and Backfilling. Excavating and backfilling shall be as specified under 901.03 and 901.08 and will be paid for under 901.

910.04 Pipe. Pipe to be encased shall be as specified under all the applicable parts of 901 pertaining to the furnishing and installing of pipe, and will be paid for thereunder.

910.05 Method of Measurement. The length of encasement of sewer to be paid for will be the actual number of linear feet accepted, as measured along the centerline of the sewer complete in place.

910.06 Basis of Payment. The accepted number of linear feet of reinforced or non-reinforced encasement work of the sizes specified will be paid for at the contract unit price per linear foot complete in place.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>  |
|-------------|-------------|---|
| 910         | Linear Foot | Plain Concrete Encasement of _____ In. Dia. Pipe Sewer      |
| 910         | Linear Foot | Reinforced Concrete Encasement of _____ In. Dia. Pipe Sewer |

ITEM 911 – COMPACTED BACKFILL

- 911.01 DESCRIPTION
- 911.02 MATERIALS
- 911.03 METHOD OF MEASUREMENT
- 911.05 BASIS OF PAYMENT

911.01 Description. This work shall consist of compacting backfill where shown on the plans or ordered by the Engineer and as specified herein. The pertinent sections of 203 shall govern the selecting, placing and compacting of backfill material.

911.02 Materials. Materials shall be as follows:

Gravel Grits ..... 912

911.03 General. Where excavated material available for compacting proves to be unsuitable or the Contractor finds it impracticable to use the excavated material to meet the requirements of this item, the Contractor shall, at no extra compensation, procure suitable backfill material elsewhere and dispose of the unsuitable material.

In the event that conditions encountered in portions of the work are such that the Contractor requests and is authorized to substitute the use of suitable granular backfill material in such portions of the work, then such material shall be gravel grits as specified in 912, adequate compaction will be required, and no extra payment will be made therefor under this or any other item.

Backfilling shall conform in every respect with the provisions of 901.08 and shall be governed by the results of such tests as may be ordered by the Engineer to determine that the compaction requirements have been met.

911.04 Method of Measurement. The number of cubic yards of compacted backfill to be paid for will be computed on the following basis:

Volume in cubic yards equals W times L times D divided by twenty-seven (27) where W is the specified trench width in feet, L is the length of trench in feet as specified or ordered to be compacted and D is the distance in feet from the top of the bedding or encasement to subgrade. Those definitions for the D measurement may be varied as indicated or as specified or ordered by the Engineer. The length of trench will be measured along the centerline of the sewer in place without deduction for manholes or other structures built in the open trench. No extra payment will be made for compacted backfill in the extra excavation widths necessary at manholes and other structures along the centerline of the work. At existing manholes or structures, where the work connects, the measurement for this item will be made from the centerline of the existing manhole or structure. At terminal manholes or structures, being constructed as part of the work, the measurement for this item will be through the manhole or structure to a point one (1) foot beyond the manhole or structure base. Where manholes or structures are built over

911.05

existing sewers, as part of the work, compacted backfill will be measured along the centerline of the sewer between two points one (1) foot beyond and on either side of the manhole or structure base. Where sewer trenches intersect, at different elevations or at a manhole or structure being constructed as part of the work, a length equal to the specified width of trench for the lesser diameter pipe shall be deducted from the above measurement for the length of the intersection.

The contractor will receive no compensation because of the following:

- a. For substitution of granular or any other material for backfill material.
- b. For being required to procure suitable backfill material elsewhere.
- c. Work necessitated or material placed outside of the payment limits defined above, which is necessary to secure the required compaction within the length of trench specified or ordered, due to unauthorized excavation.

911.05 Basis of Payment. Payment for this item shall be as specified under 901.08.

ITEM 912 – GRANULAR BACKFILL

|        |                       |
|--------|-----------------------|
| 912.01 | DESCRIPTION           |
| 912.02 | MATERIALS             |
| 912.03 | GENERAL               |
| 912.04 | METHOD OF MEASUREMENT |
| 912.05 | BASIS OF PAYMENT      |

912.01 Description. The work shall consist of furnishing, placing and compacting granular material for backfill or other use where shown on the plans, specified or ordered by the Engineer, including the disposal of excess material. The pertinent sections of 203 and 901.08 shall govern the placing and compacting of backfill material.

912.02 Materials. Materials shall be as follows:

304.02; 310.02, Grading B; or Gravel Grits which shall be in accordance with the following sieve gradation:

| <u>Passing</u> | <u>Percentage</u> |
|----------------|-------------------|
| ¼" Sieve       | 100               |
| No. 4 Sieve    | 85 - -100         |
| No. 8 Sieve    | 10 -- 15          |
| No. 16 Sieve   | 0 -- 5            |

912.03 General. Where gravel grits are used for backfilling, they shall be adequately compacted and all surplus excavated material shall be removed and disposed of by the Contractor at his own cost and expense.

912.04 Method of Measurement. The number of tons of backfill, at one hundred (100) pounds per cubic foot, will be computed on the following basis:

The number of tons is equal to W times L times D divided by twenty (20) where W is the specified trench width in feet, L is the length of trench in feet specified or ordered to be backfilled with granular material and D is the distance in feet from the top of the pipe to a point one foot below the existing ground surface. These definitions for the D measurement may be varied as indicated on the plans or as specified or ordered by the Engineer. The length of trench will be measured along the centerline of the sewer in place without deduction for manholes or other structures built in the open trench. No extra payment will be made for compacted backfill in the extra excavation widths necessary at manholes and other structures along the centerline of the work. At existing manholes or structures, where the work connects, the measurement for this item will be made from the centerline of the existing manhole or structure. At terminal manholes or structures, being constructed as part of the work, the measurement for this item will be through the manhole or structure to a point one (1) foot beyond the manhole or structure

base. Where manholes or structures are built over existing sewers, as part of the work, compacted backfill will be measured along the centerline of the sewer between two points one (1) foot beyond and on either side of the manhole or structure base. Where sewer trenches intersect, at different elevations or at a manhole or structure being constructed as part of the work, a length equal to the specified width of trench for the lesser diameter pipe shall be deducted from the above measurement for the length of the intersection.

The Contractor will receive no compensation because of the following:

- a. Work necessitated or material placed outside of the payment limits defined above, within the length of trench specified or ordered, due to unauthorized excavation.
- b. Work necessitated or material placed which is included in the price bid for pipe under 901.08.

912.05 Basis of Payment. The computed number of tons of granular backfill measured for payment will be paid for at the contract unit price per ton.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u> |
|-------------|-------------|--------------------|
| 912         | Ton         | Granular Backfill  |

ITEM 913 - CHANNEL

|        |                       |
|--------|-----------------------|
| 913.01 | DESCRIPTION           |
| 913.02 | MATERIALS             |
| 913.03 | EXCAVATION            |
| 913.04 | PAVING                |
| 913.05 | SODDING               |
| 913.06 | METHOD OF MEASUREMENT |
| 913.07 | BASIS OF PAYMENT      |

913.01 Description. This work shall consist of constructing or improving channels including clearing and grubbing, excavation, removal of surplus and unsatisfactory material, compacted backfill, concrete paving, steel reinforcing, special joints, finished grading, sodding, ditch and pipe modifications and connections as specified and as shown on the plans.

913.02 Materials. Materials shall be as follows:

|    |                         |          |
|----|-------------------------|----------|
| a. | Concrete, Class C ..... | 499, 511 |
| b. | Reinforcing Steel ..... | 709      |
| c. | Sodding .....           | 624      |

913.03 Excavation. Excavation shall be in accordance with the applicable sections of 901.03 and compaction of required backfill shall be in accordance with 203.12.

913.04 Paving. Plain or reinforced concrete paving shall be placed to the lines and at the grades shown on the plans and as specified herein.

913.05 Sodding. Sodding as shown on the plans shall conform to the pertinent requirements of 624.

913.06 Method of Measurement. The length of channel to be paid for will be the actual number of linear feet accepted, as measured along the centerline of the channel and will include all connections and appurtenances.

913.07 Basis of Payment. The accepted number of linear feet of the type of channel shown on the plans will be paid for at the contract unit price per linear foot.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>                               |
|-------------|-------------|--|
| 913         | Linear foot | Channel Construction, Unpaved                    |
| 913         | Linear Foot | Channel Construction, Paved, Plain Concrete      |
| 913         | Linear Foot | Channel Construction, Paved, Reinforced Concrete |
| 913         | Linear Foot | Channel Improvement, Unpaved                     |
| 913         | Linear Foot | Channel Improvement, Paved, Plain Concrete       |
| 913         | Linear Foot | Channel Improvement, Paved Reinforced Concrete   |



ITEM 914 – SIX-INCH DIAMETER PIPE RISERS

|        |                       |
|--------|-----------------------|
| 914.01 | DESCRIPTION           |
| 914.02 | MATERIALS             |
| 914.03 | GENERAL               |
| 914.04 | METHOD OF MEASUREMENT |
| 914.05 | BASIS OF PAYMENT      |

914.01 Description. This work shall consist of furnishing and installing six (6) inch diameter pipe risers of the kinds specified, shown on the drawings, or as directed by the Engineer including the necessary excavation and backfill, Class D concrete foundation, straight and curved pipe, stopper, joints, couplings, cap and marker pole.

914.02 Materials. Materials shall be as follows:

- a. Concrete, Class D ..... 499
- b. Asbestos-Cement Pipe, Fittings and Couplings, Class 2400 ..... ASTM C428
- c. Gaskets for Asbestos-Cement Pipe ..... 901.06, ASTM D1869
- d. Extra Strength Clay Pipe ..... ASTM C700, 706.08
- e. Gaskets for Clay Pipe ..... 901.06, 706.12
- f. ABS Plastic Pipe, Fittings and Couplings ..... ASTM D2680
- g. P.V.C. Sewer Pipe, Fittings and Couplings .... ASTM D-3033, ASTM D-3034

914.03 General. Excavation and backfilling shall be done as specified in 901.

Stoppers, plugs or caps, that are fitted to the type of gaskets used, shall be installed in the risers where immediate connections are not made to services. The piece shall be installed so that the closure is waterproof and in such a manner that the stoppers can later be removed without damage to the gaskets or pipes. Such items shall be considered payable under Item 914 and no extra compensation will be allowed therefor.

Above each sewer branch, end of riser or house service extension the Contractor shall set a two (2) inch by two (2) inch pole extending to a point above the partial backfilling. The pole shall be braced in such a manner as to hold it firmly in position during complete backfilling. After the Engineer has located the poles, the Contractor shall, at his own expense, cut off the pole to a point slightly below the original ground surface.

The price bid for all risers shall include: one six inch (6”) curve, the appropriate length of six inch (6”) pipe, one six inch bend, concrete encasement and twelve inch (12”) pipe form for concrete encasement; as indicated on the Standard Drawings.

Particular attention should be paid to these facts. (1) The wye branch from the main sewer shall be as specified under Item 915 and shall be considered payable under that Item. (2) The difference in cost between the six inch (6") ductile iron pipe connection at the top of the riser as indicated on the drawings, and its equivalent length of lateral pipe shall be included in the cost of the riser.

The following shall apply to asbestos-cement pipe risers:

The joints shall be made with approved couplings and rubber ring gaskets such as "Ring-Tite", "Fluid-Tite", or an approved equal. The rings shall be solid and of uniform cross sections. Pipe and the couplings shall be machined with a stopping shoulder automatically providing for centering of pipe ends in the couplings. The entire circumference of the pipe ends shall be thoroughly lubricated with an approved vegetable lubricant prior to assembling.

Proper and satisfactory adaptors shall be used to joint the asbestos-cement pipe risers to the sewer.

In general, the risers shall be constructed in accordance with the pipe manufacturer's recommended procedure and in accordance with the Contract Drawings.

The sections of asbestos-cement pipe shall have a minimum net laying length of thirty-nine (39") inches.

The following shall apply to ABS plastic pipe risers:

Where ABS plastic pipe is used, a typical riser shall consist of the following:

- a) 6" 1/8 Sweep (45") ..... ASTM D2680
- b) 6" Straights ..... ASTM D2680
- c) 6" 1/8 Bend (45") appropriate number of stoppers ..... ASTM D2680
- d) 12" Straights ..... ASTM D2680

All joints shall be chemically bonded.

All other specifications herein or drawings pertaining to six inch (6") diameter pipe risers shall apply to ABS plastic pipe risers unless otherwise noted.

914.04 Method of Measurement. The number of vertical feet of six inch (6") diameter pipe risers constructed and accepted will be measured in place for payment. The measurement will be made from the top of the barrel of the main sewer to the top of the double tee on the riser.

914.05

914.05 Basis of Payment. The number of vertical feet of six inch (6") diameter pipe risers complete in place measured for payment will be paid for at the contract unit price per vertical foot.

Payment will be made under:

| <u>Item</u> | <u>Unit</u>   | <u>Description</u> |
|-------------|---------------|--------------------|
| 914         | Vertical Foot | 6" _____ Risers    |

ITEM 915 – WYE OR TEE BRANCHES, CURVES, LATERALS AND SPECIALS

|        |                       |
|--------|-----------------------|
| 915.01 | DESCRIPTION           |
| 915.02 | MATERIALS             |
| 915.03 | GENERAL               |
| 915.04 | METHOD OF MEASUREMENT |
| 915.05 | BASIS OF PAYMENT      |

915.01 Description. This work shall consist of furnishing and installing all wye branches, tee branches, curves, laterals and special fittings and any plugs, caps, or stoppers therefor where shown on the plans, where directed by the Engineer and as specified herein.

915.02 Materials. The type of pipe shall be the same as that of the main sewer servicing the street unless otherwise noted on the plans or specifications or directed by the Engineer. All materials furnished and installed shall conform in all respects to the applicable provisions of 901.

915.03 General. All wye connections to the main sewer shall consist of a wye branch and a long radius curve.

Junctions with existing building drains or sewers shall be made as shown on the drawings and as specified herein or as directed by the Engineer. The ends of all wye connections and laterals which are not immediately connected to building drains or sewers shall be securely sealed with a stopper or cap which shall be installed so that the closure is watertight and so that the stopper or cap can be later removed without damage to the gaskets.

When laterals are shown on the plans or directed by the Engineer to be bored, the methods and materials shall be in accordance with the applicable provisions of 919, but **paid** for in 915.

Above each wye connection or lateral the Contractor shall set a two inch (2") by two inch (2") pole extending to a point above the partial backfilling. The pole shall be braced in such a manner as to hold it firmly in position during complete backfilling. After the Engineer has located the poles, the Contractor shall, at his own expense, cut off the pole to a point slightly below the original ground surface.

915.04 Method of Measurement. The number of wye branches, tee branches, curves and special fittings of each kind shall be those installed and accepted. The footage of laterals to be paid for will be the actual number of linear feet of pipe of each size and type, including bores, if any; measured on the horizontal centerline from the outer end of the curve or manhole stub, where applicable to the end of the lateral in place completed and accepted.

Wye branches, tee branches, curves, laterals and specials shall be itemized and paid for separately under this item unless included as a pay item elsewhere.

915.05 Basis of Payment. The number of each kind of wye branch, tee branch, curve, or special fitting accepted will be paid for at the contract unit price for each. The number of linear feet of each kind of lateral measured for payment will be paid for at the contract unit price per linear foot.

The price bid per linear foot of lateral will include any special backfill or pavement replacement required and no additional compensation will be made therefor.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>   |
|-------------|-------------|--|
| 915         | Each        | <u>                    </u> In. x <u>          </u> In. <u>                    </u><br>Wye Branch (Material) |
| 915         | Each        | <u>                    </u> In. x <u>          </u> In. <u>                    </u><br>Tee Branch (Material) |
| 915         | Each        | <u>                    </u> In. <u>                    </u> <u>          </u> Degree<br>Curve (Material)     |
| 915         | Linear Foot | <u>                    </u> In. <u>                    </u> Lateral,<br>Open Cut (Material)                  |
| 915         | Linear Foot | <u>                    </u> In. <u>                    </u> Lateral,<br>Bored (Material)                     |

ITEM 916 – TRENCH TOPPING

|        |                       |
|--------|-----------------------|
| 916.01 | DESCRIPTION           |
| 916.02 | MATERIALS             |
| 916.03 | GENERAL               |
| 916.04 | METHOD OF MEASUREMENT |
| 916.05 | BASIS OF PAYMENT      |

916.01 Description. This work shall consist of furnishing, placing, compacting, surface treating with calcium chloride or road oil and maintaining crushed stone or crushed gravel trench topping where shown on the plans, where ordered by the Engineer and as specified.

916.02 Materials. The materials used shall consist of 100 percent crushed stone or crushed gravel and shall be graded, unless otherwise required by the Engineer, in accordance with the following tabulation:

| <u>Sieve Size</u> | <u>Total Per Cent</u><br><u>Passing</u> |
|-------------------|---|
| 1"                | 100                                     |
| 3/4"              | 95 - 100                                |
| 1/2"              | 75 - 95                                 |
| 3/8"              | 60 - 75                                 |
| No. 4             | 30 - 40                                 |
| No. 8             | 20 - 30                                 |
| No. 30            | 10 - 15                                 |
| No. 100           | 0 - 10                                  |

916.03 General. Trench topping shall consist of eight (8) inches of the specified material placed over the full width of the excavated space and shall be rolled or tamped so that the finished surface shall conform in grade to the adjacent surfaces.

The finished surface of the trench topping shall be made dustproof immediately by the treatment with calcium chloride or road oil and this treatment shall be repeated at such subsequent times as may be ordered by the Engineer.

Any settlement or irregularities, which occur in the trench topping after completion of this work, shall be refilled with stone or gravel as directed during the one (1) year guarantee period or until other type surfaces are placed.

In those areas where the Engineer orders immediate placement of bituminous cold mix, in accordance with the applicable provisions of 405, the Contractor shall furnish and place eight (8) inches of trench topping as specified above except that it need not be dust proofed and it shall not extend above a level two (2) inches below the adjacent undisturbed pavement.

916.04 Method of Measurement. The linear feet of trench topping to be paid for will be measured, at the surface elevation, along the centerline of the sewer in place without deduction for manholes or other structures built to the open trench. No extra payment will be made for trench topping placed in the extra excavation widths necessary at manholes and other structures along the centerline of the work. At existing manholes or structures, where the work connects, the measurement for this item will be made from the centerline of the existing manhole or structure. At terminal manholes or structures, being constructed as part of the work, the measurement for this item will be through the manhole or structure to a point two (2) feet beyond the manhole or structure base. Where manholes or structures are built over existing sewers, as part of the work, trench topping will be measured along the centerline of the sewer between the two points two (2) feet beyond and on either side of the manhole or structure base. Where sewer trenches intersect at different elevations or at a manhole or structure, a length equal to the specified width of trench for the lesser diameter pipe shall be deducted from the above measurement for the length of the intersection.

No deduction in length will be made where bituminous cold mix has been placed over the trench topping.

916.05 Basis of Payment. The number of linear feet of trench measured for payment will be paid for at the contract unit price per linear foot.

Payment will be made under:

| <u>Item</u> | <u>Unit</u> | <u>Description</u> |
|-------------|-------------|--------------------|
| 916         | Linear Foot | Trench Topping     |

ITEM 917 – REPAVING PROVISIONS

Repaving work for sewerage construction shall be performed as shown on the plans, as ordered in writing by the Engineer, and in accordance with the detail specifications referred to herein. Repaving and related operations are included in the price bid for pipe under 901.09 unless itemized separately in the proposal.

Dimensions for payment will be as shown on the plans and payment will be made in units specified herein at the contract unit price for the various payment items listed below.

Pavement, beyond the specified payment limits and which has settled, cracked or become damaged by reason of the Contractor's operations or by reason of settlement subsequent to construction, shall be replaced by the Contractor in accordance with pertinent specifications at his own cost and expense, and will not be measured for payment. Any repaving ordered by the Engineer outside the specified payment lines will be measured for payment to the limits ordered.

Payment will be made under the following:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>                      |
|-------------|-------------|---|
| 917-301     | Tons        | Waterproofed Aggregate Base             |
| 917-304     | Square Yard | Aggregate Base                          |
| 917-305     | Square Yard | Portland Cement Concrete Base           |
| 917-310     | Cubic Yard  | Subbase                                 |
| 917-402     | Square Yard | Asphalt Concrete Intermediate Course    |
| 917-403     | Square Yard | Asphalt Concrete Leveling Course        |
| 917-404     | Square Yard | Type 404 Asphalt Concrete Surf Course   |
| 917-405     | Square Yard | Bituminous Cold Mix                     |
| 917-407     | Gal.        | Type 407 Tack Coat                      |
| 917-408     | Square Yard | Prime Coat                              |
| 917-452     | Square Yard | Plain Portland Cement Concrete Pavement |



| <u>Item</u> | <u>Unit</u> | <u>Description</u>               |
|-------------|-------------|----------------------------------|
| 917-608     | Square Feet | Concrete Sidewalks Replacement   |
| 917-608     | Linear Feet | Steps Replacement                |
| 917-609     | Linear Feet | Concrete Curbing Replacement     |
| 917-640     | Square Yard | Asphalt Driveway Replacement     |
| 917-640     | Square Yard | Concrete Driveway Replacement    |
| 917-409     | Square Yard | Seal Coat Resurfacing            |
| 917-703     | Tons        | No. 8 Limestone for<br>Driveways |

ITEM 913 – BORING WITH CASING

|        |                       |
|--------|-----------------------|
| 918.01 | DESCRIPTION           |
| 918.02 | MATERIALS             |
| 918.03 | CONSTRUCTION          |
| 918.04 | DETAILED DRAWINGS     |
| 918.05 | PERMITS               |
| 918.06 | INSURANCE             |
| 918.07 | METHOD OF MEASUREMENT |
| 918.08 | BASIS OF PAYMENT      |

918.01 Description. The Contractor shall make all highway, railroad, or other crossings, where indicated on the Contract Drawings, by boring a casing and placing the sewer pipe within the casing. This Item shall also include all necessary excavation, water removal, casing and sewer pipe, and the furnishing of all labor, material, tools, equipment and accessories to complete the work as specified, shown on the Contract Drawings, or as directed by the Engineer.

918.02 Materials. The casing pipe shall be a minimum three-eighths (3/8) inch thick smooth bore steel pipe (ASA 20). All casings shall meet the requirements of the Ohio Department of Transportation, the Engineering Department of any and all railroads affected and the Public Utilities Commission of the United States of Ohio governing such work. The inside diameter of the casing shall be at least two (2) inches greater than the largest diameter of the joints on the sewer pipe, or as otherwise shown on the Contract Drawings.

918.03 Construction. The steel casing shall be bored or jacked to the line and grade as furnished by the Engineer. After the casing is installed, the sewer pipe shall be pushed or pulled through the casing. This operation shall be done only in the presence of the Engineer or his authorized representative. After the sewer pipe is installed in the casing to its proper line and grade, each end shall be yarned or caulked with approved material for a depth of not less than three inches and then sealed with a 1:3 cement grout to prevent flow of ground water through the casing. The areas at the ends of the casing shall be carefully backfilled with approved material and compacted with mechanical tampers to ensure a satisfactory bed for the joining sewer pipe.

Prior to sealing this casing, the Engineer may elect that the encased sewer pipe be tested to ensure compliance with the specifications.

All backfilled materials within the right-of-way limits of the street, roadway or railroad shall be placed, compacted and restored in accordance with the plans and specifications.

The Contractor shall perform all required operations in such a manner as to ensure no obligations, hazards, or interference with traffic or normal operations on said street, roadway or railroad right-of-way.

918.04 Detailed Drawings. The Contractor shall furnish three (3) copies of detailed drawings describing all materials he proposes to use, a list of the workmen and their experience in such work that are intended to perform the work and the method of construction intended in his performance of the work of this Section.

918.05 Permits. The Owner will obtain all State Highway and Railroad permits necessary for working within the State Highway or railroad right-of-way. The Contractor shall notify the appropriate agency or utility at least forty-eight (48) hours in advance of commencing any construction work on the encasement.

The Contractor shall be responsible for the payments which may result due to the agency or utility requirements relative to the furnishing of watchmen and supervision by their forces.

918.06 Insurance. The Contractor shall be responsible for obtaining any and all insurance required by the proper authorities to perform this work at his own expense. The Contractor shall save harmless any railroad affected by this Contract for work performed under this Section from any claims, damages or injury and shall immediately make whatever repairs are necessary to correct any damage to any highway or railroad property.

918.07 Method of Measurement. The length of casing including sewer pipe to be paid for under this Item shall be the actual number of linear feet of casing including sewer pipe within the limits of the crossing placed in conformance with these Specifications, and as shown on the Contract Drawings or as ordered by the Engineer.

918.08 Basis of Payment. The unit price stipulated per linear foot shall include the furnishing of all labor and material necessary to complete a highway, railroad, or other crossing, according to these Specifications and as shown on the drawings, including excavation, sheeting, shoring, removal of water and furnishing and installing the casing and sewer pipe.

No extra payment will be made for the sewer pipe installed within the steel casing.

Payment will be made at contract price for:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>  |
|-------------|-------------|---|
| 918         | Linear Foot | _____ " Dia. Clay Pipe Bored in<br>_____ " Dia. Casing            |
| 918         | Linear Foot | _____ " Dia. Asbestos Cement Pipe<br>Bored in _____ " Dia. Casing |
| 918         | Linear Foot | _____ " Dia. ABS Plastic Pipe<br>Bored in _____ " Dia. Casing     |

ITEM 919 – BORING WITHOUT CASING

|        |                       |
|--------|-----------------------|
| 919.01 | WORK INCLUDED         |
| 919.02 | MATERIAL              |
| 919.03 | CONSTRUCTION          |
| 919.04 | PERMITS               |
| 919.05 | INSURANCE             |
| 919.06 | METHOD OF MEASUREMENT |
| 919.07 | BASIS OF PAYMENT      |

919.01 Work Included. The Contractor shall make all crossings, where indicated on the Contract Drawings, by boring without a casing and placing the sewer pipe within the bored hole. This Item shall also include all necessary excavation, water removal, sewer pipe, and the furnishing of all labor, material, tools, equipment and accessories to complete the work as specified, shown on the Contract Drawings, or as directed by the Engineer.

The Contractor shall provide all shoring, blocking or other special supports required to maintain uninterrupted traffic flow, together with all watchman, flagman and other services necessary to complete the work.

919.02 Material. The carrier pipe shall be asbestos cement sewer pipe, couplings, and fittings conforming to the latest requirements of ASTM Standard, C-428, Type II, or ductile iron pipe, Class 3, ASA 21.50.

Suitable fittings, adapters, and plugs shall be used to provide a water-tight system meeting the leakage requirements of 901.10.

Joints shall be rubber ring type conforming to the latest requirements of ASTM Standard D-1369, for asbestos cement pipe or ASA 21.11 for ductile iron pipe.

919.03 Construction. The Contractor shall engage the services of workmen thoroughly experienced in making such crossings.

The hole shall be a maximum of 2 inches larger than the outside diameter of the carrier pipe.

The hole shall be bored to the line and grade furnished by the Engineer. After the hole is bored the sewer pipe shall be carefully pushed through to prevent injury to pipe or joints. Every precaution shall be taken to ensure that the joints are and will remain in perfect condition.

Excavated material, construction material and equipment shall be placed so as not to interfere with the traffic flow of the highway. If necessary, excavated material shall be removed from the site of the work and brought back for backfilling after the pipe is installed.

919.04 Permits. The Owner will obtain all State Highway permits necessary for working within the State Highway right-of-way. The Contractor shall notify the appropriate agency or utility at least forty-eight (48) hours in advance of commencing any construction work on the boring.

The Contractor shall be responsible for the payments which may result due to the agency or utility requirements relative to the furnishing of watchmen and supervision by their forces.

919.05 Insurance. The Contractor shall be responsible for obtaining any and all insurance required by the proper authorities to perform this work at his own expense. The Contractor shall save harmless any utility affected by this Contract for work performed under this Section from any claims, damages or injury and shall immediately make whatever repairs are necessary to correct any damage to any highway or utility property.

919.06 Method of Measurement. The length of boring including sewer pipe to be paid for under this Item shall be the actual number of linear feet of boring including sewer pipe within the limits of the crossing placed in conformance with these Specifications, and as shown on the Contract drawings or as ordered by the Engineer.

919.07 Basis of Payment. The unit price stipulated per linear foot shall include the furnishing of all labor and material necessary to complete a boring according to these Specifications and as shown on the drawings, including boring excavations, sheeting, shoring, removal of water and furnishing and installing the sewer pipe.

No extra payment will be made for the sewer pipe within the limits of the crossing.

Payment will be made at contract price for:

| <u>Item</u> | <u>Unit</u> | <u>Description</u>                                      |
|-------------|-------------|---|
| 919         | Linear Foot | _____ " Dia. Ductile Iron Pipe Bored Without Casing.    |
| 919         | Linear Foot | _____ " Dia. Asbestos Cement Pipe Bored Without Casing. |

ITEM 920 – FORCE MAIN

|        |                       |
|--------|-----------------------|
| 920.01 | DESCRIPTION           |
| 920.02 | MATERIALS             |
| 920.03 | LAYING                |
| 920.04 | CREEK CROSSINGS       |
| 920.05 | CUTTING PIPE          |
| 920.06 | JOINTS                |
| 920.07 | LEAKAGE TEST          |
| 920.08 | METHOD OF MEASUREMENT |
| 920.09 | BASIS OF PAYMENT      |

920.01 Description. Under this Item, the Contractor shall furnish all the labor, tools, materials and equipment necessary to construct a force main complete without fittings, unless otherwise itemized herein, as specified and shown on the drawings including all excavations, all sheeting necessary to hold the sides of the trenches or to protect the work, the removal of all water, the furnishing and making of all joints, complete hydrostatic testing, the removal of trees, brush, pavement and any other work necessary to construct the force main as specified and shown, all earth backfilling above the outside top of the pipe except where substitute materials or special methods of backfilling are otherwise specified shown or ordered, all fill or embankment, the stripping, segregating and replacing of topsoil, the disposal of surplus excavated material, the restoration of all surfaces disturbed or destroyed and not otherwise herein specifically provided for, the protection and maintenance of existing surface, overhead or sub-surface structure and the maintenance of traffic and drainage, all as shown and specified.

920.02 Materials. Pipe shall be of size and kind specified in the proposal and shown on the plans.

Specific material shall be as follows:

- (a) Ductile Iron Pipe, Mechanical Joint and Push on Joint ..... 720
  - Fittings ..... 720
- All ductile iron pipe and fittings shall be cement lined inside and coal tar pitch coated outside at the point of manufacture.

920.03 Laying. The excavation and preparation of the trench and the laying of the pipe shall be done to conform to the applicable parts of the latest revision of the standard specifications for installing cast iron pipe AWWA C-600.

The laying shall also be in accordance with the requirements of Item 901 of these Specifications using Type I Bedding. The Contractor’s particular attention is directed to 901.09 concerning his responsibility for restoration of surfaces when for which no specific items are included, and for which no separate or additional payment will be made to the Contractor therefor.

920.04 Creek Crossings. Whenever the pipe passes within four feet (4’) of a creek bed it shall be encased in concrete at least twelve inches (12”) thick on all sides of the pipe in accordance with the requirements of Item 910 of these Specifications. The cost of concrete encasement to be included in the unit price bid for force main.

920.05 Cutting Pipe. Whenever it becomes necessary to cut a length of pipe for any purpose, care shall be taken to leave a smooth and uniform surface and the cut shall be performed so that the cut surface is at right angles to the pipe axis.

920.06 Joints. All joint surfaces must be cleaned and dried before joint lubricants are applied. Joints shall be made in accordance with the manufacturer’s recommendations and procedures. No joints shall be made under water.

920.07 Leakage Test. Each section of force main shall be subjected to a hydrostatic test of fifth (50) pounds per square inch at the high end of the pipe or twice the working pressure, whichever is the greater.

The allowable leakage per thousand feet of force main per hours is as follows:

| <u>PIPE SIZE<br/>INCH DIAMETER</u> | <u>ALLOWABLE LEAKAGE<br/>GALLONS/1000 FEET/HOUR</u> |
|------------------------------------|---|
| 4                                  | 0.63  |
| 6                                  | 0.95  |
| 8                                  | 1.26  |
| 10                                 | 1.58  |
| 12                                 | 1.90  |
| 14                                 | 2.21  |
| 16                                 | 2.53  |

Leakage is defined as the quantity of water which must be pumped into the force main in order to maintain the pressure of fifty (50) pounds per square inch for one (1) hour. The allowable leakage shown in the above table is based upon an allowable loss of twenty (20) gallons per inch diameter per twenty-four (24) hours per mile of pipe.

If the leakage is greater than the allowable, the Contractor shall, at his own expense, locate and repair the defective joints until the allowable leakage is obtained.

920.08 Method of Measurement. The lengths for which payment will be made for furnishing and laying will be measured lengths along the centerline of the main pipe lines in place, from the ends of spigots or shoulders of hub ends to which connections are made, to the ends of spigots or shoulders of hub ends at which the new lines terminate. Excluded from this measurement will be all bends, curves, special fittings and special assemblies itemized elsewhere for payment.

920.09 Basis of Payment. The payment for all work done **under** this Item shall be at the unit price per linear foot bid, which payment shall be full compensation for all labor, material and equipment required to furnish and lay the pipe as herein specified.

Payment will be made at contract price for:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>                                  |
|-------------|-------------|---|
| 920         | Linear Foot | _____ " Ductile Iron Pipe Class _____<br>Force Main |



ITEM 921 – BENDS, TEES, AND SPECIAL FITTINGS FOR FORCE MAIN

|        |                       |
|--------|-----------------------|
| 921.01 | DESCRIPTION           |
| 921.02 | MATERIAL              |
| 921.03 | GENERAL               |
| 921.04 | METHOD OF MEASUREMENT |
| 921.05 | BASIS OF PAYMENT      |

921.01 Description. This work shall consist of furnishing and installing all bends, tees, branches and special fittings for the force main lines where shown on the plans, or where ordered by the Engineer and as specified.

921.02 Material. Generally, the type of material shall be the same as that of the main line unless specified or shown differently on the plans. All materials furnished and installed shall conform in all respects to the applicable provisions of 920.

Specific materials shall be as follows:

- a. Cast iron tee, bend, cross and reducer ..... ASA A21.10
- b. Cast iron gate valve ..... AWWA List 14
- c. Concrete, Class “C” ..... 499
- d. Reinforcing Steel ..... 509

921.03 General. Where shown on the plans, directed by the Engineer, and as specified, all fittings shall be furnished and installed according to the manufacturer’s recommendations and acceptable construction standards.

Thrust blocks shall be of Class “C” concrete and shall be constructed as shown on the drawings and directed by the Engineer. The **list** of furnishing the materials for and the construction of thrust blocks shall be in the price bid for the associated tees, bends, or elbows and no extra payment will be made therefor.

All fittings specified herein and necessary for the installation of the force main shall be paid for in this Item unless specifically itemized to be paid for elsewhere.

921.04 Method of Measurement. The number of fittings of each kind and size shall be those installed and accepted.

921.05 Basis of Payment. The number of each kind and size of fitting accepted will be paid for at the unit price for each.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u>                              |
|-------------|-------------|---|
| 921         | Each        | _____ " Dia. C.I. _____ Degree Bend             |
| 921         | Each        | _____ In. x _____ In. x _____ In. C.I. Tee      |
| 921         | Each        | _____ In. x _____ In. C.I. Cross                |
| 921         | Each        | _____<br>(Size) _____<br>(Special Fitting Name) |
| 921         | Each        | _____ In. x _____ In. C.I. Reducer              |

ITEM 922 – SPECIAL ASSEMBLIES FOR FORCE MAIN

- 922.01 DESCRIPTION
- 922.02 MATERIALS
- 923.03 GENERAL
- 922.04 METHOD OF MEASUREMENT
- 922.05 BASIS OF PAYMENT

922.01 Description. This work shall consist of furnishing, installing, and testing all special assemblies as shown on the plans and as specified, or where directed by the Engineer.

922.02 Materials. Materials for this Item shall be as indicated on the drawings for the special assemblies and structures. The materials indicated shall conform to the applicable provisions in these specifications.

922.03 General. The methods of installing special assemblies for force mains shall be in accordance with the standards of the **A. W.A.** Such assemblies shall include but not be limited to, air relief chamber, blow-off valve assemblies, etc.

Where shown on the plans, the blow-off valve assembly shall include all pipe, fittings and valves necessary to construct the assembly including any pipe necessary to connect the assembly to a manhole. Any tees connecting the blow-off valve assembly shall not be considered as part of the assembly and will be paid for under 921.

Air relief chambers shall be constructed as shown on the plans and as specified herein. The cost of furnishing and installing all pipes, tees, crosses and valves necessary to the operation of the assembly, including the tee connection to the main line of the force main shall be included in the price of the assembly. The cost of furnishing and constructing the manhole housing, the assembly complete in place according to applicable provisions of **6** shall be considered as part of the price bid for the air relief chamber and no extra payment will be made therefor.

922.04 Method of Measurement. The number of special assemblies shall be those installed and accepted.

922.05 Basis of Payment. The number of each kind of special assembly accepted will be paid for at the lump sum price for each.

Payment will be made under:

| ITEM | UNIT     | DESCRIPTION                   |
|------|----------|-------------------------------|
| 922  | Lump Sum | _____ ,<br>(Name of Assembly) |
|      |          | _____<br>(Location)           |

**NCPI AIR TEST TABLE**

**TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP FROM 3½ TO 2½ PSIG  
(Where no time is shown, the required time is the largest value for a given diameter)**

|     | 4"  | 6"  | 8"  | 10" | 12" | 15" | 18" | 21" | 24" | 27" | 30" | 33" | 36"  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 25  | 4   | 10  | 18  | 28  | 40  | 62  | 89  | 121 | 158 | 200 | 248 | 299 | 356  |
| 50  | 9   | 20  | 35  | 55  | 79  | 124 | 178 | 243 | 317 | 401 | 495 | 599 | 713  |
| 75  | 13  | 30  | 53  | 83  | 119 | 186 | 267 | 364 | 475 | 601 | 743 | 898 | 1020 |
| 100 | 18  | 40  | 70  | 110 | 158 | 248 | 356 | 485 | 634 | 765 | 851 | 935 |      |
| 125 | 22  | 50  | 88  | 138 | 198 | 309 | 446 | 595 | 680 |     |     |     |      |
| 150 | 26  | 59  | 106 | 165 | 238 | 371 | 510 |     |     |     |     |     |      |
| 175 | 31  | 69  | 123 | 193 | 277 | 425 |     |     |     |     |     |     |      |
| 200 | 35  | 79  | 141 | 220 | 317 |     |     |     |     |     |     |     |      |
| 225 | 40  | 89  | 158 | 248 | 340 |     |     |     |     |     |     |     |      |
| 250 | 44  | 99  | 176 | 275 |     |     |     |     |     |     |     |     |      |
| 275 | 48  | 109 | 194 | 283 |     |     |     |     |     |     |     |     |      |
| 300 | 53  | 119 | 211 |     |     |     |     |     |     |     |     |     |      |
| 350 | 62  | 139 | 227 |     |     |     |     |     |     |     |     |     |      |
| 400 | 70  | 158 |     |     |     |     |     |     |     |     |     |     |      |
| 450 | 79  | 170 |     |     |     |     |     |     |     |     |     |     |      |
| 500 | 88  |     |     |     |     |     |     |     |     |     |     |     |      |
| 550 | 97  |     |     |     |     |     |     |     |     |     |     |     |      |
| 600 | 106 |     |     |     |     |     |     |     |     |     |     |     |      |
| 650 | 113 |     |     |     |     |     |     |     |     |     |     |     |      |

**NOTE: TO BE USED WHEN TESTING ONE DIAMETER ONLY**

**NCPI AIR TEST TABLES**

**MINIMUM HOLDING TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP FROM 3 ½ TO 2 ½ PSIG**

| LENGTH OF LATERAL IN FEET<br>4" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     |     |     |     |     | 6" DIAMETER |     |
|--|-----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275         | 300 |
| 25                                       | 14                          | 24  | 34  | 44  | 54  | 64  | 74  | 84  | 94  | 103 | 113         | 123 |
| 50                                       | 19                          | 29  | 39  | 48  | 58  | 68  | 78  | 88  | 98  | 108 | 118         | 128 |
| 75                                       | 23                          | 33  | 43  | 53  | 63  | 73  | 83  | 92  | 102 | 112 | 122         | 132 |
| 100                                      | 28                          | 37  | 47  | 57  | 67  | 77  | 87  | 97  | 107 | 117 | 127         | 136 |
| 125                                      | 32                          | 42  | 52  | 62  | 72  | 81  | 91  | 101 | 111 | 121 | 131         | 141 |
| 150                                      | 36                          | 46  | 56  | 66  | 76  | 86  | 96  | 106 | 116 | 125 | 135         | 145 |
| 175                                      | 41                          | 51  | 61  | 70  | 80  | 90  | 100 | 110 | 120 | 130 | 140         | 150 |
| 200                                      | 45                          | 55  | 65  | 75  | 85  | 95  | 105 | 114 | 124 | 134 | 144         | 153 |
| 225                                      | 50                          | 59  | 69  | 79  | 89  | 99  | 109 | 119 | 129 | 139 | 149         | 151 |
| 250                                      | 54                          | 64  | 74  | 84  | 94  | 103 | 113 | 123 | 133 | 143 | 149         | 150 |
| 275                                      | 58                          | 68  | 78  | 88  | 98  | 108 | 118 | 128 | 138 | 146 | 147         | 149 |
| 300                                      | 63                          | 73  | 83  | 92  | 102 | 112 | 122 | 132 | 142 | 145 | 146         | 147 |
| 350                                      | 72                          | 81  | 91  | 101 | 111 | 121 | 131 | 140 | 141 | 143 | 144         | 145 |
| 400                                      | 80                          | 90  | 100 | 110 | 120 | 130 | 136 | 138 | 139 | 141 | 142         | 143 |
| 450                                      | 89                          | 99  | 109 | 119 | 129 | 132 | 134 | 136 | 138 | 139 | 141         | 142 |
| 500                                      | 98                          | 108 | 118 | 126 | 129 | 131 | 133 | 135 | 136 | 138 | 139         | 140 |

| LENGTH OF LATERAL IN FEET<br>4" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     |     |     |     |     | 8" DIAMETER |     |
|--|-----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275         | 300 |
| 25                                       | 22                          | 40  | 57  | 75  | 92  | 110 | 128 | 145 | 163 | 180 | 198         | 216 |
| 50                                       | 26                          | 44  | 62  | 79  | 97  | 114 | 132 | 150 | 167 | 185 | 202         | 218 |
| 75                                       | 31                          | 48  | 66  | 84  | 101 | 119 | 136 | 154 | 172 | 189 | 207         | 214 |
| 100                                      | 35                          | 53  | 70  | 88  | 106 | 123 | 141 | 158 | 176 | 194 | 209         | 211 |
| 125                                      | 40                          | 57  | 75  | 92  | 110 | 128 | 145 | 163 | 180 | 198 | 206         | 207 |
| 150                                      | 44                          | 62  | 79  | 97  | 114 | 132 | 150 | 167 | 185 | 201 | 202         | 204 |
| 175                                      | 48                          | 66  | 84  | 101 | 119 | 136 | 154 | 172 | 189 | 197 | 199         | 201 |
| 200                                      | 53                          | 70  | 88  | 106 | 123 | 141 | 158 | 176 | 192 | 194 | 197         | 199 |
| 225                                      | 57                          | 75  | 92  | 110 | 128 | 145 | 163 | 180 | 189 | 192 | 194         | 196 |
| 250                                      | 62                          | 79  | 97  | 114 | 132 | 150 | 167 | 183 | 186 | 189 | 191         | 193 |
| 275                                      | 66                          | 84  | 101 | 119 | 126 | 154 | 172 | 181 | 184 | 187 | 189         | 191 |
| 300                                      | 73                          | 88  | 106 | 123 | 141 | 158 | 174 | 178 | 181 | 184 | 187         | 189 |
| 350                                      | 79                          | 97  | 114 | 132 | 160 | 166 | 170 | 174 | 177 | 180 | 183         | 185 |
| 400                                      | 88                          | 106 | 123 | 141 | 157 | 162 | 166 | 170 | 174 | 176 | 179         | 181 |
| 450                                      | 97                          | 114 | 132 | 148 | 154 | 159 | 163 | 167 | 170 | 173 | 176         | 178 |
| 500                                      | 106                         | 123 | 140 | 146 | 151 | 156 | 160 | 164 | 167 | 170 | 173         | 175 |

| LENGTH OF LATERAL IN FEET<br>6" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     |     |     |     |     | 8" DIAMETER |     |
|--|-----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------------|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275         | 300 |
| 25                                       | 28                          | 45  | 53  | 80  | 98  | 116 | 133 | 151 | 168 | 186 | 204         | 221 |
| 50                                       | 37                          | 55  | 73  | 90  | 103 | 126 | 143 | 161 | 178 | 196 | 214         | 220 |
| 75                                       | 47                          | 65  | 83  | 100 | 118 | 135 | 153 | 171 | 188 | 206 | 217         | 217 |
| 100                                      | 57                          | 75  | 93  | 110 | 128 | 145 | 163 | 181 | 198 | 214 | 214         | 215 |
| 125                                      | 67                          | 85  | 102 | 120 | 138 | 155 | 173 | 190 | 208 | 211 | 212         | 213 |
| 150                                      | 77                          | 95  | 112 | 130 | 148 | 165 | 182 | 200 | 207 | 209 | 210         | 211 |
| 175                                      | 87                          | 105 | 122 | 140 | 157 | 175 | 192 | 204 | 206 | 207 | 208         | 209 |
| 200                                      | 97                          | 114 | 132 | 150 | 167 | 185 | 201 | 202 | 204 | 205 | 206         | 207 |
| 225                                      | 107                         | 124 | 142 | 160 | 177 | 195 | 199 | 201 | 203 | 204 | 205         | 206 |
| 250                                      | 117                         | 134 | 152 | 169 | 187 | 195 | 198 | 199 | 201 | 202 | 203         | 204 |
| 275                                      | 127                         | 144 | 162 | 179 | 192 | 194 | 196 | 198 | 200 | 201 | 202         | 204 |
| 300                                      | 136                         | 154 | 172 | 187 | 190 | 192 | 195 | 196 | 198 | 200 | 201         | 202 |
| 350                                      | 156                         | 174 | 181 | 185 | 187 | 190 | 193 | 194 | 196 | 198 | 199         | 200 |
| 400                                      | 173                         | 178 | 181 | 184 | 186 | 189 | 191 | 192 | 194 | 196 | 197         | 198 |
| 450                                      | 173                         | 177 | 180 | 183 | 185 | 187 | 189 | 190 | 192 | 194 | 195         | 196 |
| 500                                      | 173                         | 177 | 180 | 182 | 184 | 186 | 188 | 189 | 191 | 192 | 193         | 194 |

## NCPI AIR TEST TABLES

MINIMUM HOLDING TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP FROM 3 ½ TO 2 ½ PSIG

| LENGTH OF LATERAL IN FEET<br>4" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 10" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 32                          | 59  | 87  | 114 | 142 | 169 | 197          | 224 | 252 | 277 | 277 | 278 |
| 50                                       | 36                          | 64  | 91  | 119 | 146 | 174 | 201          | 229 | 256 | 271 | 272 | 273 |
| 75                                       | 41                          | 68  | 96  | 123 | 151 | 178 | 206          | 233 | 261 | 265 | 267 | 268 |
| 100                                      | 45                          | 73  | 100 | 128 | 155 | 183 | 210          | 238 | 258 | 260 | 262 | 264 |
| 125                                      | 50                          | 77  | 105 | 132 | 160 | 187 | 214          | 242 | 253 | 255 | 257 | 259 |
| 150                                      | 54                          | 81  | 109 | 136 | 164 | 191 | 219          | 244 | 248 | 251 | 253 | 255 |
| 175                                      | 58                          | 86  | 113 | 141 | 168 | 196 | 223          | 239 | 243 | 246 | 249 | 251 |
| 200                                      | 63                          | 90  | 118 | 145 | 173 | 200 | 228          | 235 | 239 | 242 | 245 | 248 |
| 225                                      | 67                          | 95  | 122 | 150 | 177 | 205 | 226          | 231 | 235 | 239 | 242 | 244 |
| 250                                      | 72                          | 99  | 127 | 154 | 182 | 209 | 222          | 227 | 231 | 235 | 238 | 241 |
| 275                                      | 76                          | 103 | 131 | 158 | 186 | 211 | 218          | 223 | 228 | 231 | 235 | 238 |
| 300                                      | 80                          | 108 | 135 | 163 | 190 | 208 | 214          | 220 | 224 | 228 | 232 | 235 |
| 350                                      | 89                          | 117 | 144 | 172 | 194 | 201 | 208          | 213 | 218 | 222 | 226 | 229 |
| 400                                      | 98                          | 125 | 153 | 179 | 188 | 196 | 202          | 208 | 213 | 217 | 221 | 224 |
| 450                                      | 107                         | 134 | 162 | 174 | 183 | 191 | 197          | 203 | 208 | 212 | 216 | 220 |
| 500                                      | 116                         | 143 | 160 | 170 | 179 | 186 | 193          | 198 | 203 | 208 | 212 | 215 |

| LENGTH OF LATERAL IN FEET<br>6" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 10" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 37                          | 65  | 92  | 120 | 147 | 175 | 202          | 230 | 257 | 277 | 278 | 278 |
| 50                                       | 47                          | 75  | 102 | 130 | 157 | 185 | 212          | 240 | 267 | 271 | 272 | 273 |
| 75                                       | 57                          | 85  | 112 | 140 | 167 | 195 | 222          | 250 | 265 | 266 | 267 | 269 |
| 100                                      | 67                          | 95  | 122 | 150 | 177 | 205 | 232          | 257 | 260 | 262 | 263 | 265 |
| 125                                      | 77                          | 105 | 132 | 160 | 187 | 215 | 242          | 253 | 255 | 257 | 259 | 261 |
| 150                                      | 87                          | 114 | 142 | 169 | 197 | 224 | 245          | 248 | 251 | 254 | 256 | 257 |
| 175                                      | 97                          | 124 | 152 | 179 | 207 | 234 | 241          | 245 | 248 | 250 | 252 | 254 |
| 200                                      | 107                         | 134 | 162 | 189 | 217 | 233 | 237          | 241 | 244 | 247 | 249 | 251 |
| 225                                      | 117                         | 144 | 172 | 199 | 225 | 230 | 234          | 238 | 241 | 244 | 246 | 248 |
| 250                                      | 127                         | 154 | 182 | 209 | 222 | 227 | 231          | 235 | 238 | 241 | 243 | 246 |
| 275                                      | 136                         | 164 | 191 | 213 | 219 | 224 | 229          | 232 | 236 | 238 | 241 | 243 |
| 300                                      | 146                         | 174 | 201 | 211 | 217 | 222 | 226          | 230 | 233 | 236 | 239 | 241 |
| 350                                      | 166                         | 192 | 200 | 207 | 212 | 217 | 222          | 226 | 229 | 232 | 235 | 237 |
| 400                                      | 181                         | 190 | 197 | 203 | 209 | 214 | 216          | 222 | 225 | 228 | 231 | 233 |
| 450                                      | 180                         | 188 | 195 | 201 | 206 | 211 | 215          | 218 | 222 | 225 | 227 | 230 |
| 500                                      | 179                         | 186 | 193 | 198 | 203 | 208 | 212          | 215 | 219 | 222 | 224 | 227 |

| LENGTH OF LATERAL IN FEET<br>8" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 10" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 45                          | 73  | 100 | 128 | 155 | 183 | 210          | 238 | 265 | 279 | 280 | 250 |
| 50                                       | 63                          | 90  | 113 | 145 | 173 | 200 | 228          | 255 | 275 | 275 | 276 | 277 |
| 75                                       | 80                          | 108 | 135 | 163 | 190 | 218 | 245          | 270 | 272 | 272 | 273 | 274 |
| 100                                      | 98                          | 125 | 153 | 180 | 208 | 235 | 263          | 267 | 268 | 269 | 270 | 271 |
| 125                                      | 116                         | 143 | 171 | 198 | 226 | 253 | 263          | 265 | 266 | 267 | 268 | 269 |
| 150                                      | 133                         | 161 | 189 | 216 | 243 | 253 | 260          | 262 | 264 | 265 | 266 | 267 |
| 175                                      | 151                         | 178 | 206 | 233 | 254 | 256 | 258          | 260 | 262 | 263 | 264 | 265 |
| 200                                      | 168                         | 196 | 223 | 249 | 252 | 254 | 256          | 258 | 260 | 261 | 262 | 263 |
| 225                                      | 186                         | 213 | 241 | 247 | 250 | 253 | 255          | 257 | 258 | 259 | 261 | 262 |
| 250                                      | 204                         | 231 | 242 | 246 | 249 | 251 | 253          | 255 | 256 | 258 | 259 | 260 |
| 275                                      | 221                         | 237 | 241 | 244 | 247 | 250 | 250          | 254 | 255 | 256 | 258 | 259 |
| 300                                      | 232                         | 237 | 240 | 243 | 246 | 249 | 251          | 253 | 254 | 255 | 256 | 238 |
| 350                                      | 232                         | 235 | 239 | 242 | 244 | 247 | 249          | 251 | 252 | 253 | 254 | 256 |
| 400                                      | 231                         | 234 | 238 | 240 | 243 | 243 | 247          | 249 | 250 | 251 | 253 | 254 |
| 450                                      | 230                         | 234 | 237 | 239 | 241 | 243 | 245          | 247 | 248 | 250 | 251 | 252 |
| 500                                      | 230                         | 233 | 236 | 238 | 240 | 242 | 244          | 246 | 247 | 249 | 250 | 251 |

Air Test

## NCPI AIR TEST TABLES

MINIMUM HOLDING TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP FROM 3 ½ TO 2 ½ PSIG

| LENGTH OF LATERAL IN FEET<br>4" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 12" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 44                          | 84  | 123 | 163 | 202 | 242 | 282          | 321 | 332 | 333 | 334 | 334 |
| 50                                       | 48                          | 88  | 128 | 167 | 207 | 246 | 256          | 323 | 324 | 326 | 327 | 328 |
| 75                                       | 53                          | 92  | 132 | 172 | 211 | 251 | 290          | 316 | 317 | 319 | 321 | 323 |
| 100                                      | 57                          | 97  | 136 | 176 | 216 | 255 | 295          | 308 | 311 | 313 | 316 | 317 |
| 125                                      | 62                          | 101 | 141 | 180 | 220 | 260 | 297          | 301 | 304 | 308 | 310 | 312 |
| 150                                      | 66                          | 106 | 145 | 185 | 224 | 264 | 290          | 295 | 299 | 302 | 305 | 308 |
| 175                                      | 70                          | 110 | 150 | 189 | 229 | 268 | 283          | 289 | 293 | 297 | 300 | 303 |
| 200                                      | 75                          | 114 | 154 | 194 | 233 | 271 | 277          | 283 | 288 | 292 | 296 | 299 |
| 225                                      | 79                          | 119 | 158 | 198 | 238 | 265 | 272          | 278 | 283 | 288 | 291 | 295 |
| 250                                      | 84                          | 123 | 163 | 202 | 242 | 259 | 267          | 273 | 278 | 283 | 287 | 291 |
| 275                                      | 88                          | 128 | 167 | 207 | 244 | 254 | 262          | 269 | 274 | 279 | 283 | 287 |
| 300                                      | 92                          | 132 | 172 | 211 | 239 | 249 | 257          | 264 | 270 | 275 | 279 | 283 |
| 350                                      | 101                         | 141 | 180 | 218 | 231 | 241 | 249          | 256 | 262 | 268 | 272 | 276 |
| 400                                      | 110                         | 150 | 189 | 210 | 223 | 233 | 242          | 249 | 255 | 261 | 266 | 270 |
| 450                                      | 119                         | 158 | 189 | 204 | 216 | 227 | 235          | 243 | 249 | 255 | 260 | 264 |
| 500                                      | 128                         | 166 | 184 | 198 | 210 | 221 | 229          | 237 | 243 | 249 | 254 | 259 |

| LENGTH OF LATERAL IN FEET<br>6" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 12" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 50                          | 89  | 129 | 168 | 208 | 248 | 287          | 327 | 331 | 332 | 333 | 333 |
| 50                                       | 59                          | 99  | 139 | 178 | 218 | 257 | 297          | 321 | 323 | 325 | 326 | 327 |
| 75                                       | 69                          | 109 | 149 | 188 | 228 | 267 | 307          | 314 | 316 | 318 | 320 | 321 |
| 100                                      | 79                          | 119 | 158 | 198 | 238 | 277 | 302          | 306 | 309 | 312 | 314 | 315 |
| 125                                      | 89                          | 129 | 168 | 208 | 248 | 287 | 295          | 300 | 303 | 306 | 309 | 311 |
| 150                                      | 99                          | 139 | 178 | 218 | 257 | 284 | 289          | 294 | 298 | 301 | 304 | 306 |
| 175                                      | 109                         | 149 | 188 | 228 | 267 | 278 | 284          | 289 | 293 | 296 | 299 | 302 |
| 200                                      | 119                         | 158 | 198 | 238 | 265 | 272 | 278          | 284 | 288 | 292 | 295 | 298 |
| 225                                      | 129                         | 168 | 208 | 248 | 260 | 268 | 274          | 279 | 284 | 288 | 291 | 294 |
| 250                                      | 139                         | 178 | 218 | 246 | 255 | 263 | 269          | 275 | 280 | 284 | 287 | 290 |
| 275                                      | 149                         | 188 | 228 | 242 | 251 | 259 | 266          | 271 | 276 | 280 | 284 | 287 |
| 300                                      | 158                         | 198 | 227 | 238 | 248 | 255 | 262          | 268 | 272 | 277 | 281 | 284 |
| 350                                      | 178                         | 208 | 221 | 232 | 241 | 249 | 255          | 261 | 266 | 271 | 274 | 275 |
| 400                                      | 189                         | 204 | 217 | 227 | 236 | 243 | 250          | 256 | 261 | 265 | 269 | 273 |
| 450                                      | 187                         | 201 | 213 | 223 | 231 | 239 | 245          | 251 | 256 | 260 | 264 | 268 |
| 500                                      | 186                         | 199 | 210 | 219 | 227 | 234 | 240          | 246 | 251 | 256 | 260 | 263 |

| LENGTH OF LATERAL IN FEET<br>8" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 12" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 57                          | 97  | 136 | 176 | 216 | 255 | 295          | 331 | 332 | 333 | 334 | 334 |
| 50                                       | 75                          | 114 | 154 | 194 | 233 | 273 | 312          | 324 | 325 | 327 | 328 | 329 |
| 75                                       | 92                          | 132 | 172 | 211 | 251 | 290 | 315          | 317 | 319 | 321 | 323 | 324 |
| 100                                      | 110                         | 150 | 189 | 229 | 268 | 306 | 309          | 312 | 314 | 316 | 318 | 319 |
| 125                                      | 128                         | 167 | 207 | 246 | 286 | 300 | 303          | 306 | 309 | 311 | 314 | 315 |
| 150                                      | 145                         | 185 | 224 | 264 | 290 | 295 | 299          | 302 | 305 | 307 | 310 | 311 |
| 175                                      | 163                         | 202 | 242 | 279 | 285 | 290 | 294          | 298 | 301 | 304 | 306 | 308 |
| 200                                      | 180                         | 220 | 260 | 275 | 281 | 287 | 291          | 294 | 297 | 300 | 303 | 305 |
| 225                                      | 198                         | 238 | 265 | 272 | 278 | 283 | 287          | 291 | 294 | 297 | 300 | 302 |
| 250                                      | 216                         | 253 | 262 | 269 | 275 | 280 | 284          | 288 | 291 | 294 | 297 | 299 |
| 275                                      | 233                         | 251 | 260 | 266 | 272 | 277 | 282          | 285 | 289 | 292 | 294 | 297 |
| 300                                      | 240                         | 249 | 258 | 264 | 270 | 275 | 279          | 283 | 286 | 289 | 292 | 294 |
| 350                                      | 238                         | 247 | 254 | 260 | 266 | 271 | 275          | 279 | 282 | 285 | 288 | 290 |
| 400                                      | 237                         | 245 | 252 | 257 | 263 | 267 | 271          | 275 | 278 | 281 | 284 | 286 |
| 450                                      | 236                         | 243 | 249 | 255 | 260 | 264 | 268          | 272 | 275 | 278 | 281 | 283 |
| 500                                      | 235                         | 242 | 248 | 253 | 257 | 262 | 265          | 269 | 272 | 275 | 278 | 280 |

## NCPI AIR TEST TABLES

MINIMUM HOLDING TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP FROM 3 ½ TO 2 ½ PSIG

| LENGTH OF LATERAL IN FEET<br>4" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 15" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 66                          | 128 | 190 | 252 | 314 | 376 | 414          | 415 | 416 | 417 | 418 | 418 |
| 50                                       | 71                          | 133 | 194 | 256 | 318 | 380 | 403          | 406 | 408 | 409 | 411 | 412 |
| 75                                       | 75                          | 137 | 199 | 261 | 323 | 385 | 393          | 397 | 400 | 402 | 404 | 406 |
| 100                                      | 80                          | 141 | 203 | 265 | 327 | 378 | 384          | 388 | 392 | 395 | 397 | 400 |
| 125                                      | 84                          | 146 | 208 | 270 | 331 | 369 | 375          | 380 | 385 | 386 | 391 | 394 |
| 150                                      | 88                          | 150 | 212 | 274 | 336 | 360 | 367          | 373 | 378 | 382 | 385 | 388 |
| 175                                      | 93                          | 155 | 216 | 278 | 340 | 351 | 359          | 366 | 371 | 376 | 380 | 383 |
| 200                                      | 97                          | 159 | 221 | 283 | 332 | 343 | 352          | 359 | 365 | 370 | 374 | 378 |
| 225                                      | 102                         | 163 | 225 | 287 | 324 | 336 | 345          | 353 | 359 | 365 | 369 | 373 |
| 250                                      | 106                         | 168 | 230 | 292 | 317 | 329 | 339          | 347 | 353 | 359 | 364 | 368 |
| 275                                      | 110                         | 172 | 234 | 293 | 310 | 323 | 333          | 341 | 348 | 354 | 359 | 364 |
| 300                                      | 115                         | 177 | 238 | 287 | 303 | 316 | 327          | 336 | 343 | 349 | 354 | 359 |
| 350                                      | 124                         | 185 | 247 | 275 | 292 | 305 | 316          | 325 | 333 | 340 | 346 | 351 |
| 400                                      | 132                         | 194 | 242 | 264 | 281 | 295 | 306          | 316 | 324 | 332 | 338 | 343 |
| 450                                      | 141                         | 203 | 233 | 255 | 272 | 286 | 298          | 308 | 316 | 324 | 330 | 336 |
| 500                                      | 150                         | 199 | 225 | 247 | 264 | 278 | 290          | 300 | 309 | 316 | 323 | 329 |

| LENGTH OF LATERAL IN FEET<br>6" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 15" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 72                          | 134 | 196 | 257 | 319 | 381 | 411          | 413 | 414 | 416 | 416 | 417 |
| 50                                       | 82                          | 144 | 205 | 267 | 329 | 391 | 379          | 402 | 404 | 406 | 408 | 409 |
| 75                                       | 92                          | 154 | 215 | 277 | 339 | 383 | 388          | 392 | 395 | 398 | 400 | 402 |
| 100                                      | 102                         | 163 | 225 | 287 | 349 | 372 | 378          | 383 | 387 | 390 | 393 | 395 |
| 125                                      | 111                         | 173 | 235 | 297 | 352 | 362 | 369          | 374 | 379 | 383 | 386 | 389 |
| 150                                      | 121                         | 183 | 245 | 307 | 342 | 352 | 360          | 367 | 372 | 376 | 380 | 383 |
| 175                                      | 131                         | 193 | 255 | 317 | 334 | 344 | 353          | 360 | 365 | 370 | 374 | 377 |
| 200                                      | 141                         | 203 | 265 | 312 | 326 | 337 | 346          | 353 | 359 | 364 | 368 | 372 |
| 225                                      | 151                         | 213 | 275 | 304 | 319 | 330 | 339          | 346 | 353 | 358 | 363 | 367 |
| 250                                      | 161                         | 223 | 279 | 298 | 312 | 323 | 333          | 341 | 347 | 353 | 358 | 362 |
| 275                                      | 171                         | 233 | 273 | 292 | 305 | 317 | 327          | 335 | 342 | 348 | 353 | 357 |
| 300                                      | 181                         | 243 | 268 | 286 | 300 | 312 | 322          | 330 | 337 | 343 | 349 | 353 |
| 350                                      | 201                         | 237 | 259 | 277 | 291 | 302 | 312          | 321 | 328 | 334 | 339 | 344 |
| 400                                      | 204                         | 321 | 252 | 268 | 282 | 294 | 304          | 312 | 320 | 326 | 332 | 337 |
| 450                                      | 201                         | 226 | 245 | 261 | 275 | 286 | 296          | 305 | 312 | 319 | 325 | 330 |
| 500                                      | 199                         | 221 | 240 | 255 | 269 | 280 | 290          | 298 | 306 | 312 | 318 | 324 |

| LENGTH OF LATERAL IN FEET<br>8" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 15" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 80                          | 141 | 203 | 265 | 327 | 389 | 411          | 413 | 414 | 418 | 416 | 417 |
| 50                                       | 97                          | 159 | 221 | 283 | 345 | 395 | 399          | 402 | 404 | 408 | 407 | 409 |
| 75                                       | 115                         | 177 | 238 | 300 | 362 | 383 | 388          | 392 | 395 | 400 | 400 | 402 |
| 100                                      | 132                         | 194 | 256 | 318 | 366 | 373 | 378          | 383 | 387 | 392 | 393 | 395 |
| 125                                      | 150                         | 212 | 274 | 336 | 356 | 364 | 370          | 375 | 379 | 385 | 386 | 389 |
| 150                                      | 168                         | 229 | 291 | 337 | 348 | 356 | 362          | 368 | 373 | 379 | 380 | 383 |
| 175                                      | 185                         | 247 | 309 | 329 | 340 | 349 | 355          | 362 | 366 | 373 | 374 | 378 |
| 200                                      | 203                         | 265 | 309 | 323 | 334 | 342 | 349          | 356 | 361 | 367 | 369 | 373 |
| 225                                      | 220                         | 282 | 303 | 317 | 328 | 337 | 344          | 350 | 356 | 362 | 364 | 368 |
| 250                                      | 238                         | 281 | 298 | 311 | 322 | 331 | 339          | 345 | 351 | 357 | 360 | 364 |
| 275                                      | 256                         | 277 | 293 | 307 | 318 | 327 | 334          | 341 | 346 | 353 | 356 | 359 |
| 300                                      | 254                         | 274 | 290 | 303 | 313 | 322 | 330          | 336 | 342 | 349 | 352 | 356 |
| 350                                      | 250                         | 269 | 283 | 296 | 306 | 315 | 322          | 329 | 335 | 341 | 344 | 349 |
| 400                                      | 248                         | 264 | 278 | 290 | 300 | 308 | 316          | 322 | 328 | 335 | 338 | 342 |
| 450                                      | 246                         | 261 | 274 | 285 | 294 | 303 | 310          | 316 | 322 | 329 | 332 | 337 |
| 500                                      | 244                         | 258 | 270 | 281 | 290 | 298 | 305          | 311 | 317 | 323 | 327 | 331 |



## NCPI AIR TEST TABLES

MINIMUM HOLDING TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP FROM 3 ½ TO 2 ½ PSIG

| LENGTH OF LATERAL IN FEET<br>4" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 18" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 94                          | 183 | 272 | 361 | 450 | 496 | 498          | 499 | 501 | 502 | 502 | 503 |
| 50                                       | 98                          | 187 | 276 | 365 | 454 | 483 | 487          | 489 | 492 | 493 | 495 | 496 |
| 75                                       | 102                         | 191 | 281 | 370 | 459 | 470 | 476          | 480 | 483 | 485 | 488 | 489 |
| 100                                      | 107                         | 196 | 285 | 374 | 450 | 459 | 465          | 470 | 475 | 478 | 481 | 483 |
| 125                                      | 111                         | 200 | 289 | 378 | 438 | 448 | 456          | 462 | 467 | 470 | 474 | 477 |
| 150                                      | 116                         | 205 | 294 | 383 | 427 | 438 | 446          | 453 | 459 | 463 | 467 | 471 |
| 175                                      | 120                         | 209 | 298 | 387 | 416 | 428 | 438          | 445 | 452 | 457 | 461 | 465 |
| 200                                      | 124                         | 213 | 303 | 388 | 406 | 419 | 430          | 438 | 445 | 450 | 455 | 459 |
| 225                                      | 129                         | 218 | 307 | 378 | 397 | 410 | 422          | 431 | 438 | 444 | 449 | 453 |
| 250                                      | 133                         | 222 | 311 | 369 | 388 | 402 | 414          | 424 | 431 | 438 | 443 | 448 |
| 275                                      | 138                         | 227 | 316 | 360 | 380 | 395 | 407          | 417 | 425 | 432 | 438 | 443 |
| 300                                      | 142                         | 231 | 320 | 352 | 372 | 387 | 400          | 411 | 419 | 426 | 433 | 433 |
| 350                                      | 151                         | 240 | 308 | 337 | 358 | 374 | 388          | 399 | 408 | 416 | 422 | 428 |
| 400                                      | 160                         | 249 | 295 | 323 | 345 | 362 | 376          | 388 | 397 | 406 | 413 | 419 |
| 450                                      | 168                         | 246 | 283 | 312 | 333 | 351 | 365          | 378 | 388 | 396 | 404 | 411 |
| 500                                      | 177                         | 237 | 273 | 301 | 323 | 341 | 355          | 368 | 379 | 388 | 396 | 403 |

| LENGTH OF LATERAL IN FEET<br>6" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 18" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 99                          | 188 | 277 | 366 | 455 | 492 | 495          | 497 | 498 | 499 | 500 | 501 |
| 50                                       | 109                         | 198 | 287 | 376 | 465 | 476 | 481          | 484 | 487 | 489 | 491 | 493 |
| 75                                       | 119                         | 208 | 297 | 386 | 453 | 462 | 468          | 473 | 477 | 480 | 482 | 484 |
| 100                                      | 129                         | 218 | 307 | 396 | 439 | 449 | 456          | 462 | 467 | 470 | 474 | 476 |
| 125                                      | 139                         | 228 | 317 | 406 | 425 | 437 | 445          | 452 | 457 | 462 | 466 | 469 |
| 150                                      | 149                         | 239 | 327 | 397 | 413 | 425 | 435          | 443 | 449 | 454 | 458 | 462 |
| 175                                      | 158                         | 248 | 337 | 385 | 402 | 415 | 426          | 434 | 441 | 445 | 451 | 455 |
| 200                                      | 168                         | 257 | 347 | 375 | 392 | 406 | 417          | 426 | 433 | 439 | 444 | 449 |
| 225                                      | 178                         | 267 | 340 | 365 | 383 | 397 | 409          | 418 | 426 | 432 | 438 | 443 |
| 250                                      | 188                         | 277 | 331 | 356 | 376 | 389 | 401          | 411 | 419 | 426 | 431 | 437 |
| 275                                      | 198                         | 287 | 323 | 348 | 367 | 382 | 394          | 404 | 412 | 419 | 426 | 431 |
| 300                                      | 208                         | 286 | 316 | 341 | 359 | 375 | 387          | 397 | 406 | 414 | 420 | 426 |
| 350                                      | 228                         | 272 | 303 | 328 | 346 | 362 | 375          | 385 | 395 | 403 | 409 | 415 |
| 400                                      | 224                         | 263 | 293 | 316 | 335 | 351 | 364          | 375 | 384 | 392 | 400 | 406 |
| 450                                      | 219                         | 255 | 284 | 307 | 325 | 341 | 354          | 365 | 375 | 383 | 391 | 397 |
| 500                                      | 215                         | 246 | 276 | 298 | 316 | 332 | 345          | 356 | 366 | 375 | 382 | 389 |

| LENGTH OF LATERAL IN FEET<br>8" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 18" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 107                         | 196 | 285 | 374 | 403 | 479 | 493          | 495 | 497 | 498 | 499 | 500 |
| 50                                       | 124                         | 213 | 303 | 392 | 468 | 473 | 478          | 482 | 485 | 487 | 489 | 491 |
| 75                                       | 142                         | 231 | 320 | 409 | 451 | 453 | 465          | 469 | 474 | 477 | 479 | 482 |
| 100                                      | 160                         | 249 | 338 | 423 | 436 | 445 | 452          | 458 | 463 | 467 | 470 | 473 |
| 125                                      | 177                         | 266 | 355 | 409 | 423 | 433 | 442          | 448 | 454 | 458 | 462 | 466 |
| 150                                      | 195                         | 284 | 373 | 397 | 411 | 422 | 432          | 439 | 445 | 450 | 454 | 458 |
| 175                                      | 212                         | 301 | 366 | 386 | 401 | 413 | 422          | 430 | 437 | 442 | 447 | 451 |
| 200                                      | 230                         | 319 | 356 | 377 | 391 | 404 | 414          | 422 | 429 | 435 | 440 | 445 |
| 225                                      | 248                         | 321 | 348 | 368 | 386 | 396 | 406          | 415 | 422 | 429 | 434 | 439 |
| 250                                      | 265                         | 315 | 341 | 361 | 376 | 389 | 399          | 408 | 416 | 423 | 428 | 433 |
| 275                                      | 275                         | 309 | 334 | 354 | 369 | 382 | 393          | 402 | 410 | 417 | 422 | 428 |
| 300                                      | 271                         | 304 | 325 | 348 | 363 | 376 | 387          | 396 | 404 | 411 | 417 | 422 |
| 350                                      | 266                         | 296 | 319 | 337 | 352 | 365 | 376          | 386 | 394 | 401 | 407 | 413 |
| 400                                      | 262                         | 289 | 311 | 329 | 343 | 356 | 367          | 375 | 384 | 392 | 398 | 404 |
| 450                                      | 258                         | 284 | 306 | 321 | 335 | 348 | 359          | 368 | 376 | 384 | 390 | 396 |
| 500                                      | 255                         | 279 | 298 | 315 | 323 | 340 | 351          | 351 | 369 | 376 | 383 | 389 |

NCPI AIR TEST TABLES

MINIMUM HOLDING TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP FROM 3 1/2 TO 2 1/2 PSIG

| LENGTH OF LATERAL IN FEET<br>4" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 21" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 126                         | 247 | 368 | 490 | 577 | 581 | 582          | 584 | 585 | 586 | 587 | 588 |
| 50                                       | 130                         | 251 | 373 | 494 | 561 | 567 | 570          | 573 | 576 | 578 | 579 | 581 |
| 75                                       | 135                         | 256 | 377 | 498 | 545 | 553 | 559          | 563 | 567 | 569 | 571 | 574 |
| 100                                      | 139                         | 260 | 381 | 503 | 531 | 541 | 548          | 553 | 558 | 561 | 564 | 567 |
| 125                                      | 143                         | 265 | 386 | 503 | 518 | 529 | 537          | 544 | 549 | 553 | 557 | 560 |
| 150                                      | 148                         | 269 | 390 | 488 | 505 | 518 | 527          | 535 | 541 | 546 | 550 | 553 |
| 175                                      | 152                         | 273 | 395 | 475 | 493 | 507 | 518          | 526 | 533 | 538 | 543 | 547 |
| 200                                      | 157                         | 278 | 399 | 462 | 482 | 497 | 509          | 518 | 526 | 531 | 536 | 541 |
| 225                                      | 161                         | 282 | 403 | 450 | 472 | 488 | 500          | 510 | 518 | 524 | 530 | 535 |
| 250                                      | 165                         | 287 | 408 | 439 | 462 | 479 | 492          | 502 | 511 | 518 | 524 | 529 |
| 275                                      | 170                         | 291 | 397 | 429 | 452 | 470 | 484          | 495 | 504 | 511 | 518 | 523 |
| 300                                      | 174                         | 295 | 387 | 420 | 443 | 462 | 476          | 488 | 498 | 505 | 512 | 518 |
| 350                                      | 183                         | 304 | 368 | 402 | 427 | 446 | 462          | 474 | 485 | 493 | 501 | 507 |
| 400                                      | 192                         | 304 | 352 | 386 | 412 | 432 | 448          | 462 | 473 | 482 | 490 | 497 |
| 450                                      | 201                         | 291 | 338 | 372 | 398 | 419 | 436          | 450 | 462 | 472 | 480 | 488 |
| 500                                      | 209                         | 279 | 325 | 360 | 386 | 407 | 425          | 439 | 452 | 462 | 471 | 479 |

| LENGTH OF LATERAL IN FEET<br>6" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 21" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 131                         | 253 | 374 | 495 | 572 | 576 | 579          | 581 | 582 | 584 | 585 | 586 |
| 50                                       | 141                         | 262 | 384 | 505 | 552 | 559 | 563          | 567 | 570 | 573 | 574 | 576 |
| 75                                       | 151                         | 272 | 394 | 515 | 533 | 543 | 549          | 554 | 559 | 562 | 565 | 567 |
| 100                                      | 161                         | 282 | 403 | 501 | 516 | 528 | 536          | 542 | 548 | 552 | 555 | 559 |
| 125                                      | 171                         | 292 | 413 | 483 | 501 | 514 | 524          | 531 | 537 | 542 | 547 | 550 |
| 150                                      | 181                         | 302 | 423 | 468 | 487 | 501 | 512          | 521 | 528 | 533 | 538 | 543 |
| 175                                      | 191                         | 312 | 425 | 454 | 474 | 490 | 501          | 511 | 518 | 525 | 530 | 535 |
| 200                                      | 201                         | 322 | 412 | 441 | 462 | 479 | 491          | 501 | 510 | 517 | 522 | 528 |
| 225                                      | 210                         | 332 | 399 | 429 | 451 | 468 | 482          | 492 | 501 | 509 | 515 | 521 |
| 250                                      | 220                         | 347 |     |     |     |     |              | 484 | 501 | 508 | 514 | 514 |
| 275                                      | 230                         |     |     |     |     |     |              | 476 | 486 | 494 | 501 | 508 |
| 300                                      | 240                         | 327 | 369 | 399 | 423 | 441 | 456          | 468 | 479 | 487 | 495 | 501 |
| 350                                      | 255                         | 312 | 353 | 383 | 407 | 426 | 441          | 454 | 465 | 474 | 482 | 490 |
| 400                                      | 246                         | 300 | 339 | 369 | 393 | 417 | 428          | 441 | 453 | 462 | 471 | 479 |
| 450                                      | 239                         | 290 | 327 | 357 | 380 | 400 | 416          | 429 | 441 | 451 | 460 | 468 |
| 500                                      | 234                         | 281 | 317 | 346 | 369 | 389 | 405          | 419 | 431 | 441 | 450 | 459 |

| LENGTH OF LATERAL IN FEET<br>8" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     | 21" DIAMETER |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|--------------|-----|-----|-----|-----|-----|
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175          | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 139                         | 260 | 381 | 503 | 569 | 573 | 576          | 578 | 580 | 582 | 583 | 584 |
| 50                                       | 157                         | 278 | 399 | 520 | 546 | 554 | 559          | 563 | 566 | 569 | 571 | 573 |
| 75                                       | 174                         | 295 | 417 | 513 | 526 | 536 | 543          | 549 | 554 | 557 | 560 | 563 |
| 100                                      | 192                         | 313 | 434 | 493 | 508 | 520 | 529          | 536 | 542 | 546 | 550 | 554 |
| 125                                      | 209                         | 331 | 452 | 476 | 493 | 506 | 516          | 524 | 531 | 536 | 540 | 545 |
| 150                                      | 227                         | 348 | 436 | 461 | 479 | 493 | 504          | 513 | 520 | 526 | 531 | 536 |
| 175                                      | 245                         | 366 | 422 | 447 | 466 | 481 | 493          | 502 | 511 | 517 | 523 | 528 |
| 200                                      | 262                         | 375 | 409 | 435 | 455 | 470 | 483          | 493 | 502 | 509 | 515 | 520 |
| 225                                      | 280                         | 364 | 398 | 424 | 444 | 461 | 473          | 484 | 493 | 501 | 507 | 513 |
| 250                                      | 297                         | 355 | 389 | 415 | 435 | 451 | 465          | 476 | 485 | 493 | 500 | 506 |
| 275                                      | 298                         | 347 | 380 | 406 | 426 | 443 | 456          | 468 | 478 | 486 | 493 | 499 |
| 300                                      | 293                         | 340 | 372 | 398 | 418 | 435 | 449          | 460 | 470 | 479 | 486 | 493 |
| 350                                      | 285                         | 328 | 359 | 384 | 404 | 421 | 435          | 447 | 458 | 466 | 474 | 481 |
| 400                                      | 279                         | 319 | 348 | 372 | 392 | 409 | 423          | 435 | 446 | 455 | 463 | 471 |
| 450                                      | 274                         | 311 | 338 | 362 | 381 | 398 | 413          | 425 | 435 | 443 | 453 | 461 |
| 500                                      | 270                         | 304 | 330 | 353 | 372 | 389 | 403          | 415 | 426 | 436 | 444 | 452 |

NCPI AIR TEST TABLES

MINIMUM HOLDING TIME IN SECONDS REQUIRED FOR PRESSURE TO DROP FROM 3 ½ TO 2 ½ PSIG

| LENGTH OF LATERAL IN FEET<br>4" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     |     |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|  | 24" DIAMETER                |     |     |     |     |     |     |     |     |     |     |     |
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 163                         | 321 | 480 | 638 | 662 | 665 | 667 | 669 | 670 | 671 | 672 | 673 |
| 50                                       | 167                         | 326 | 484 | 637 | 645 | 650 | 654 | 658 | 660 | 662 | 664 | 665 |
| 75                                       | 172                         | 330 | 488 | 617 | 629 | 636 | 642 | 647 | 650 | 653 | 656 | 658 |
| 100                                      | 176                         | 334 | 493 | 599 | 613 | 623 | 631 | 637 | 641 | 645 | 648 | 650 |
| 125                                      | 180                         | 339 | 497 | 582 | 599 | 611 | 620 | 627 | 632 | 637 | 640 | 643 |
| 150                                      | 185                         | 343 | 502 | 567 | 585 | 599 | 609 | 617 | 623 | 629 | 633 | 636 |
| 175                                      | 189                         | 348 | 506 | 552 | 573 | 588 | 599 | 608 | 615 | 621 | 626 | 630 |
| 200                                      | 194                         | 352 | 506 | 538 | 560 | 577 | 589 | 599 | 607 | 613 | 619 | 623 |
| 225                                      | 198                         | 356 | 492 | 525 | 549 | 566 | 580 | 591 | 599 | 606 | 612 | 617 |
| 250                                      | 202                         | 361 | 478 | 513 | 538 | 556 | 571 | 582 | 591 | 599 | 605 | 611 |
| 275                                      | 207                         | 365 | 465 | 501 | 528 | 547 | 562 | 574 | 584 | 592 | 599 | 605 |
| 300                                      | 211                         | 370 | 454 | 491 | 518 | 538 | 554 | 567 | 577 | 585 | 593 | 599 |
| 350                                      | 220                         | 375 | 432 | 471 | 499 | 521 | 538 | 552 | 563 | 573 | 581 | 588 |
| 400                                      | 229                         | 356 | 413 | 453 | 482 | 505 | 523 | 538 | 550 | 560 | 569 | 577 |
| 450                                      | 238                         | 340 | 397 | 436 | 467 | 491 | 509 | 525 | 538 | 549 | 553 | 566 |
| 500                                      | 244                         | 326 | 382 | 422 | 453 | 477 | 497 | 513 | 526 | 538 | 548 | 556 |

| LENGTH OF LATERAL IN FEET<br>6" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     |     |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|  | 24" DIAMETER                |     |     |     |     |     |     |     |     |     |     |     |
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 168                         | 327 | 485 | 644 | 656 | 660 | 663 | 665 | 667 | 668 | 669 | 670 |
| 50                                       | 178                         | 337 | 495 | 624 | 634 | 641 | 646 | 651 | 654 | 656 | 658 | 660 |
| 75                                       | 188                         | 347 | 505 | 600 | 614 | 624 | 631 | 637 | 641 | 645 | 648 | 650 |
| 100                                      | 198                         | 356 | 515 | 579 | 596 | 608 | 617 | 624 | 630 | 634 | 638 | 641 |
| 125                                      | 208                         | 366 | 525 | 559 | 579 | 593 | 603 | 612 | 618 | 624 | 629 | 632 |
| 150                                      | 218                         | 376 | 511 | 542 | 563 | 579 | 591 | 600 | 608 | 614 | 619 | 624 |
| 175                                      | 228                         | 386 | 493 | 526 | 548 | 566 | 579 | 589 | 598 | 605 | 611 | 616 |
| 200                                      | 238                         | 396 | 477 | 511 | 535 | 553 | 567 | 579 | 588 | 596 | 602 | 608 |
| 225                                      | 248                         | 406 | 462 | 497 | 522 | 542 | 557 | 569 | 579 | 587 | 594 | 667 |
| 250                                      | 257                         | 397 | 449 | 485 | 511 | 531 | 547 | 557 | 570 | 579 | 586 | 591 |
| 275                                      | 267                         | 385 | 437 | 473 | 500 | 521 | 537 | 550 | 561 | 571 | 579 | 586 |
| 300                                      | 277                         | 374 | 426 | 462 | 490 | 511 | 528 | 542 | 553 | 563 | 571 | 579 |
| 350                                      | 283                         | 356 | 406 | 443 | 471 | 493 | 511 | 526 | 538 | 549 | 558 | 566 |
| 400                                      | 272                         | 340 | 389 | 426 | 454 | 477 | 495 | 511 | 524 | 535 | 545 | 553 |
| 450                                      | 263                         | 327 | 375 | 411 | 439 | 462 | 481 | 497 | 511 | 523 | 533 | 542 |
| 500                                      | 255                         | 316 | 362 | 398 | 426 | 449 | 468 | 485 | 499 | 511 | 521 | 531 |

| LENGTH OF LATERAL IN FEET<br>8" DIAMETER | LENGTH OF MAIN LINE IN FEET |     |     |     |     |     |     |     |     |     |     |     |
|--|-----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|  | 24" DIAMETER                |     |     |     |     |     |     |     |     |     |     |     |
|  | 25                          | 50  | 75  | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275 | 300 |
| 25                                       | 176                         | 334 | 493 | 645 | 652 | 656 | 659 | 662 | 664 | 666 | 667 | 668 |
| 50                                       | 194                         | 352 | 510 | 615 | 627 | 635 | 641 | 645 | 649 | 652 | 654 | 656 |
| 75                                       | 211                         | 370 | 528 | 589 | 604 | 615 | 623 | 630 | 635 | 639 | 642 | 645 |
| 100                                      | 229                         | 387 | 541 | 566 | 584 | 597 | 607 | 615 | 622 | 627 | 631 | 635 |
| 125                                      | 246                         | 405 | 519 | 546 | 566 | 581 | 592 | 602 | 609 | 615 | 620 | 625 |
| 150                                      | 264                         | 422 | 499 | 528 | 550 | 566 | 579 | 589 | 597 | 604 | 610 | 615 |
| 175                                      | 282                         | 436 | 482 | 512 | 535 | 553 | 566 | 577 | 586 | 594 | 600 | 606 |
| 200                                      | 299                         | 421 | 467 | 498 | 522 | 540 | 554 | 566 | 576 | 584 | 591 | 597 |
| 225                                      | 317                         | 408 | 453 | 485 | 509 | 528 | 543 | 556 | 566 | 575 | 583 | 589 |
| 250                                      | 331                         | 396 | 441 | 473 | 498 | 517 | 533 | 546 | 557 | 566 | 574 | 581 |
| 275                                      | 324                         | 386 | 430 | 462 | 487 | 507 | 523 | 537 | 548 | 558 | 566 | 573 |
| 300                                      | 317                         | 377 | 421 | 452 | 478 | 498 | 514 | 528 | 540 | 550 | 559 | 566 |
| 350                                      | 307                         | 362 | 404 | 435 | 460 | 481 | 498 | 513 | 525 | 535 | 544 | 553 |
| 400                                      | 298                         | 350 | 390 | 420 | 445 | 466 | 483 | 498 | 511 | 522 | 532 | 540 |
| 450                                      | 292                         | 340 | 378 | 407 | 432 | 453 | 470 | 485 | 498 | 510 | 520 | 529 |
| 500                                      | 286                         | 331 | 367 | 396 | 421 | 441 | 459 | 474 | 487 | 498 | 509 | 518 |

SUBJECT INDEX

| <u>SUBJECT</u>                            | <u>SECTION</u>         |
|---|------------------------|
| General Provisions .....                  | 100                    |
| Acceptance, measurement and payment ..... | 109                    |
| Acts of God .....                         | 107.16                 |
| Aggregate .....                           | 703.01                 |
| Mortar or grout .....                     | 703.04                 |
| Portland cement concrete .....            | 703.02                 |
| Sizes .....                               | 703.01                 |
| Aggregate for .....                       | 703.04                 |
| Aggregate base                            |                        |
| Bituminous base                           |                        |
| Slope and channel protection              |                        |
| Waterbound macadam base                   |                        |
| Aggregate for .....                       | 703.05                 |
| Asphalt concrete                          |                        |
| Bituminous cold mix                       |                        |
| Prime Coat                                |                        |
| Bituminous road mix                       |                        |
| Seal coat                                 |                        |
| Tack coat                                 |                        |
| Aggregate base for repaving .....         | 817                    |
| Air-entraining admixtures .....           | 705.10                 |
| Air release assemblies .....              | 814.03, 922.03         |
| Air test for sewers, low pressure .....   | 901.10                 |
| Aluminum for railings .....               | 711.20                 |
| Anchor bolts .....                        | 516.05, 625.06, 713.01 |
| Approach slabs .....                      | 611                    |
| Approval of structure                     |                        |
| Construction plans .....                  | 502.02                 |
| Fabricator .....                          | 501.04                 |
| Falsework plans .....                     | 508.01                 |
| Foundation .....                          | 501.03                 |
| Shop drawings .....                       | 501.05                 |
| Asbestos cement pressure pipe .....       | 722                    |
| Asbestos packing, sheet .....             | 711.22                 |
| Asphalt                                   |                        |
| Cement .....                              | 702.01                 |
| Concrete .....                            | 402, 403, 404, 412     |
| Cut-back .....                            | 702.02                 |
| Cut-back emulsion .....                   | 702.03                 |
| Emulsified .....                          | 702.04                 |
| Filler, oil .....                         | 702.07                 |
| Primer for waterproofing .....            | 702.05                 |

SUBJECT INDEX

| <u>SUBJECT</u>                                      | <u>SECTION</u>         |
|---|------------------------|
| Waterproofing .....                                 | 702.06                 |
| Asphalt concrete leveling course for repaving ..... | 817, 917               |
| Asphalt concrete surface course for repaving .....  | 817, 917               |
| Award and execution of contract .....               | 103                    |
| Backfill, porous .....                              | 518.04                 |
| Backfill, structures .....                          | 503.10                 |
| Backfilling fire hydrants .....                     | 813.06                 |
| Backfilling   |                        |
| For water lines .....                               | 801.08, 811.03, 812.03 |
| For sewers .....                                    | 901.08, 911.03, 912.03 |
| Bacteriologic tests for                             |                        |
| waterlines .....                                    | 801.109                |
| Barricades .....                                    | 107.10, 614.03         |
| Barrier, concrete .....                             | 622                    |
| Base  |                        |
| Aggregate .....                                     | 304.02                 |
| Bituminous aggregate .....                          | 301                    |
| Portland cement concrete .....                      | 305                    |
| Waterbound macadam .....                            | 303                    |
| Base, concrete, for repaving .....                  | 817, 917               |
| Bearing devices, structural .....                   | 516.05                 |
| Bearing pads, elastomeric .....                     | 516.01, 711.23         |
| Bearing pads, preformed .....                       | 516.06, 711.21         |
| Bearing piles .....                                 | 507.04                 |
| Bedding .....                                       | 603.04                 |
| For water lines .....                               | 801.04                 |
| For sewers .....                                    | 901.04                 |
| Bidding requirements and conditions .....           | 102                    |
| Bituminous cold mix .....                           | 405                    |
| Bituminous cold mix for repaving .....              | 817, 917               |
| Bituminous materials .....                          | 702                    |
| Bituminous road mix .....                           | 406                    |
| Blast cleaning .....                                | 514.04                 |
| Blasting in rock .....                              | 803.02, 903.02         |
| Blow-off valve assemblies .....                     | 922.03                 |
| Bolts   |                        |
| Anchor .....  | 516.06, 625.06, 713.01 |
| Bearing .....                                       | 513.16                 |
| High-strength steel .....                           | 513.15, 711.09         |
| Boring  |                        |
| For waterlines .....                                | 818.01                 |
| For sewers .....                                    | 918.01                 |

SUBJECT INDEX

| <u>SUBJECT</u>                             | <u>SECTION</u> |
|--|----------------|
| Borrow .....                               | 203.03         |
| Brick, clay or shale .....                 | 704.01         |
| Brick, concrete .....                      | 704.02         |
| Bridge, temporary .....                    | 502            |
| Bridge timber .....                        | 521            |
| Bents .....                                | 521.04         |
| Joists .....                               | 521.06         |
| Painting .....                             | 521.09         |
| Pile caps .....                            | 521.05         |
| Plank floor .....                          | 521.07         |
| Strip floor .....                          | 521.08         |
| Bridges, removed .....                     | 202.03         |
| Bronze                                     |                |
| Cast .....                                 | 711.17         |
| Leaded .....                               | 711.18         |
| Phosphor .....                             | 711.16         |
| Buildings removed .....                    | 202.06         |
| Burlap blankets, plastic coated .....      | 451.10, 511.14 |
| Burlap cloth .....                         | 705.05         |
| <br>                                       |                |
| Calcium chloride .....                     | 712.02         |
| Camber, falsework .....                    | 508.01         |
| Camber .....                               | 513.19         |
| Casings for bored sewers .....             | 918.02         |
| Casings for bored water lines .....        | 818.02         |
| Cast iron pipe .....                       | 720            |
| Catch basins .....                         | 604            |
| Cellular retaining walls .....             | 610            |
| Cement, hydraulic .....                    | 701            |
| Cement lining for pipe .....               | 720.01         |
| Cement, masonry .....                      | 701.07         |
| Channelization .....                       | 913.01         |
| Channel protection .....                   | 601            |
| Channel protection, dumped rock .....      | 601.08         |
| Chlorine for water line disinfection ..... | 801.105        |
| Cleaning and grubbing .....                | 201            |
| Coal-tar pitch for waterproofing .....     | 702.11         |
| Coating and antistripping agents .....     | 712.08         |
| Cofferdams, cribs and sheeting .....       | 503.03         |
| Cofferdams, as forms .....                 | 508.02         |

SUBJECT INDEX

| <u>SUBJECT</u>                           | <u>SECTION</u>     |
|--|--------------------|
| Compacted backfill                       |                    |
| For water lines .....                    | 811.03             |
| For sewers .....                         | 911.03             |
| Compaction, embankment .....             | 203.12             |
| Concrete, asphalt .....                  | 402, 403, 404, 412 |
| Concrete barrier .....                   | 622                |
| Concrete base for repaving .....         | 817, 917           |
| Concrete bedding for sewers .....        | 901.04             |
| Concrete bridges, cast-in-place .....    | 501.06             |
| Concrete intermediate course             |                    |
| For repaving .....                       | 817, 917           |
| Concrete pavements .....                 | 451, 452, 453      |
| Concrete pressure pipe .....             | 721                |
| Concrete for structures .....            | 511                |
| Admixtures .....                         | 499.03             |
| Cold weather curing .....                | 511.12             |
| Compressive strength .....               | 511.03             |
| Construction joints .....                | 511.09             |
| Curing and loading .....                 | 511.14             |
| Depositing under water .....             | 511.11             |
| Entrained air .....                      | 499.03             |
| Grout cleaning .....                     | 511.15             |
| High-early-strength .....                | 511.05             |
| Patching .....                           | 519.06             |
| Placing .....                            | 511.08             |
| Proportions .....                        | 511.03             |
| Roadway finish .....                     | 511.16             |
| Rubbed finish .....                      | 511.15             |
| Sidewalk finish .....                    | 511.17             |
| Slump .....                              | 511.07             |
| Surface finish .....                     | 511.15             |
| Test specimens .....                     | 511.04             |
| Concrete, general .....                  | 499                |
| Admixtures .....                         | 705.12             |
| Equipment .....                          | 499.04             |
| Handling, measuring and batching .....   | 499.05             |
| Materials .....                          | 499.02             |
| Mixing .....                             | 499.06             |
| Proportioning .....                      | 499.03             |
| Table .....                              | 499.03             |
| Test specimens .....                     | 451.07, 451.14     |
| Concrete median and traffic island ..... | 612                |

## SUBJECT INDEX

| <u>SUBJECT</u>                               | <u>SECTION</u> |
|--|----------------|
| Concrete, prestressed .....                  | 515            |
| Construction joints, concrete .....          | 511.09         |
| Contract .....                               | 101.08         |
| Contract bond .....                          | 103.05         |
| Contractor .....                             | 101.14         |
| Control of material .....                    | 106            |
| Control of work .....                        | 105            |
| Copper, sheet .....                          | 711.15         |
| Corporation cocks .....                      | 815.03         |
| Corrugated steel pipe and pipe arches .....  | 707            |
| Bituminous coated .....                      | 707.04         |
| Bituminous coated, paved .....               | 707.05         |
| Corrugated steel structures .....            | 522, 707.03    |
| Covers for meter boxes .....                 | 815.04         |
| Creosote for priming coat .....              | 702.10         |
| Crushed aggregate slope protection .....     | 601.05         |
| Culverts removed .....                       | 202.03         |
| Curbing .....                                | 609            |
| Asphaltic concrete .....                     | 609.06         |
| Cast-in-place .....                          | 609.04         |
| Precast concrete .....                       | 609.05         |
| Stone .....                                  | 609.03         |
| Curbing compound .....                       | 451.10, 705.07 |
| Definitions and terms .....                  | 101            |
| Delineators .....                            | 620            |
| Dimensions, verification of .....            | 501.02, 513.02 |
| Director .....                               | 101.171        |
| Disinfection of waterlines .....             | 801.10         |
| Dowel holes .....                            | 510            |
| Drain tile, clay .....                       | 706.09         |
| Drain tile, concrete .....                   | 706.07         |
| Drain tubes, copper .....                    | 518.07         |
| Drainage of structures .....                 | 518            |
| Excavation .....                             | 518.09         |
| Pipe .....                                   | 518.05         |
| Porous backfill .....                        | 518.04         |
| Scuppers .....                               | 518.06         |
| Subdrainage for wearing surface course ..... | 518.07         |
| Ductile iron pipe .....                      | 720            |
| Dust control .....                           | 616            |



## SUBJECT INDEX

| <u>SUBJECT</u>                  | <u>SECTION</u>         |
|---------------------------------|------------------------|
| Earthwork .....                 | 200                    |
| Elastomeric bearing pads .....  | 516.02, 711.23         |
| Electrical equipment .....      | 625                    |
| Cable .....                     | 625.14                 |
| Cable connectors .....          | 713.15                 |
| Conduit .....                   | 625.13                 |
| Bituminous fiber .....          | 713.06                 |
| Rigid asbestos cement .....     | 713.05                 |
| Rigid ferrous .....             | 713.04                 |
| Connections .....               | 625.17                 |
| Control center .....            | 625.19, 713.20         |
| Duct-cable system .....         | 625.15, 713.03         |
| Electrical tests .....          | 625.22                 |
| Glare shields .....             | 625.09                 |
| Ground rods .....               | 625.10, 713.16         |
| Lamps .....                     | 625.08, 713.14         |
| Light poles .....               | 625.05, 713.01         |
| Foundations .....               | 625.06                 |
| Identification .....            | 625.23, 713.18         |
| Luminaries .....                | 625.07, 713.11, 713.13 |
| Markers .....                   | 625.16                 |
| Pull boxes .....                | 625.11                 |
| Bituminous .....                | 713.08                 |
| Corrugated metal .....          | 713.09                 |
| Service pole .....              | 625.18, 713.19         |
| Structure ground .....          | 625.20                 |
| Cable .....                     | 713.17                 |
| Structure junction boxes .....  | 625.21, 713.10         |
| Trench .....                    | 625.12                 |
| Electrodes, welding .....       | 501.07, 513.17, 711.08 |
| Embankment .....                | 203                    |
| Compaction .....                | 203.12                 |
| Construction methods .....      | 203.09                 |
| Moisture control .....          | 203.11                 |
| Suitable materials .....        | 203.08                 |
| Encasement of sewers .....      | 910.01                 |
| Encasement of water lines ..... | 810.01                 |
| Engineer .....                  | 101.18                 |
| Erection procedures             |                        |
| Plate girders .....             | 501.06                 |
| Rolled beams .....              | 501.06                 |
| Erection stresses .....         | 501.09                 |

SUBJECT INDEX

| <u>SUBJECT</u>                        | <u>SECTION</u>         |
|---------------------------------------|------------------------|
| Excavated material, disposal of ..... | 503.09                 |
| Excavation                            |                        |
| Additional .....                      | 503.08                 |
| Disposal .....                        | 203.05                 |
| For Structures .....                  | 503                    |
| Near railroad .....                   | 501.08                 |
| Protection of .....                   | 503.04                 |
| Rock .....                            | 203.04, 503.05         |
| Excavation                            |                        |
| For water line .....                  | 801.03                 |
| For sewers .....                      | 901.03                 |
| Excelsior matting .....               | 688                    |
| Exfiltration test for sewers .....    | 901.10                 |
| Expansion joints, structure           |                        |
| Preformed .....                       | 516.02                 |
| Sliding plates .....                  | 516.05                 |
| Structural .....                      | 516.03                 |
| Expansion rockers .....               | 516.05                 |
| Extra work .....                      | 101.20, 104.03         |
| <br>                                  |                        |
| Fabricator, approval of .....         | 501.04                 |
| Falsework .....                       | 508                    |
| Falsework plans, approval of .....    | 501.06                 |
| Federal Aid .....                     | 107.05                 |
| Fence .....                           | 607, 710               |
| Aluminum coated .....                 | 710.05                 |
| Barbed wire .....                     | 607.09, 710.01         |
| Chain link, aluminum .....            | 710.04                 |
| Chain link, steel .....               | 710.03                 |
| Post, steel drive .....               | 712.20                 |
| Posts .....                           | 607.04, 607.06, 710.11 |
| Woven wire .....                      | 607.08, 710.12         |
| Fertilizing .....                     | 659.08                 |
| Field office .....                    | 619                    |
| Fillers, preformed .....              | 705.03                 |
| Finishing machine .....               | 511.16                 |
| Fire hydrants                         |                        |
| Materials for .....                   | 813.021                |
| Design of .....                       | 813.022                |
| Painting .....                        | 813.023                |
| First test pile .....                 | 505                    |

SUBJECT INDEX

| <u>SUBJECT</u>                     | <u>SECTION</u>                 |
|------------------------------------|--------------------------------|
| Fittings for force mains .....     | 921                            |
| Flexible pavement .....            | 400                            |
| Footings in rock .....             | 503.05                         |
| Force mains .....                  | 920                            |
| Forms .....                        | 508.02                         |
| Foundation, information .....      | 501.03                         |
| Foundations, approval of .....     | 503.06                         |
| <br>                               |                                |
| Galvanized steel .....             | 711.02                         |
| Railing .....                      | 517.04                         |
| Timber bridges .....               | 521                            |
| Glass beads .....                  | 712.05                         |
| Grade bars                         |                                |
| For water line work .....          | 801.05                         |
| For sewer work .....               | 901.05                         |
| Granular backfill .....            | 908.06                         |
| For water line .....               | 812.03                         |
| For sewers .....                   | 912.03                         |
| Granulated slag .....              | 703.08                         |
| Grout for tunnel liners .....      | 808.06                         |
| Grout rail .....                   | 606, 710                       |
| Deep beam rail .....               | 710.06                         |
| Erecting rail elements .....       | 606.05                         |
| Hardware .....                     | 710.10                         |
| Painting .....                     | 618                            |
| Posts .....                        | 710.12, 710.13, 712.14, 712.15 |
| Rebuilt .....                      | 606.06                         |
| Removal .....                      | 202.07                         |
| Setting posts .....                | 606.03                         |
| Temporary beam .....               | 606.04                         |
| Wire rope rail .....               | 710.09                         |
| Guard rail and fence removed ..... | 202.07                         |
| Guard rail hardware .....          | 710.10                         |
| Guard rail posts                   |                                |
| Butt treated .....                 | 710.13                         |
| Pressure treated .....             | 710.14                         |
| Square sawed and round .....       | 710.12                         |
| Steel .....                        | 710.15                         |
| Gutters, paved .....               | 601.09                         |

SUBJECT INDEX

| <u>SUBJECT</u>  | <u>SECTION</u>         |
|---|------------------------|
| Handling materials .....                              | 106.07                 |
| Infiltration test for sewers .....                    | 901.10                 |
| Inlets .....  | 604                    |
| Inspections .....                                     | 105.11, 106.04         |
| Intermediate course, concrete<br>for repaving .....   | 817, 917               |
| Iron castings   |                        |
| Ductile .....   | 711.13                 |
| Gray .....  | 711.12                 |
| Joint sealer .....                                    | 516.04, 615.05         |
| Cold applied .....                                    | 705.02                 |
| Hot applied .....                                     | 705.01                 |
| Preformed elastomeric compression .....               | 705.11                 |
| Joints, construction .....                            | 511.09                 |
| Joints, expansion and contraction .....               | 516.03                 |
| Joints  |                        |
| Force mains .....                                     | 920.06                 |
| Sanitary sewers .....                                 | 901.06                 |
| Water lines .....                                     | 801.03                 |
| Jute matting .....                                    | 667                    |
| Laterals .....  | 915.03                 |
| Lead, sheet .....                                     | 711.19                 |
| Leakage tests for force mains .....                   | 920.07                 |
| Leakage test for water line .....                     | 801.1106               |
| Legal relations and responsibility<br>to public ..... | 107                    |
| Light Poles .....                                     | 625.05, 713.01         |
| Lighting .....  | 625, 713               |
| Lime .....  | 712.04                 |
| Limestone for driveways replacement .....             | 817, 917               |
| Linseed oil   |                        |
| Boiled .....  | 708.02                 |
| Raw .....   | 708.01                 |
| Liquifier .....                                       | 702.08                 |
| Liquid membrane-forming compounds .....               | 705.07                 |
| Low pressure air test for sewers .....                | 901.10                 |
| Lubricant adhesive .....                              | 451.13, 705.11         |
| Lumber .....  | 711.26                 |
| Luminaries .....                                      | 625.07, 713.11, 713.12 |

SUBJECT INDEX

| <u>SUBJECT</u>                                      | <u>SECTION</u>   |
|---|------------------|
| Maintaining existing services .....                 | 801.037, 901.037 |
| Maintaining traffic .....                           | 614              |
| Manhole, catch basin and inlet removed .....        | 202.08           |
| Manholes .....                                      | 604, 706.13      |
| Marker poles for pipe risers .....                  | 914.03           |
| Marker poles for sewer service<br>connections ..... | 915.03           |
| Masonry .....                                       | 602, 704         |
| Masonry blocks, concrete .....                      | 704.03           |
| Masonry cement .....                                | 701.07           |
| Material details, sampling .....                    | 700              |
| Median, concrete .....                              | 612              |
| Meter boxes .....                                   | 815.04           |
| Mill test reports .....                             | 501.07, 518.02   |
| Mineral filler .....                                | 703.06           |
| Mineral petroleum spirits .....                     | 708.04           |
| Moisture control .....                              | 203.11           |
| Monument assemblies .....                           | 604              |
| Monument boxes .....                                | 604              |
| Mulching .....                                      | 659              |
| <br>  |                  |
| Navigable waters, bridges over .....                | 107.09           |
| <br>  |                  |
| Office, field .....                                 | 619              |
| <br>  |                  |
| Packing for water line joints .....                 | 801.03           |
| Paint .....   | 708              |
| Aluminum .....                                      | 708.12           |
| Black .....   | 78.11            |
| Finish .....  | 708.08           |
| Graphite .....                                      | 708.13           |
| Green enamel .....                                  | 708.10           |
| Prime .....   | 708.15           |
| Red Lead .....                                      | 708.06           |
| Red Lead, semi-quick drying .....                   | 708.07           |
| White .....   | 708.05, 708.16   |
| Painting .....                                      | 514              |
| Bridge timber .....                                 | 521.09           |
| Existing steel .....                                | 514.06           |
| Field .....   | 514.05           |
| Guard rail .....                                    | 618              |
| Shop .....  | 514.04           |

SUBJECT INDEX

| <u>SUBJECT</u>                         | <u>SECTION</u>     |
|--|--------------------|
| Painting (cont'd.)                     |                    |
| Wood .....                             | 514.07             |
| Paint for fire hydrants .....          | 813.023            |
| Patching concrete structures .....     | 519.06, 519        |
| Paving for channels .....              | 913.04             |
| Paved gutter .....                     | 601.09             |
| Pavement                               |                    |
| Asphalt concrete .....                 | 401, 402, 403, 404 |
| Bituminous cold mix .....              | 405                |
| Bituminous road mix .....              | 406                |
| Marking .....                          | 621                |
| Pavement, concrete                     |                    |
| Continuously reinforced concrete ..... | 453                |
| Curing .....                           | 451.10             |
| Equipment .....                        | 451.03             |
| Finegrading .....                      | 451.05             |
| Finishing .....                        | 451.09             |
| Joints .....                           | 451.08             |
| Opening to traffic .....               | 451.14             |
| Placing .....                          | 451.06             |
| Plain Portland cement .....            | 452                |
| Reinforced Portland cement .....       | 451                |
| Reinforced placing .....               | 451.07             |
| Sealing joints .....                   | 451.13             |
| Setting forms .....                    | 451.04             |
| Slip forms .....                       | 451.15             |
| Smoothness .....                       | 451.12             |
| Thickness .....                        | 451.16             |
| Pavement, flexible                     |                    |
| Plant mix .....                        | 401                |
| Prime coat .....                       | 408                |
| Seal coat .....                        | 409                |
| Stabilized crushed aggregate .....     | 411                |
| Tack coat .....                        | 407                |
| Traffic compacted surface .....        | 410                |
| Pile                                   |                    |
| Bearing .....                          | 507                |
| Bearing, welding .....                 | 507.09             |
| Capacity .....                         | 507.05             |
| Cast-in-place .....                    | 507.06             |
| Cut-off .....                          | 505.03             |
| Defective .....                        | 507.10             |

SUBJECT INDEX

| <u>SUBJECT</u>                                      | <u>SECTION</u>         |
|---|------------------------|
| Pile (cont'd.)                                      |                        |
| Driving of .....                                    | 507.04                 |
| Painting of .....                                   | 507.11                 |
| Prebored holes .....                                | 507.12                 |
| Steel .....   | 507.07                 |
| Steel shoes or points .....                         | 507.08                 |
| Temporary bridge .....                              | 502                    |
| Test .....  | 505                    |
| Test load .....                                     | 506                    |
| Timber .....  | 507.08                 |
| Piling, sheet, left in place .....                  | 504                    |
| Piling, timber .....                                | 711.26                 |
| Preservation treatment .....                        | 712.06                 |
| Pins .....  | 513.12                 |
| Pipe  |                        |
| Alloy steel .....                                   | 707.11                 |
| Aluminum alloy .....                                | 710.04                 |
| Arches .....  | 707.01                 |
| Cast iron .....                                     | 720                    |
| Concrete, non-reinforced .....                      | 706.01                 |
| Concrete, perforated .....                          | 706.06                 |
| Concrete, reinforced .....                          | 706.01, 706.03, 706.14 |
| Concrete, reinforced elliptical .....               | 706.04                 |
| Concrete, reinforced, vitrified<br>clay lined ..... | 706.05                 |
| Concrete, requirements .....                        | 706.03                 |
| Corrugated steel, galvanized .....                  | 707.01                 |
| Corrugated steel, underdrains .....                 | 707.01                 |
| Drain .....   | 518.07                 |
| Ductile iron .....                                  | 720                    |
| Joint filler, bituminous .....                      | 706.10                 |
| Removal .....                                       | 202.04                 |
| Steel, welded and seamless .....                    | 707.11                 |
| Underdrains, aluminum .....                         | 707.12                 |
| Vitrified clay .....                                | 706.08                 |
| Pipe culverts, sewers and drains .....              | 603                    |
| Backfilling .....                                   | 603.08                 |
| Bedding .....                                       | 603.04                 |
| Excavation .....                                    | 603.03                 |
| Joint conduit .....                                 | 603.06                 |
| Laying conduit .....                                | 603.05                 |
| Materials .....                                     | 603.02                 |

SUBJECT INDEX

| <u>SUBJECT</u>                             | <u>SECTION</u> |
|--|----------------|
| Pipe culverts, sewers and drains (cont'd.) |                |
| Risers .....                               | 914.01         |
| Shop strutting .....                       | 603.07         |
| Plans, approval of .....                   | 501.06         |
| Planting                                   |                |
| Salvaged plants .....                      | 664            |
| Shrubs .....                               | 622            |
| Trees .....                                | 663            |
| Vines .....                                | 661            |
| Plate girders, erection procedures .....   | 501.06         |
| Plate girders and flange plates .....      | 513.10         |
| Pneumatically placed mortar .....          | 520            |
| Pollution control .....                    | 207            |
| Polyethylene sheeting, white .....         | 451.10, 705.06 |
| Porous backfill .....                      | 518.04         |
| Portland cement .....                      | 701.04         |
| Air-entraining .....                       | 701.01         |
| Air-entraining, blast furnace slag .....   | 701.03         |
| Air-entraining, high-early-strength .....  | 701.02         |
| Blast furnace slag .....                   | 701.06         |
| High-early-strength .....                  | 701.05         |
| Prelabored holes .....                     | 507.12         |
| Preformed elastomeric compression          |                |
| joint sealer .....                         | 451.13, 705.11 |
| Preformed expansion joint filler .....     | 516.02, 705.03 |
| Premolded sealing strip .....              | 512.02, 711.25 |
| Preparation of proposals .....             | 102.06         |
| Prequalification of bidders .....          | 102.01         |
| Pressure tests for water line .....        | 801.11         |
| Prestressed concrete .....                 | 515            |
| Construction methods .....                 | 515.05         |
| Curing .....                               | 515.041        |
| Plant requirements .....                   | 515.04         |
| Proposals .....                            | 102.02         |
| Prosecution and progress .....             | 108.03         |
| Strength .....                             | 516.05         |
| Transportation, storage and erection ..... | 515.08         |
| Radiographic inspection of welds .....     | 513.21         |
| Railings .....                             | 517            |
| Aluminum .....                             | 517.05         |
| Steel .....                                | 517.04         |



## SUBJECT INDEX

| <u>SUBJECT</u>                               | <u>SECTION</u> |
|--|----------------|
| Reconditioning shoulders .....               | 617            |
| Reinforcing steel .....                      | 509            |
| Bending .....                                | 509.05         |
| Placing .....                                | 509.04         |
| Protective coating .....                     | 509.10         |
| Splicing .....                               | 509.08         |
| Supports .....                               | 509.09         |
| Reinforcing steel, material .....            | 709            |
| Axle steel deformed bars .....               | 709.05         |
| Billet steel bars .....                      | 709.01         |
| Carbon steel, smooth .....                   | 709.02         |
| Rail steel bars .....                        | 709.03         |
| Steel bar mat, fabricated .....              | 709.09         |
| Steel wire, cold-drawn .....                 | 709.08         |
| Steel wire, deformed .....                   | 709.11         |
| Steel wire fabric, deformed, welded .....    | 709.12         |
| Steel wire fabric, welded .....              | 709.10         |
| Removal of structures and obstructions ..... | 202            |
| Responsibility for work .....                | 107.16         |
| Restoration of surfaces                      |                |
| For water lines .....                        | 801.09         |
| For sewers .....                             | 901.09         |
| Retaining walls, cellular .....              | 610            |
| Rigid pavement .....                         | 450            |
| Riprap .....                                 | 601.04         |
| Riprap for tree protection .....             | 657            |
| Roads and pavements, temporary .....         | 615            |
| Roadside cleanup .....                       | 656            |
| Roadway                                      |                |
| Disposal of excavated material .....         | 203.05         |
| Excavation and embankment .....              | 203            |
| Tolerances .....                             | 203.06         |
| Rock .....                                   | 203.09         |
| Rolled beams, camber .....                   | 513.19         |
| Rolled beams, erection procedures .....      | 501.06         |
| Rollers .....                                | 513.13         |
| Run-around bridge .....                      | 502            |
| Run-around bridge, maintenance .....         | 502.03         |
| Rustification .....                          | 508.02         |
| <br>   |                |
| Safety regulation .....                      | 107.07         |
| Salvaged plants, planting .....              | 664            |

## SUBJECT INDEX

| <u>SUBJECT</u>                                   | <u>SECTION</u>         |
|--|------------------------|
| Sampling materials .....                         | 700                    |
| Sand cover .....                                 | 703.06                 |
| Sanitary sewers .....                            | 901                    |
| Scalping .....                                   | 201.04                 |
| Screenings .....                                 | 703.10                 |
| Scope of work .....                              | 104                    |
| Scuppers .....                                   | 518.06                 |
| Seal coat .....                                  | 409                    |
| Sealing strip, premolded .....                   | 512.03, 512.08, 711.25 |
| Sectional corrugated steel arch structures ..... | 522                    |
| Seeding .....                                    | 659                    |
| Sewers and drains .....                          | 603                    |
| Sheet lead .....                                 | 516.05, 711.19         |
| Sheet piling left in place .....                 | 504                    |
| Sheeting .....                                   | 503.03                 |
| Sheeting and bracing .....                       | 501.06                 |
| Shop drawings .....                              | 501.05                 |
| Shoulders, reconditioning .....                  | 617                    |
| Shrubs, planting .....                           | 622                    |
| Sidewalks replacement .....                      | 817, 917               |
| Siltation control .....                          | 207                    |
| Slabs, approach .....                            | 611                    |
| Slacker aggregate .....                          | 703.09                 |
| Sleeves for existing water lines .....           | 816.22                 |
| Sliding plates .....                             | 516                    |
| Slope protection .....                           | 600                    |
| Concrete .....                                   | 601.03, 601.06         |
| Crushed aggregate .....                          | 601.05                 |
| Dumped rock .....                                | 601.07                 |
| Paved gutter .....                               | 601.09                 |
| Riprap .....                                     | 601.04                 |
| Slump, concrete for structures .....             | 511.07                 |
| Sod, seeding and renovating .....                | 655                    |
| Sodding .....                                    | 660                    |
| Sodium chloride .....                            | 712.03                 |
| Soil erosion .....                               | 207                    |
| Soil, renovating existing .....                  | 654                    |
| Soundings, accuracy of .....                     | 501.03                 |
| Splicing, reinforcing steel .....                | 509.08                 |
| Stabilized crushed aggregate .....               | 411                    |
| Stakes, construction layout .....                | 623                    |
| Standard bedding for sewers .....                | 901.04                 |

## SUBJECT INDEX

| <u>SUBJECT</u>                                    | <u>SECTION</u>         |
|---|------------------------|
| Steel   |                        |
| Expansion joint .....                             | 511.08                 |
| Piles .....                                       | 507.07                 |
| Reinforcing .....                                 | 509                    |
| Structural .....                                  | 513                    |
| Steel, material .....                             | 711                    |
| Casting .....                                     | 711.07                 |
| Cold rolled .....                                 | 711.04                 |
| Forgings .....                                    | 711.05, 711.06         |
| Galvanized .....                                  | 711.02                 |
| Prestressing .....                                | 711.27                 |
| Sheet piling .....                                | 711.03                 |
| Structural .....                                  | 711.01                 |
| Steps, walks and .....                            | 608                    |
| Concrete .....                                    | 608.03, 608.06         |
| Steps, replacement .....                          | 817, 917               |
| Sterilization of water lines .....                | 810.10                 |
| Stiffeners .....                                  | 513.08                 |
| Stone foundation for sewers .....                 | 906.01                 |
| Stone foundation for water lines .....            | 806.01                 |
| Storage of materials .....                        | 106.06                 |
| Stresses, erection .....                          | 501.09                 |
| Structural expansion and contraction joints ..... | 516.03                 |
| Structural steel .....                            | 513                    |
| Anchor bolts .....                                | 516.05, 625.06, 713.01 |
| Bearing devices .....                             | 516                    |
| Bolts, high-strength .....                        | 513.15, 711.09         |
| Bolts, machine .....                              | 513.16, 711.10         |
| Camber .....                                      | 513.19                 |
| Cleaning .....                                    | 514.03                 |
| Fabrication .....                                 | 513.02                 |
| Field painting .....                              | 514.05                 |
| High-strength bolts .....                         | 513.15                 |
| Holes for bolts .....                             | 513.14                 |
| Joints .....                                      | 513.11                 |
| Pin holes .....                                   | 513.12                 |
| Pins and rollers .....                            | 513.13                 |
| Plates, web and flange .....                      | 513.10                 |
| Screw threads .....                               | 513.18                 |
| Shipping and erection .....                       | 513.22                 |
| Shop assembly .....                               | 513.20                 |
| Shop drawings .....                               | 513.02                 |

SUBJECT INDEX

| <u>SUBJECT</u>                             | <u>SECTION</u> |
|--|----------------|
| Structural steel (cont'd.)                 |                |
| Shop painting .....                        | 514.04         |
| Stiffeners .....                           | 513.08         |
| Straightening and workmanship .....        | 513.06         |
| Welding .....                              | 513.17         |
| Structures                                 |                |
| Concrete for .....                         | 511            |
| Draining of .....                          | 513            |
| Excavation for .....                       | 518.09         |
| General .....                              | 501            |
| Removal of .....                           | 202            |
| Subbase .....                              | 310            |
| Subbase for repaving .....                 | 817, 917       |
| Subdrainage for wearing surface .....      | 518.07         |
| Subgrade .....                             | 203.13         |
| Requirements for sewers .....              | 901.033        |
| Requirements for water lines .....         | 801.033        |
| Subletting or assigning of contracts ..... | 108.01         |
| Suspension of work .....                   | 108.031        |
| <br>                                       |                |
| Tack coat .....                            | 407            |
| Tars .....                                 | 702.09         |
| Tee branch .....                           | 915.03         |
| Temporary roads and pavements .....        | 615            |
| Temporary run-around bridge .....          | 502            |
| Tests for force mains .....                | 920.07         |
| Tests for sewers .....                     | 901.10         |
| Tests for water lines .....                | 801.10, 801.11 |
| Test load, pile .....                      | 506            |
| Test pile .....                            | 505            |
| Thrust blocks .....                        | 804.03         |
| Timber                                     |                |
| Bridge .....                               | 521            |
| Piles .....                                | 507.08, 711.26 |
| Structural .....                           | 711.26         |
| Structural, preservative treatment .....   | 712.06         |
| Topsoil .....                              | 650            |
| Furnished and placed .....                 | 653            |
| Plating stockpiled .....                   | 652            |
| Stockpiled .....                           | 651            |
| Traffic                                    |                |
| Compacted surface .....                    | 410            |

SUBJECT INDEX

| <u>SUBJECT</u>                                 | <u>SECTION</u>         |
|--|------------------------|
| Traffic (cont'd.)                              |                        |
| Control .....                                  | 614.03                 |
| Dividers .....                                 | 613                    |
| Island .....                                   | 612                    |
| Maintaining .....                              | 614                    |
| Pavement marking .....                         | 621                    |
| Restricted on structure .....                  | 501.10                 |
| Trees  |                        |
| Moved and reset .....                          | 665                    |
| Planting .....                                 | 663                    |
| Protection, riprap for .....                   | 657                    |
| Pruning existing .....                         | 666                    |
| Root aeration .....                            | 658                    |
| Trench topping material .....                  | 916.02                 |
| Tubing, steel, square and rectangular .....    | 707.10                 |
| Tunneling for sewers .....                     | 908.03                 |
| Tunneling for water lines .....                | 808.03                 |
| Turpentine .....                               | 708.03                 |
| Underdrains .....                              | 605                    |
| Aggregate .....                                | 605.05                 |
| Pipe .....                                     | 605.03                 |
| Utilities .....                                | 501.08                 |
| Valve boxes for water lines .....              | 805.03                 |
| Valves for water lines .....                   | 805.03                 |
| Vibrators .....                                | 451.03, 451.06, 511.08 |
| Vines, planting .....                          | 661                    |
| Walks .....                                    | 608                    |
| Bituminous .....                               | 608.04                 |
| Concrete .....                                 | 608.03                 |
| Crushed aggregate .....                        | 608.05                 |
| Walks and steps .....                          | 608                    |
| Walls, retaining, cellular .....               | 610                    |
| Water service installation .....               | 815.03                 |
| Waterproof paper .....                         | 705.07                 |
| Waterproofed aggregate base for repaving ..... | 817, 917               |
| Waterproofing .....                            | 512                    |
| Fabric .....                                   | 711.24                 |
| Primer coat .....                              | 512.04                 |
| Type A .....                                   | 512.05                 |

SUBJECT INDEX

| <u>SUBJECT</u>                    | <u>SECTION</u> |
|-----------------------------------|----------------|
| Waterproofing (cont'd.)           |                |
| Type B .....                      | 512.06         |
| Premolded sealing strip .....     | 512.08         |
| Wearing surface subdrainage ..... | 518.07         |
| Weep holes .....                  | 508.02         |
| Welders, qualified .....          | 513.17         |
| Welding .....                     | 513.17         |
| Bearing piles .....               | 507.09         |
| Extension bars .....              | 513.17         |
| Flux .....                        | 513.17         |
| Radiographic inspection .....     | 513.21         |
| Wood chips .....                  | 661.04         |
| Wye branch .....                  | 915.03         |

CITY OF CUYAHOGA FALLS  
DEPARTMENT OF PUBLIC SERVICE  
DIVISION OF ENGINEER AND CONSTRUCTION

ADDENDUM #1

CONSTRUCTION SPECIFICATIONS  
1976 EDITION  
FEBRUARY 15, 1977

To become attached to and a part of the current construction specifications for the City of Cuyahoga Falls, Ohio, and shall become effective for public improvement contracts entered into by the City after February 15, 1977.

The items within the following sections are revised as follows. Please make appropriate references to these items in the main text.

SECTION 100

103.98 Insurance [This section replaced in Addendum #4]

SECTION 800

801.033 Subgrade

c. If dewatering and placing stone foundation as specified in 806 up to one (1) foot on each side of the pipe and up to one (1) feet below the bottom of the trench does not provide a stable foundation acceptable to the Engineer, the Contractor, if directed by the Engineer in writing, shall remove additional unsuitable material and shall replace it with stone foundation as specified in 806 and shall be paid as indicated therein less the quantity within the above described limits.

SECTION 900

901.033 Subgrade

c. If dewatering and placing stone foundation as specified in 906 up to one (1) foot on each side of the pipe and up to one (1) foot below the bottom of the trench does not provide a stable foundation acceptable to the Engineer, the Contractor, if directed by the Engineer, shall

remove additional unsuitable material and shall replace it with stone foundation as specified in 906 and shall be paid as indicated therein less the quantity within the above described limits.

901.04 Bedding

Type I (Standard Bedding)

The bottom of the trench shall be excavated below the bottom of the sewer pipe not less than six inches (6") and the pipe shall then be bedded in item 310.02 Subbase Aggregate placed at a minimum depth of 6" and extending up around the sides of the pipe so that the lower half of the pipe is supported its entire length.

Type II (Concrete Bedding)

Where called for on the plans, or when ordered by the Engineer, the bottom of the trench shall be excavated below the bottom of the sewer pipe a minimum thickness of six (6) inches and the pipe shall then be bedded in Class "A" concrete extending up around the sides of the pipe so that the lower half of the pipe is supported its entire length as shown in the plans. The concrete should be a "stiff mixture" so as not to cause flotation of the pipe.

912.04 Method of Measurement The number of tons of backfill, at one hundred (100) pounds per cubic foot, will be computed on the following basis:

The number of tons is equal to W times L times D divided by twenty (20) where W is the specified trench width in feet, L is the length of trench in feet specified or ordered to be backfilled with granular material and D is the distance in feet from the top of the bedding or encasement to subgrade. Definition for the D measurement may be varied as indicated on the plans or as specified or ordered by the Engineer.

914.03 General

The Price Bid for all risers shall include : one six inch (6") curve, the appropriate length of six inch (6") pipe, one six inch (6") bend, concrete encasement over the vertical sections of the riser and concrete foundation at the main sewer connection.

Particular attention should be paid to this fact. The wye branch from the main sewer shall be as specified under Item 915 and shall be considered payable under that Item.

Where ABS plastic pipe is used, a typical riser shall consist of the following:

- a). 6" 1/8 Bends (45°) ..... ASTM D2680
- b). 6" Straights ..... ASTM D2680



c.) 6" Saddle Wye ..... ASTM D2680

All joints shall be chemically bonded.

All other specifications herein or drawings pertaining to six inch (6") diameter pipe risers shall apply to ABS plastic pipe risers unless otherwise noted.

914.04 Method of Measurement The number of vertical feet of six inch (6") diameter pipe risers constructed and accepted will be measured in place for payment. The measurement will be made from the top of the barrel of the main sewer to the top of the riser.

CITY OF CUYAHOGA FALLS  
DEPARTMENT OF PUBLIC SERVICE  
DIVISION OF ENGINEERING AND CONSTRUCTION

ADDENDUM #4

CONSTRUCTION SPECIFICATIONS

1976 EDITION

March 29, 1978

To become attached to and a part of the current construction specifications for the City of Cuyahoga Falls, Ohio, and shall become effective for public improvement contracts entered into by the City after March 29, 1978.

The enclosed is the Insurance Requirements as amended, in its entirety. Please use this as the complete **Item 103.08**.

\*\* Addendums #2 and #3 are also replaced by this addendum.

CITY OF CUYAHOGA FALLS

DIVISION OF ENGINEERING

INSURANCE REQUIREMENTS - as amended

103.08 Insurance. The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the City nor shall the Contractor allow any subcontractor to commence work on his subcontract until the insurance required of he subcontractor has been so obtained and approved.

1. Compensation Insurance: The Contractor shall procure and shall maintain during the life of this contract Workmen's Compensation Insurance as required by the State of Ohio for all of his employees to be engaged in work at the site of the project under this contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this contract is not protected under the Workmen's Compensation Statute, the Contractor shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of his employees as are not otherwise protected.

2. Contractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance: The Contractor shall procure and shall maintain during the life of this contract, Contractor's Public Liability Insurance, Contractor's Property Damage Insurance and Vehicle Liability Insurance in the amounts specified in Subparagraph 5.

3. Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance: The Contractor shall either (1) require of his subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance and Vehicle Liability Insurance of the type and in the amounts specified in Subparagraph 6 hereof or, (2) insure the activities of his policy, specified in subparagraph 2 hereof.

4. Scope of Insurance and Special Hazards: The insurance required under Subparagraphs 2 and 3 hereof shall provide adequate protection for the Contractor and his Subcontractors, respectively, against claims which may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him and, also against any of the special hazards which may be encountered in the performance of this contract as enumerated in he SPECIAL PROVISIONS.

5. Builder's Risk Insurance (Fire and Extended Coverage): (Building Construction only) Until the project is completed and accepted by the City the Contractor is required to maintain Builder's Risk Insurance (fire and extended coverage) on a 100 percent completed value basis

on the insurable portion of the project for the benefit of the City, the Contractor, Subcontractors as their interests may appear. The Contractor shall not include any costs for Builder's Risk Insurance (fire and extended coverage) premiums during construction unless the Contractor is required to provide such insurance; however, this provision shall not release the Contractor from his obligation to complete, according to plans and specifications, the project covered by the contract, and the Contractor and his Surety shall be obligated to full performance of the Contractor's undertaking.

6. Proof of Carriage of Insurance: The Contractor shall furnish the City with certificates showing the type, amount, class of operations covered, effective dates and date of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be cancelled or materially altered, except after ten (10) days' written notice has been received by the City."

The amounts of such insurance shall be as follows:

BODILY INJURY LIABILITY

|                 |                 |
|-----------------|-----------------|
| Each Occurrence | \$ 1,000,000.00 |
| Aggregate       | \$ 1,000,000.00 |

PROPERTY DAMAGE LIABILITY

|                 |               |
|-----------------|---------------|
| Each Occurrence | \$ 500,000.00 |
| Aggregate       | \$ 500,000.00 |

3/29/78

CITY OF CUYAHOGA FALLS  
DEPARTMENT OF PUBLIC SERVICE  
DIVISION OF ENGINEERING AND CONSTRUCTION

ADDENDUM #5

CONSTRUCTION SPECIFICATIONS

1976 EDITION

July 6, 1972

To become attached to and a part of the current construction specifications for the City of Cuyahoga Falls, Ohio, and shall become effective for public improvement contracts entered into by the City after July 6, 1978.

The following sections are hereby corrected by the attached sheets.

ITEM 811 – COMPACTED BACKFILL

ITEM 812 – GRANULAR BACKFILL

ITM 911 – COMPACTED BACKFILL

ITEM 912 – GRANULAR BACKFILL

ITEM 811 – COMPACTED BACKFILL

Delete entire section.

ITEM 812 – GRANULAR BACKFILL

812.03 General. Where gravel grits are used for backfilling, they shall be adequately compacted and all surplus excavated material shall be removed and disposed of by the Contractor at his own cost and expense.

812.04 Method of Measurement. The number of cubic yards of compacted backfill to be paid for will be computed on the following basis:

Volume in cubic yards equals W times L times D divided by twenty-seven (27) where W is the specified trench width in feet, L is the length of trench in feet as specified or ordered to be compacted and D is the distance in feet from the top of the bedding or encasement to the specified top of trench. The length of trench will be measured along the centerline of the water line in place without deduction for structures built in the open trench. No extra payment will be made for compacted backfill in the extra excavation widths necessary at structures along the centerline of the work. At existing structures, where the work connects, the measurement for this item will be made from the centerline of the existing structure. At terminal structures being constructed as part of the work, the measurement for this item will be through the structure to a point one (1) foot beyond the structure base. Where structures are built over existing water lines, as part of the work, compacted backfill will be measured along the centerline of the water line between two points one (1) foot beyond and on either side of the manhole or structure base. Where water line trenches intersect at different elevations or at a structure being constructed as part of the work, a length equal to the specified width of trench for the lesser diameter pipe shall be deducted from the above measurement for the length of the intersection.

The Contractor will receive no compensation because of the following:

- a. Work necessitated or material placed outside of the payment limits defined above, within the length of trench specified or ordered, due to unauthorized excavation.
- b. Work necessitated or material placed which is included in the price bid for pipe under 801.08.

812.05 Basis of Payment. The computed number of cubic yards of granular backfill measured for payment will be paid for at the contract unit price per cubic yard.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u> |
|-------------|-------------|--------------------|
| 812         | cubic yard  | Granular backfill  |

ITEM 911 COMPACTED BACKFILL

Delete entire Section.

ITEM 912 GRANULAR BACKFILL

912.04 Method of Measurement. The number of cubic yards of compacted backfill to be paid for will be computed on the following basis:

Volume in cubic yards equals W times L times D divided by twenty-seven (27) where w is the specified trench width in feet, L is the length of trench in feet as specified or ordered to be compacted and D is the distance in feet from the top of the bedding or encasement to the specified top of trench. The length of trench will be measured along the centerline of the sewer in place without deduction for manholes or other structures built in the open trench. No extra payment will be made for compacted backfill in the extra excavation width necessary at manholes and other structures along the centerline of the work. At existing manholes or structures, where the work connects, the measurement for this item will be made from the centerline of the existing manhole or structure. At terminal manholes or structures, being constructed as part of the work, the measurement for this item will be through the manhole or structure to a point one (1) foot beyond the manhole or structure base. Where manholes or structures are built over existing sewers, as part of the work, compacted backfill will be measured along the centerline of the sewer between two points one (1) foot beyond and on either side of the manhole or structure base. Where sewer trenches intersect, at different elevations or at a manhole or structure being constructed as part of the work, a length equal to the specified width of trench for the lesser diameter pipe shall be deducted from the above measurement for the length of the intersection.

The Contractor will receive no compensation because of the following:

- a. Work necessitated or material placed outside of the payment limits defined above, within the length of trench specified or ordered, due to unauthorized excavation.
- b. Work necessitated or material placed which is included in the price bid for pipe under 901.08.

912.05 Basis of Payment. The computed number of cubic yards of granular backfill measured for payment will be paid for at the contract unit price per cubic yard.

Payment will be made under:

| <u>ITEM</u> | <u>UNIT</u> | <u>DESCRIPTION</u> |
|-------------|-------------|--------------------|
| 912         | cubic yard  | Granular backfill  |

CITY OF CUYAHOGA FALLS  
DEPARTMENT OF PUBLIC SERVICE  
DIVISION OF ENGINEERING AND CONSTRUCTION

ADDENDUM #6

CONSTRUCTION SPECIFICATIONS

1976 EDITION

January 15, 1981

To become attached to and a part of the current construction specifications for the City of Cuyahoga Falls, Ohio, and shall become effective for public improvement contracts entered into by the City after January 15, 1981.

The following sections are hereby amended.

109.08 – FINAL ESTIMATE

109.09 – GUARANTEE & RETAINAGE



CITY OF CUYAHOGA FALLS

DIVISION OF ENGINEERING

SPECIFICATION ADDENDUM – SECTIONS 109.08 & 109.09

109.08 Final Estimate

Before the final estimate is allowed, the Owner shall require the Contractor to submit an affidavit from each and every subcontractor showing that all claims and obligations arising in connection with the performance of his portion of the contract have been satisfactorily settled. The improvement shall be inspected by the Engineer, and if he finds the Work is completed according to the contract, shall, within 60 days after the completion of this contract, prepare a statement of the total cost of the Work done hereunder, and the Owner shall pay the entire sum so found to be due hereunder after deduction therefrom all previous payments under the provisions of this contract and ALSO DEDUCTING THE GUARANTEE AND RETAINAGE CHARGE AS SET FORTH IN SECTION 109.09 following.

109.09 Guarantee and Retainage

The Contractor shall guarantee all Materials and Equipment furnished and work performed for a period of one (1) year from the date of completion. The Contractor warrants and guarantees that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The Owner will give notice of observed defects with reasonable promptness. In event that the Contractor should fail to make such repairs, adjustments, or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

Further, the City will retain three percent (3%) of the entire cost of the work done by the contractor for the above guarantee period of one year beginning on the date of the Engineer's final estimate payment sheet.

If the Contractor shall have complied with all the requirements of the contract in keeping said improvement in good and proper repair, at the end of his guarantee period under order of the director the Contractor shall receive this retainer; but, if the Contractor shall fail to make all necessary repairs as indicated by said Engineer at any time during the above period, then the Engineer shall have power to expend all or such part of the amounts so retained as the said Engineer may see fit, and apply the same to making the necessary repairs.

(cont'd.)

SPECIFICATIONS ADDENDUM – SECTIONS 109.08 & 109.09

Should the amount retained not be sufficient to make the required repairs, the contractor shall at once make good the deficiency. At the expiration of the guarantee period as above specified, whatever remains to the credit of the Contractor, provided all repairs shall have been made satisfactory to the said Engineer, shall be paid to the Contractor as full settlement of any balance due on said contract as herein provided whereupon and not until then, shall the Contractor be released from the obligation assumed in this contract and his bond discharged. The final acceptance of the work shall be the date when the guarantee is released.

1/15/81

CITY OF CUYAHOGA FALLS  
DEPARTMENT OF PUBLIC SERVICE  
DIVISION OF ENGINEERING AND CONSTRUCTION

ADDENDUM #7

CONSTRUCTION SPECIFICATIONS

1976 EDITION

February 18, 1982

To become attached to and a part of the current construction specifications for the City of Cuyahoga Falls, Ohio, and shall become effective for public improvement contracts entered into by the City after February 18, 1982.

The enclosed is the 'Insurance Requirements' as amended, in its entirety. Please use this as the complete item 103.08.

CITY OF CUYAHOGA FALLS

INSURANCE REQUIREMENTS – amended 2/18/82

103.08 Insurance. The Contractor shall not commence work under this contract until he has obtained all the insurance required under this paragraph and such insurance has been approved by the City nor shall the Contractor allow any subcontractor to commence work on his subcontract until the insurance required of the subcontractor has been so obtained and approved.

1. Compensation Insurance: The Contractor shall procure and shall maintain during the life of this contract Workmen's Compensation Insurance as required by the State of Ohio for all of his employees to be engaged in work at the site of the project under this contract and, in case of any such work sublet, the Contractor shall require the subcontractor similarly to provide Workmen's Compensation Insurance for all of the latter's employees to be engaged in such work unless such employees are covered by the protection afforded by the Contractor's Workmen's Compensation Insurance. In case any class of employees engaged in hazardous work on the project under this contract is not protected under the Workmen's Compensation Statute, the Contractor shall provide and shall cause each subcontractor to provide adequate employer's liability insurance for the protection of such of his employees as are not otherwise protected.

2. Contractor's Comprehensive General Liability Insurance and Automobile Liability Insurance: The Contractor shall procure and shall maintain, during the life of this contract, (1) Comprehensive General Liability Insurance including all Premises/Operations; Products/Completed Operations; and Broad Form Property Damage and (2) Automobile Liability Insurance for all vehicles and equipment in the amount specified in subparagraph 6.

3. Subcontractor's Comprehensive General Liability Insurance and Automobile Liability Insurance: The Contractor shall either (1) require of his subcontractors to procure and to maintain during the life of his subcontract, Comprehensive General Liability Insurance and Automobile Liability Insurance of the type and in the amounts specified in Subparagraph 2 and 6 hereof or, (2) insure the activities of his policy, specified in subparagraph 2 hereof.

4. Scope of Insurance and Special Hazards: The insurance required under Subparagraph 2 and 3 hereof shall provide adequate protection for the Contractor and his Subcontractors, respectively, against claims which may arise from operations under this contract, whether such operations be by the insured or by anyone directly or indirectly employed by him and, also against any of the special hazards which may be encountered in the performance of this contract as enumerated in the SPECIAL PROVISIONS.

5. Builder's Risk Insurance (Fire and Extended Coverage): (Building Construction only) Until the project is completed and accepted by the City the Contractor is required to maintain Builder's Risk Insurance (fire and extended coverage) on a 100 percent completed value basis on the insurable portion of the project for the benefit of the City, the Contractor, Subcontractors as their interests may appear. The Contractor shall not include any costs for Builder's Risk Insurance (fire and extended coverage) premiums during construction unless the Contractor is

required to provide such insurance; however, this provision shall not release the Contractor from his obligation to complete, according to plans and specifications, the project covered by the contract, and the Contractor and his Surety shall be obligated to full performance of the Contractor's undertaking.

6. Proof of Carriage of Insurance: The Contractor shall furnish the City with certificates showing the type, amount, class of operations covered, effective dates and date of expiration of policies. Such certificates shall also contain substantially the following statement: "The insurance covered by this certificate will not be cancelled or materially altered, except after ten (10 days' written notice has been received by the City."

The minimum amount of such insurance including underlying and umbrella excess shall be as follows:

**BODILY INJURY AND PROPERTY DAMAGE LIABILITY COMBINED SINGLE LIMIT**

Each Occurrence      \$2,000,000.00

CITY OF CUYAHOGA FALLS  
DEPARTMENT OF PUBLIC SERVICE  
DIVISION OF ENGINEERING AND CONSTRUCTION

ADDENDUM #8

CONSTRUCTION SPECIFICATIONS  
1976 EDITION

May 23, 1988

To become attached to and a part of the current Construction Specifications for the City of Cuyahoga Falls, Ohio, and shall become effective for public improvement contracts entered into by the City after May 23, 1988.

The section being amended is 109.06 – Partial Payments.

---

Gerald M. Dzurilla, P.E.  
City Engineer

Attachment

## SPECIFICATION ADDENDUM

### SECTION 109.06

#### 109.06 Partial Payments

(a) At least ten (10) days before each progress payment falls due (but not more often than once a month), the Contractor will submit to the Engineer a partial payment estimate filled out and signed by the Contractor covering the Work performed during the period covered by the partial payment estimate and supported by such data as the Engineer may reasonably require. If payment is requested on the basis of Materials and equipment not incorporated in the Work but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the Owner, as will establish the Owner's title to the material and equipment and protect his interest therein, including applicable insurance. The Engineer will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the Owner, or return the partial payment estimate to the Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, the Contractor may make the necessary corrections and resubmit the partial payment estimate. The Owner will, within ten (10) days of presentation to him of an approved partial payment estimate, pay the Contractor a progress payment on the basis of the approved partial payment estimate. The Contractor will be paid the bid and stipulated unit and lump sum prices as set forth in his Proposal, for the amount of work approved for payment by the Engineer. The sum total for these items shall constitute full payment for the job complete, tested and ready for use.

The Owner shall retain ten percent (10%) of the amount of each partial payment until the work is complete. Within thirty (30) days after completion of the work, the Owner shall pay to the Contractor the retainage.

(b) The request for payment may also include an allowance for the cost of such major materials and equipment which are suitably stored either at or near the site, upon submission of proper invoices and Proof of Payment to the Engineer.

Ord. 103-1988  
5/23/88