City of Salisbury
Jacob R. Day, Mayor

# CONSTRUCTION & MATERIAL SPECIFICATIONS

## FOR UTILITY AND ROADWAY CONSTRUCTION

Issued January 4, 2014

Department of Infrastructure & Development
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Latest revision 01-01-14

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JAMES IRETON, JR.
*MAYOR*

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# City of Salisbury
## MARYLAND

Salisbury
All-America City
2010

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## PREFACE

This book of "Construction and Material Specifications for Utility and Roadway Construction" has been prepared by the City of Salisbury - Department of Public Works to provide Engineers, Contractors and Developers with a catalog of Construction Methods and Material Specifications for Roadway and Utility Construction authorized by the City of Salisbury.

Any Specifications previously issued by the City of Salisbury - Department of Public Works are herewith superseded as of the latest revision date shown on the pertinent Specification.

All Engineers, Land Surveyors, and Contractors involved with the construction of roadways and utilities authorized by the City of Salisbury should become thoroughly familiar with contents of this book.

All materials shall be new, standard production, and made in the U.S.A. unless otherwise approved as a substitute by the City of Salisbury before use of the material.

These Specifications may be revised periodically to reflect changes in regulations and technology. Items may be added or deleted at the City's discretion. These Specifications are not intended to cover all materials purchased, or construction performed by the City of Salisbury or its Contractors. The City of Salisbury reserves the right to default to the Maryland Department of Transportation State Highway Administration Standard Specifications for Construction and Materials Manual (Current Edition) for clarification and reference.

Any obvious errors found or any comments that you may have regarding these Standards are welcome and will be given due consideration. Please submit them to:

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# DESIGN GUIDELINES
# UTILITIES
Latest revision 01-01-14

# DESIGN GUIDELINES
# UTILITIES
Latest revision 01-01-14

The following design information contains guidelines relating to some of the most commonly asked questions submitted to the City by various persons in the process of designing utilities inside the City of Salisbury City Limits. This information in no way intends to cover all aspects of design of any item or process. The City of Salisbury should be contacted when questions arise which are not covered in the design guidelines listed in this specification booklet. See City of Salisbury "Construction Standards" manual for standard drawings. In case of conflict with other specifications or standards, the City of Salisbury shall be contacted by the designer to resolve the difference. The following design criteria refer to utilities, which will be accepted by the City for ownership and/or maintenance. These guidelines are subject to future modifications and revisions based upon operational experience and technological development.

## 1. BENCHMARKS

A. All utilities shall be established, designed, and constructed using City of Salisbury vertical datum available at the City Public Works.
B. The developer shall establish a City approved project benchmark for utility construction. This should be shown and/or referenced on the contract plan. All utilities shall be established, designed, and constructed using the project benchmark.

## 2. HORIZONTAL CONTROL

A. All horizontal control shall be established, designed, and constructed using the Maryland State Coordinate system datum, 1927 NAD.
B. The City will supply horizontal control datum, when requested.

## 3. ESTIMATING UTILITY QUANTITIES

A. Developer shall submit quantities to the City, using a format established by the City. Estimate examples are available at the City Public Works Department.
B. The City reserves the right to establish prices on some items to avoid unbalanced bidding procedures.
C. The City estimates trench materials i.e.; borrow, unsuitable material removal, pea gravel, using total trench volumes.

## 4. CITY UTILITY CONTRACT PLAN DRAWINGS

A. Shall be drawn similar to as-built contract drawings currently on record in the City Public Works Department.
B. Generally shall be drawn using 1"= 40' horizontal scale, 1" = 4' vertical scale for profile or 1" = 50' horizontal scale, 1" = 5' vertical scale for profile. City engineer must approve other scales.
C. Shall be drawn on 11" x 25" reproducible Mylar.
D. Shall use City contract border, which shall not be altered, and City conventional signs and format. See standard detail 600.21.
E. Developer shall submit final utility contract plan in Computer Aided Drafting (CAD) form using the ACAD – Release (Varies). Contact City for the latest CAD release number. A diskette is available, to the developer, which has a file containing the format for the borders of a blank City contract plan using ACAD. When using computer option, developer must send draft version of plan (on paper) to City for review before sending final plan in ACAD form.
F. All water utility valves and valve boxes, including main line, fire service, combination fire/domestic, fire hydrant, tapping valves and domestic service valves (1 1/2" and above) shall be stationed and shown on the contract drawings.
G. All water meter pits and vaults shall be stationed and shown.
H. All water and sewer utility fittings shall be stationed and shown.

## 5. UTILITY CONTRACT AS-BUILT

A. All utilities which will be owned or maintained by the City, or which are located in a City R/W, easement, street bed, etc. shall be as-built on the contract plan after construction.
B. The developer's approved utility contractor performing the work shall provide a contract plan showing any changes to the original signed and approved contract drawings, such as but not limited to, changed stations and additional fittings.
C. Accurate and reliable "as-built drawings" shall be provided to the City of Salisbury. A registered land surveyor or professional engineer shall do these drawings and have their State of Maryland stamp on them. In our view the "as-built drawings" must be just that. They must depict the work actually accomplished under the specific project. We do not consider the practice of placing a note on the construction plans, changing the tense of instructions or otherwise generalizing that all work has been accomplished as shown on the construction plans, satisfies the requirement for an accurate record of the work "as-built". An accurate record of the in-place facilities is essential. The "as-built drawings" shall reflect actual sizes, grades, inverts, elevations, profiles and cross sections, stations of all water distribution, wastewater collection and storm water system pipes, fittings, services, valves, sewer laterals, manholes, hydrants and other relevant information.
D. Shall be drawn similar to as-built contract drawings currently on record in the City Public Works Department. All as-built contract drawings shall follow specifications noted in DG-2, number 4; A-H.

## 6. DESIGN CRITERIA CALCULATIONS FOR WATER AND SEWER

Shall include the following:

A. Present population to be served.
B. Projected future population to be served.
C. Average daily flows.
   1. Domestic
   2. Commercial
   3. Industrial
   4. Others
D. Peak flows
E. Design hydraulic flow
F. Value of "n" used for applications to the Manning's formula.
G. Diameters and slopes of the critical sewers (with minimum hydraulic capacities) between specified manholes.
H. Hydraulic capacities of the critical sewers.

## 7. PERMITS

A. MDE Permits

Maryland Department of Environment permits are required for construction of water & sewer mains, which are greater than 400' in length or one block in length, unless a terminal section is involved.

1. City will process permit when utilities are constructed under City contract.
2. Developer shall process permit when utilities are constructed without City contract (an example might be a development where utilities are constructed under a Public Works agreement between the developer and the City).

B. USDA & Soil Conservation Permits

United States Department of Agriculture and Wicomico County Soil Conservation District permits are required for construction of water & sewer mains.

1. The City has prepared a standard sediment control plan which may be used for construction of utilities for City ownership or maintenance.
2. City will process permit when utilities are constructed under City contract.
3. Developer shall process permit when utilities are constructed without City contract (an example might be a development where utilities are constructed under a Public Works agreement between the developer and the City).

C. State of Maryland Forest Management Agreement

1. Required where cutting, clearing, or grading of 40,000 SF or greater.
2. Managed by Wicomico County Department of Planning & Zoning.
3. Developer's responsibility

## 8. CUSTOMER SERVICE FOR WATER & SEWER

A. The City will allow one water service with meter and one sewer service per building. If one person owns two or more buildings on one lot, these buildings may be required to be connected jointly or independently to the public water supply and public sewer system. If the lot is subdivided, any residential or commercial building on a subdivided lot shall be connected directly and independently to the public water supply and sewer system, respectively.

## 9. SANITARY SEWER

A. Flow
   1. The sewer capacity should be greater than or equal to design hydraulic flow.

B. Minimum Size
   1. No sewer main shall be less than 8" in diameter.
   2. No sewer laterals (from sewer main to property line at street) shall be less than 6" diameter.

C. Depth
   1. Depth of gravity feed mains vary, but the top of the sewer main shall be lower than the bottom of the accompanying water main. The depth of the gravity main should allow for a minimum of 1/4"/ft slope from the customer's sewer service line at the structure. Depth shall not be less than or deeper than manufacture's recommendation for the type material used. See below, concerning sewers, which cross or parallel water mains.
   2. Laterals shall be placed at depths specified in Construction Methods - Utilities of this manual.

D. Slopes
   1. All sewers shall be designed and constructed to provide mean velocities, when flowing full, of not less than 2.0 feet per second. Based on Manning's formula an "n" value shall be determined, by the pipe manufacturer, per pipe construction material.
   2. In flat areas where excessive excavations are needed to maintain minimum slopes, slopes slightly less than those required for the 2.0 feet per second velocity when flowing full may be permitted.
   3. Percent of grade shall be designed to the center of each manhole and shall have only one (1) elevation per manhole, unless the sewer main changes size.

E. Alignment
   1. Sewers should be laid with straight alignment between manholes.
   2. Except on curved streets and where it is not possible, the sewer mains shall be laid parallel or perpendicular to the street, building, or other prominent features, and/or parallel to the water mains and storm drain utilities. Skewed alignment of mains and laterals is not permitted.

F. Size Change
   1. When a smaller pipe joins a larger one, the tops of the mains should be placed at the same elevation, causing the larger pipe to always have a lower invert. The larger pipe shall be in the downstream direction.

G. Materials
   1. Pipe materials shall be specified by the City. See Sewer Material specifications of this manual.
   2. No recycled Polyethylene materials shall be allowed.

H. Manholes & Clean-outs
   1. Manholes: See "Construction Standards" manual
      a. Locate at the end of each sewer main; at all changes in grade, size or alignment; at all sewer main intersections; and at distances not greater than 400'.
      b. Drop connections may be required when the inlet pipe elevation exceeds the manhole invert.
      c. Watertight manhole inserts shall be used on all sanitary sewer manhole frames.
      d. Steps shall be required in all manholes.
      e. Stubs for future use are not permitted.
      f. A maximum of four pipe penetrations permitted in a manhole.
   2. Street Clean-outs
      a. Street type Clean-outs may be constructed at the end of sewer mains when approved by City.
   3. Customer Clean-outs
      a. Required at all customer service laterals
      b. When service is extended from a sewer main located in a City street, the customer clean out should be located 2' back of sidewalk or 2' back of street R/W if sidewalk is not required.
      c. Additional clean-outs to building may be required by Plumbing Inspector.

I. Protection of potable water Supply.
   1. Clearances
      Where specified crossing clearance cannot be obtained, sewer pipe shall be encased in concrete 10' each side of water main. For crossings of other utilities, sewer shall be encased with limits of the utility trench. See "Construction Standards" manual for encasement details. Design engineers shall investigate clearance between sewer and other utilities, both existing and future.
      a. Sewers crossing water mains shall have a minimum clearance of 12" below water main or shall be encased.
      b. Sewers, which are parallel to water mains, and are less than 10' apart sewer shall be 6' below water main or shall be encased.
      c. Sewers shall have minimum of 6" clearance when crossing other utilities.

J. Force Mains.
   1. Material
      a. Ductile Iron
      b. C-900 PVC
      c. Extra high molecular weight high-density polyethylene, (HDPE).

2. Depth
   a. 42" to top of main unless otherwise approved by city engineer.
3. Access manhole: See "Construction Standards" manual.
4. Air valve access manhole: See "Construction Standards" manual, at all high points.
5. Minimum size shall be 4"
6. Testing: The force main shall be tested in accordance with SPW "Testing Procedures" in this manual.

## 10. WATER MAIN

### A. Domestic Service to Customer

1. See "Construction Standards manual" for various services.
2. City of Salisbury designates size of meter based on Water Customer Data Sheet submitted to the Public Works Department. Water service size is to be designated by developer and shown on site plans and contract drawings.
3. Water meter type designated, supplied and installed by the City.
4. Locate meter pits and vaults in center of sidewalk when possible or locate next to curb in grass plot.

### B. Fire Service to Customer

1. City of Salisbury designates size of meter (when fire service is metered) based on demand requirements provided by developer and submitted to the Public Works Department fire service line size determined by developer based on fire system demand and code requirements. Fire service line and valve shall be shown and stationed on site plan and contract drawing. Fire service stubs installed to serve unimproved lots where future demand is unknown shall be 4" minimum. Metered fire service not recommended. When approved, fire service meter shall be shown on site plan and contract drawing.
2. Water meter (when applicable) supplied and installed by the City.
3. Combination domestic/fire service is recommended in most situations. See "Construction Standards" manual.
4. High pressure (pumped) mains shall be separated from other fire or domestic mains. Designate on plan.

### C. Minimum Size

1. No water main shall be less than 6" in diameter.
2. Water mains shall normally be 8" minimum diameter, except 6" diameter hydrant leads and short sections of 6" diameter dead end mains may be allowed.
3. No water service shall be less than 1" diameter.
4. Minimum 4" water service for all commercial, unimproved lots.

### D. Depth

1. Depth of water mains shall be 42" from the finish grade to the top of the water main unless otherwise approved by city engineer.

E. Alignment
   1. On curved streets, water mains must be laid using bends to achieve alignment. Deflection of water mains shall be per the Water Main Materials section of the City of Salisbury's *Construction & Material Specifications for Utility & Roadway Construction.*
   2. Water mains shall be laid parallel or perpendicular to the street, building or other prominent features and/or parallel to the sanitary sewer mains and storm drain utilities. Skewed alignment of mains and services is not permitted.

F. Materials
   1. Pipe materials shall be specified by the City. See Water Material specifications of this manual.
   2. No recycled polyethylene materials shall be allowed.
   3. ANSI/NSF Standard 61 certification shall be required for all components that come in contact with drinking water.

G. Protection of potable water Supply.
   1. Clearances
      a. Where specified crossing clearance, 12", cannot be obtained, sewer pipe shall be encased in concrete 10' each side of water main. For crossings of other utilities, sewer shall be encased with limits of the utility trench. See "Construction Standards" manual for encasement details. Design engineers shall investigate clearance between sewer and other utilities, both existing and future.
      b. Sewers crossing water mains shall have a minimum clearance of 12" below water main or shall be encased.
      c. Sewers, which are parallel to water mains, and are less than 10' apart sewer shall be 6' below water main or shall be encased.
      d. Water mains shall have minimum of 6" clearance when crossing other utilities.

H. Hydrants
   1. See "Construction Standards" Manual and the Construction and Material Specifications Manual, Water Main Materials and Construction Methods sections.
   2. Hydrants shall be spaced a maximum span of 500' apart, based on the lay of fire engine hoses. Obstacles, which may cause a barrier for laying of hoses, must be considered for the placement of hydrants. Distance shall be around pedestrian obstacles. Maintain 3-ft. clearance from center of hydrant for all above ground objects. Hydrant lead shall be ductile iron pipe. Hydrants shall not be placed in the quadrant/radius area of a curb return for street intersections and driveway entrances.
   3. Hydrant tee and 6" valve required at all hydrants.

I. Blow-off Hydrants
   1. Shall be required at all dead-end lines, which extend past the last customer service and do not have a fire hydrant past the last customer service.
   2. Shall be required at all dead-end lines, which do not have a hydrant within 100' of termination of water main.
   3. See "Construction Standards" manual.

J. Main line Valves
1. See "Construction Standards" manual
2. Shall be located at all hydrant tees, intersections (one valve for main line and one valve for each direction branching off from main line), terminations of mains, fire services and at some customer services. Valves shall be spaced with consideration for emergency shut-off of customers, so as to cause the least amount of inconvenience to the customer. Valves shall be placed so that emergency repairs may be isolated on a block-by-block basis.
3. Shall be located at new customer services using a main line tee (or tapping tee) and service is constructed of ductile iron or PVC material.
4. All valves shall be shown and stationed on site plan and contract drawing.
5. All branch valves shall be installed as close to the branch point as practical. Use ductile iron mechanical joint swivel tees whenever possible.

## 11. STORM DRAIN UTILITIES

A. Flow
1. The storm drain pipe capacity should be greater than or equal to design hydraulic flow.

B. Minimum Size
1. No storm drain pipe shall be less than 15" in diameter.

C. Depth
1. Depth of pipes varies, but should not be less than manufacturers recommendation for the type of material used.
2. Minimum cover for Class IV RCP shall be 24".
3. Minimum cover for Class V RCP shall be 12".

D. Design Procedure
1. General
   a. All design information including drainage area delineation; time of concentration flow path delineation and all calculations shall be submitted to the City Engineer's office for review. Any deviation from the methodologies explained below shall be subject to approval of the City Engineer's office.
2. Hydrology
   a. The Rational Method shall be used for all hydrologic computations. Refer to the latest edition Maryland State Highway Administration's Highway Drainage Manual for procedural details.
   b. All storm drain inlets shall be designed to limit gutter spread in accordance with the latest edition of the Maryland State Highway Administration's Highway Drainage Manual. All closed storm drain systems shall be designed to convey the 10-year storm without surcharging.

3. Hydraulics
   a. The Mannings Formula shall be used for friction loss computations. "N" value shall be in accordance with those values listed in the latest edition Maryland State Highway Administration's Highway Drainage Manual. All closed storm drains shall be designed to provide a minimum full flow velocity of 2.0 feet per second. Minor losses shall be estimated in accordance with the procedures and values contained in the latest edition Maryland State Highway Administration's Highway Drainage Manual.
4. Slopes
   a. Percent of grade shall be designed to the center of each manhole on smaller diameter pipe and shall have only one (1) elevation per manhole. Larger diameter pipe may require more than one invert per manhole. Changes of pipe direction will require inverts designated at each pipe.
   b. Submission of data and calculations shall be on standard forms found in the latest edition of the Maryland State Highway Administration's Highway Drainage Manual.

E. Alignment
1. Storm drain pipes should be laid with straight alignment between manholes.
2. Except on curved streets and where it is not possible, the storm drain pipes shall be laid parallel or perpendicular to the street, building, or other prominent features, and/or parallel to the water mains and sanitary sewer utilities. Skewed alignment of storm drain pipes is not permitted.
3. Inlets should not be used as a junction (manhole) except for small diameter pipe utilized for inlet leads, normally placed perpendicular to main line or street.

F. Size Change
1. When possible, where a smaller pipe joins a larger one, the tops of the mains should be placed at the same elevation, causing the larger pipe to always have a lower invert. The larger pipe should be in the downstream direction.

G. Materials
1. Pipe materials shall be specified by the City. See Storm Drain Material specifications of this manual.

H. Manholes
1. Manholes: See "Construction Standards" manual
   a. Inlets should not be used as junctions (manholes), except for smaller diameter pipes, normally placed perpendicular to street.
   b. Locate manhole at the termination of each storm drain, unless end is open outlet or open inlet; at all changes in grade, size or alignment; at all storm drain intersections; and at distances not greater than 400'.
   c. Stubs for future use are not permitted.

I. Inlets
   1. See "Construction Standards" manual.
   2. Unless otherwise approved, use type "A-1" inlet(s) at low points (sump conditions).
   3. Unless otherwise approved, use type "NR" open throat inlet(s) as a pickup inlet in a non-low point condition.
   4. Inlet protection requirements for sediment control must be adhered to during construction.

12. ROADWAY
   A. Intersecting streets or driveways.
      1. The gradients of intersecting streets should be as flat as possible on those sections that are to be used for storage space for stopped vehicles. Grades in excess of 3% may not be allowed on the landing grade (first 50 feet) of administration. This allows for a normal maximum grade break of 5% between the normal 2% preference road cross slope and the profile grade of the non-preference road. Grades beyond the landing grade shall be in accordance with currently accepted engineering practices, but may not exceed 6%.

# GENERAL CONDITIONS

Revised 01/01/2014

# GENERAL CONDITIONS

Revised 01/01/2014

## 1. OUTLINE SPECIFICATIONS

Some sections of these contract specifications have been written in outline form to facilitate reading and locating information. Only key words, product designations and phrases have been used. Bidders will resolve any questions arising from the outline form specifications prior to bidding. By his bid, the Contractor agrees to accept the Engineer's interpretation of the specifications in case of discrepancy or misunderstanding.

## 2. LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

A. Definition of Contractor - hereinafter Contractor will refer to any contractor currently under contract with the City of Salisbury, or any Contractor or person performing construction to City utilities, roadways, etc. or other appurtenances owned and/or maintained by the City, for which no contract has been awarded by the City of Salisbury.

B. Responsibility for Damage Claims - Contractor will indemnify and save harmless the City of Salisbury and all its representatives from all damage brought about by damages resulting from the construction or non-compliance with any law, ordinance, regulation or by-law in effect.

C. Contractor is responsible for public safety.

D. Contractor is responsible for preservation of all public and private property, trees, monuments, highway signs, markers, fences, curbs and appurtenances.

E. Contractor is responsible for storm water drainage, management and soil erosion control relating to the completion of the project.

F. "Engineer" or "Inspector" will be the authorized representative(s) of Salisbury Public Works (SPW).

## 3. PROSECUTION OF CONTRACT & LIQUIDATED DAMAGES

A. Contract time may be accrued using working days or calendar days. Calendar days will be used unless designated as working days elsewhere in the contract.

B. Determination of working day - will be any normal calendar day when the weather or soil conditions are suitable for work for five (5) hours.

C. Saturdays, Sundays, and legal Holidays will not be considered a working day unless it is used as a productive work day (See Section 20), but are considered Calendar days for the purpose of assessing liquidated damages.

D. Calendar days will begin at start of construction or "Notice to Proceed" date and will be continuous until completion of project.

E. Time extensions will normally be granted when it can be shown that the Contractor has been unavoidably detained in completing the work.

F. Liquidated damages for each calendar day the project is not complete beyond the allowable will be as follows:

| Amount of Contract | Liquidated Damages Per Day |
|---|---|
| Less than $10,000 | $100.00 |
| $10,000 or less than $100,000 | $250.00 |
| $100,000 or less than $500,000 | $750.00 |
| $500,000 or more | $1,000.00 |

Or will be based on actual cost to the City, whichever is greater.

4. CONTROL OF MATERIAL

A. Source of supply subject to approval of the Engineer.

B. Engineer may require samples of materials.

C. Only materials conforming to these specifications will be approved.

D. Manufacturers and suppliers listed in these specifications or on the City construction standard drawings are pre-approved for the convenience of the Contractor.

E. Plans prepared by agencies other than the City Department of Public Works will require approval of materials and/or approved substitutes by the City Engineer or representative.

F. Approved substitutes will conform to City contract specifications and meet requirements as stated in the Approved Substitute section of Instructions to Bidders or "Approved Substitute" on record at the City Department of Public Works or use the "Construction and Material specifications for utility and roadway construction manual" where applicable.

G. All rejected materials, damaged in shipment or otherwise not conforming to the specifications or samples, will be removed immediately from the vicinity of the project.

5. PAYMENT REQUESTS

A. Partial (periodic) payments

1. Made approximately each month in an amount equal to the estimated amount less any Retainage.
2. The Engineer will make out the monthly estimate based on estimated quantities submitted in writing by the Contractor, and agreed upon by the City.

B. Final Payment

1. Final payment will not be made until Final Acceptance is issued.
2. Retainage amounts will be withheld (unless replaced by a Maintenance Bond) until project final acceptance at the end of the guarantee period.
3. Maintenance bond will be in the amount of 5% of the total contract amount.
4. At completion of the guarantee period, a final inspection will be made by the Engineer.
5. Any items of non-acceptance will be listed on a "Final Punch List" for the Contractor. Items on this Final Punch List must be corrected or completed before final acceptance can be made.
6. Items on the "Final Punch List" not completed by the Contractor will be done by the City, or the City will cause the work to be done.
7. The cost of any work required by the "Final Punch List" not done by the Contractor will be charged to the Contractor's retainage account or maintenance bond.

C. Retainage Payment

1. Retainage payment will be made upon conditional acceptance and receipt of a maintenance bond.
2. If no maintenance bond is provided, the Retainage amount will not be paid until a satisfactory final inspection is performed and final acceptance is issued.
3. Any unused portion of the Retainage account will be returned to the Contractor after all repairs have been made.
4. Unless otherwise specified in the Contract, Retainage will be withheld on all contracts.
5. Retainage will be made at 10% of the estimated amount with the maximum retainage being 5% of the total Contract amount.

D. Payment for Stored Materials

In making estimates of the value of the work done and materials incorporated in the work, the Contractor may, subject to the approval of the owner or as required by law, include in the current estimates the delivered cost, as modified below, of equipment and non-perishable materials which have been tested for adequacy and which have been delivered to the site or other such location approved by the owner and adequately protected from fire, theft, vandalism, the effect of the elements, and any damage whatsoever, or similarly placed in approved storage facilities adjacent thereto. Such materials and equipment will at all times be available for inspection by the engineer and the owner. No progress payment will, however, be made for said material and equipment until each of the following conditions has been fulfilled:

1. The Contractor will have furnished to the Engineer invoices establishing the value of the said materials and equipment with an indication of the amount the Contractor agrees to pay the vendor. Such invoices will be furnished at least ten days in advance of the date of preparation of monthly estimates as established by the Engineer;
2. The Engineer will have inspected said material and equipment and recommended payment therefore;
3. The Contractor will have furnished to the owner the fire insurance policies, as provided in this contract and with the broad form extended coverage endorsement, for said material and equipment in an amount equal to one hundred percent of the value thereof and which policies will be maintained, at the sole cost and expense of the Contractor, until said material and equipment has been incorporated into the project;
4. Within sixty (60) days of the submission to the owner of any progress payment, including payment for said materials and equipment, or within thirty days of the date of payment to the Contractor by the owner, whichever is longer, the Contractor will furnish to the Engineer satisfactory evidence that the funds included in the progress payment for said materials and equipment have been paid to the vendors supplying such items. Satisfactory evidence will be: a cancelled check in the correct amount and including identification of the invoice or invoices paid; a letter or telegram, from the vendor and signed by his properly authorized employee, stating the amounts and invoices that have been paid; or a receipted invoice;
5. Should the above evidence of payment not be furnished, the Engineer will recommend the deduction of any funds included in previous estimates for such materials and equipment for which said evidence has not been furnished from the current estimate or subsequent current estimates;
6. Any payment made for materials and equipment delivered will not relieve the Contractor of any responsibility for furnishing all the necessary equipment and materials required for prosecution of the work in the same manner as if such payments had not been made.

6. INSPECTION

A. Competent inspectors will be supplied by the City.

B. The City Engineer will be notified by the Contractor at least three (3) days prior to starting new work.

C. Inspectors will have access to all work at all times; Inspector's duty to ascertain all work being performed in accordance with specifications.

D. Contractor has final responsibility for acceptability of finished work.

E. Contractor will consult with Engineer concerning:

1. Method of work;
2. Equipment to be used;
3. Point of beginning project.

F. The City Inspector will not act as Construction Foreman.

G. No inspection or supervision, no failure to inspect or supervise, nor the presence of any employees of the City of Salisbury during the execution of the work, and no approval or acceptance of any part of the work herein contracted for, or of the materials and equipment used therein, will relieve the Contractor of any of his obligations to fulfill his contract, or will prevent the rejection of said work, materials, and equipment in whole or in part, at any time thereafter should said work, materials, or equipment be found by the City of Salisbury to be defective or not in accordance with the requirements of these Contract Documents.

H. No inspection, or any failure to inspect, at any time or place, will relieve the Contractor from his obligation to perform all the work strictly in accordance with the specifications. The City's Construction Inspectors are not authorized to revoke, alter, enlarge, relax, or release any requirement of these specifications, nor to issue instructions contrary to the drawings and specifications, nor to authorize any changes to the scope of work without an approved, written change order signed by the Assistant Director of Internal Services–Procurement Division issued prior to the additional work being initiated.

7. DISCREPANCIES

A. The Contractor will immediately stop work and notify the Engineer of any discrepancies discovered between the drawings and existing conditions.

B. Errors or omissions in drawings or layout will be treated as a discrepancy (above).

C. The Engineer or authorized representatives will review the Contractor's findings to confirm the discrepancy.

D. The Engineer will issue new instructions as soon as possible to relieve the discrepancy.

E. The Contractor will resolve any questions before start of work or continuation after the discrepancy or question arises.

8. OTHER CONTRACTS WITHIN CONSTRUCTION LIMITS

A. Owner may let other contracts within construction limits.

B. Utility companies and others may work within construction limits.

C. Contractor to cooperate and coordinate with others.

D. Contractor to inform Engineer of delays being caused by other Contractors.

E. Engineer to resolve conflicts over working space and sequence in the best interests of the project.

9. SUPERINTENDENCE

A. The Contractor will keep on his work site, at all times during its progress, a competent Superintendent and/or responsible assistant.

B. Contractor's field representative will have an approved, signed copy of the contract and plans at the construction area, during working hours. Personnel working outside of a City contract will have a current copy of the "Construction and Material Specifications for Utility and Roadway Construction" manual at the construction area during working hours.

C. The Superintendent or his assistant will be available on an around-the-clock emergency basis.

10. PROTECTION OF THE PUBLIC

A. Contractor to comply with "Maryland Department of Transportation - New Work Zone Traffic Control" (Latest Revision).

B. Any restriction or diversion of traffic at any time will be subject to the approval of the Engineer and the requirements of that agency having jurisdiction over the road in which the Contractor is working (See also #23: Maintenance of Traffic).

C. During the progress of the work, sidewalks and crossings will be kept open for the passage of pedestrians unless otherwise authorized. Streets will not be unnecessarily obstructed; and unless the Engineer and/or the City of Salisbury as applicable, will authorize the complete closing of a street, the Contractor will take such measures at his own expense as may be necessary to keep the street open for traffic. This will include but not necessarily be limited to the provision, erection, and maintenance of all necessary signs, barricades, lights and flagmen or uniformed traffic directors.

D. The Contractor will construct and maintain without extra compensation such adequate and proper bridges over excavations as may be necessary or directed for purpose of accommodating pedestrian and/or motor vehicles.

E. Construction activities that may temporarily interfere with property access will be coordinated in advance with the individual property owners.

F. The Contractor will so schedule his work as to minimize the time period during which vehicular access to each dwelling along the work route is prevented. At no time will vehicular access be prevented to any dwelling for longer than 24 hours. The Contractor will provide, at all times, safe pedestrian access to all dwellings, whether residential, commercial, or other.

G. Vehicular access on side streets, in the proximity of the route of the work, will not be encumbered by the Contractor.

H. The Contractor will not totally bar vehicular access from more than one block of the route of the work at any given time.

I. Access to fire hydrants will be possible at all times and, wherever possible, one lane of traffic will be maintained to accommodate access by emergency vehicles.

J. Contractor responsible for the damage to lack of reasonable protective precautions.

11. CARE AND PROTECTION OF WORK

A. Contractor solely responsible for protection and care of:

-----materials delivered to job site;
-----equipment;
-----work under the contract;
-----existing structures near the work.

B. Damage or loss will be made good at Contractor's expense.

C. During construction, the open ends of work will be effectively closed with temporary covers or plugs to prevent the entry of foreign material.

D. Where permanent equipment called for under this Contract is installed before the erection of adequate protective structures, the Contractor without additional compensation therefore, will provide approved effective and durable covers for fully protecting such equipment against damage from the elements or from any other cause.

E. Electrical equipment will be carefully and effectively covered with waterproof material and otherwise protected at all times from the elements.

12. SUBCONTRACTORS

A. Successful bidder must submit names prior to the award of the contract.

B. City reserves the right to reject unsatisfactory subcontractors.

13. MATERIALS

A. Manufacturer's and trade names specified used to establish standard of quality.

B. Will be new, standard production, and made in the USA unless otherwise approved by City Engineer.

C. Substitutes must be:
-----approved by Engineer before delivery to project site;
-----equal in all respects to specified material;
-----submitted with bid so Engineer may evaluate prior to award.

14. WORKMANSHIP

A. Construction will be performed by a Contractor previously approved by the City, for specific construction.

B. First class material and workmanship demanded.

C. Unsatisfactory work or material will be removed and replaced at Contractor's expense.

D. Will be the Contractor's responsibility to obtain workmanship requirements from the City before start of construction or delivery of materials to jobsite or to the City for City ownership.

15. CLEAN-UP & ACCESSIBILITY TO PROPERTY

A. Clean-up on block-by-block basis.

B. Keep working area in public streets to minimum.

C. Keep inconvenience to traveling public and nearby residents to a minimum. Unless previous arrangements have been made with homeowners and/or businesses, all will be accessible, clean up working area before Holidays and each Friday afternoon prior to any non-working period.

E. Paper, trash, and refuse will not be allowed to collect on project site.

F. Upon completion of the work and before Final Acceptance will be made, the work site, storage areas, and other areas occupied by the Contractor during construction thereon by the Contractor will be removed by the Contractor. The Contractor's storage area will be top soiled, seeded, and mulched in accordance with City standards. No separate payment will be made for the work as all such costs will be included in the lump sum price bid.

16. WORK PERFORMED BY OWNER ON CONTRACTOR'S BEHALF

A. City will take appropriate measures independent of Contractor when:

1. Contractor is not performing work timely or properly;
2. Contractor cannot be reached during an emergency.

B. City will deduct bills for services from payments to Contractor or invoice the Contractor at City's option.

C. City will not be responsible for the cost of materials purchased by the Contractor and not used due to work performed by another contractor of the City on the Contractor's behalf.

17. CONSTRUCTION IN RIGHT-OF-WAY AND EASEMENTS

A. Work confined to Easement areas.

B. Restore original condition to satisfaction of Engineer.

18. WATER SUPPLY AND SANITATION

A. Contractor to supply at his expense.

B. Location of facilities to be approved by Engineer.

C. If available, the City may supply water via a temporary hydrant connection, at Contractor's expense. Contractor must apply for service, before construction, using the proper form available at the City Government Office Building, 125 N. Division Street, Room 202, Salisbury, Maryland 21801.

19. SURPLUS MATERIAL

A. All excavated and excess material is the property of the City until declared surplus in writing.

B. Contractor must dispose of all surplus material in an approved manner.

20. WORKING TIME

A. The City of Salisbury (Owner) observes the following holidays:

1. New Years Day
2. Martin Luther King's Birthday
3. President's Day
4. Good Friday
5. Memorial Day
6. Independence Day
7. Labor Day
8. Veteran's Day
9. Thanksgiving Day
10. Day after Thanksgiving Day (Friday)
11. Christmas Day

B. Written permission of Engineer required for Contractor to:

1. Work more than ten hours per day or 40 hours per week;
2. Work between 6:00 P.M. and 7:00 A.M;
3. Work on Saturday, Sunday and Holidays;
4. Discontinue work or leave site before project completion.

C. Engineer may require Contractor to make certain utility tie-ins at night to minimize inconvenience to customers. No extra cost will be permitted in such circumstances nor will any time be charged against the contract time.

1. Utility connections requiring disruption of service to customers will be performed between 10:00 P.M. and 5:00 A.M., unless otherwise approved by SPW. The contractor will be responsible for notification to all properties or businesses who are directly affected by disruption of service 48 hours in advance. Contractor will submit sample of proposed notification to SPW for approval prior to distribution to customers. Notice to customers will include the following:

a) Utility(s) affected;
b) Date & Time of disruption of service(s);
c) Date & Time of restoration of service(s);
d) Brief description of planned work;
e) Contractor's company name and Point of Contact (Name & Phone Number).

21. REFERENCED SPECIFICATIONS BY OTHER ORGANIZATIONS

A. When standard specifications of national organizations are referenced, the latest revision will be assumed, unless otherwise noted.

B. Following is a list of organizations, by abbreviation, referenced in these specifications:

AASHTO or AASHO.....American Association of State Highway and Transportation Officials
ACI.....American Concrete Institute
AISI.....American Iron and Steel Institute
AISC.....American Institute of Steel Construction
ANSI.....American National Standards Institute
ASTM.....American Society for Testing and Materials
AWS.....American Welding Society
AWWA.....American Water Works Association
CIPRA.....Cast Iron Pipe Research Association
CS.....Commercial Standard
MD.SHA.....Maryland State Highway Administration
MD.SRC.....Maryland State Roads Commission
(Synonymous with Maryland State Highway Commission)
MIL.....United States Military
NCMA.....National Concrete Masonry Association
NCPI.....National Clay Pipe Institute
NEC.....National Electrical Code
NFPA.....National Fire Protection Association
NIST.....National Institute of Standards & Technology
PPI.....Plastic Pipe Institute
UL.....Underwriter's Laboratories, Inc.
USDA.....United States Department of Agriculture
WPCF.....Water Pollution Control Federation

## 22. GUARANTEE AND MAINTENANCE BOND

A. Maintenance Bond:

(1) Unless otherwise specified in the contract, the Contractor must post a Maintenance Bond, or the City will retain a percentage of the contract cost for the maintenance warranty period;
(2) Contractor may post a Maintenance Bond for 5% of the contract amount in lieu of a retained percentage during the guarantee period;
(3) When retained percentage is held for surety the guarantee period will begin after final acceptance by the City and notification from the Contractor that no Maintenance Bond will be posted.

B. It will be the Contractor's responsibility to repair all items found unacceptable during the guarantee period, even if the Maintenance Bond expires before repairs are completed.

C. Repair items which are discovered during the guarantee period but are not repaired satisfactorily by the Contractor may be done by the City or the City's agent.

D. The cost of any work required by the repairs, performed by the City or its agent will be charged to the Contractor's retained percentage or Maintenance Bond.

E. Unless otherwise specified **guarantee period will last for two years** from date of Final Acceptance and City's release of Retainage or receipt of Maintenance Bond.

F. In addition to any other guarantee obligation contained herein, the Contractor will be responsible for any settlement caused by improper compaction, backfill, or other project related work and for any damage caused by such settlement during the full length of the guarantee period.

23. MAINTENANCE OF TRAFFIC

A. Prior to construction, the Contractor will designate and submit to the City the name of the person designated as the traffic manager for this project.

B. The Contractor is required to submit a traffic control plan (TCP) to the City of Salisbury, Department of Public Works, for approval. Traffic control must be maintained at all times. The site specific TCP must be submitted on a separate 24" x 36" sheet with the approved 911 address. The TCP must be approved by the DPW and will have a signature block for the Public Works Director in the lower right hand entering upon or approaching roadways maintained by either jurisdiction. The Contractor will be responsible for notification to all properties or businesses directly affected by detours or changes in traffic patterns before beginning of construction and as determined by City of Salisbury. At least 48 hours' notice will be given. The TCP sheet will include the following statement accompanied by a signature block containing the signature of a registered professional engineer or professional land surveyor (registered in Maryland):

> *"I hereby certify that this plan has been prepared under my supervision and in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways for Maryland requirements, latest edition. I further certify that, to the best of my ability, the plan features the minimum amount of traffic disruption necessary to complete the work in and along the public roadway."*

C. Contractor will be responsible for all traffic maintenance and detouring. All signs, arrow boards, barricades, lights, flagmen, etc. needed for maintenance of traffic will be furnished by the Contractor. All traffic control devices will be properly maintained to insure that the general public's safety is never jeopardized. All traffic control devices are to conform and adhere to those specified and set forth in the Maryland Department of Transportation "New Work Zone Traffic Control" and/or "Manual on Uniform Traffic Control Devices for Streets and Highways." This manual is approved by the U.S. Department of Transportation - Federal Highway Administration and a copy can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Any Contractor who is unsuccessful in obtaining this publication may review our office copy by visiting the Department of Public Works, Government Office Building, 125 N. Division Street, Room 202, Salisbury, Maryland 21801.

D. No item has been included in the Form of Proposal for the aforementioned items and no additional payment will be made for them. Items will be incidental costs to the Contract.

24. SUBSTANTIAL COMPLETION

A. Upon completion of all work under this Contract, including the Preliminary and Final testing of any equipment, the Contractor will request, in writing, Substantial Completion by the Owner.

B. Prior to this request, all specified operation and maintenance instructions and training will have been provided for the City personnel and all certificates, spare parts, test equipment, record drawings, and other items required to be delivered will have been provided.

C. Inspection Procedures: Upon receipt of Contractor's request, Engineer will either proceed with inspection or advise Contractor of prerequisites not fulfilled. Following initial inspection, Engineer will either prepare certificate of substantial completion, or advice Contractor of work which must be performed prior to issuance of certificate; and repeat inspection when requested or assure that work has been substantially completed. Results of complete inspection will form punch-list for final acceptance.

25. COMPLETION OF PUNCH LIST ITEMS

A. At the time of Substantial Completion, the Engineer and Owner will prepare a punch list of items remaining to be completed or corrected prior to final acceptance. The punch list will fix the time within which, and a retainage amount equal to one and one half times the estimated cost for which such items will be completed or corrected, said time to be within the Contract Time.

B. Contractor will complete all items of work on the punch list, plus any new items that may be added to it, as soon as possible after the date of Substantial Completion but within the Contract Time.

C. No partial payments or monthly progress payments will be allowed between the Substantial Completion Payment and the Final Payment.

26. FINAL ACCEPTANCE

A. General: prior to requesting Owner's final inspection for certification of final acceptance and final payment, as required by General Conditions, the Contractor will complete the following and list known exceptions:

1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certifications where required;
2. Submit updated final statement, accounting for additional (final) changes to Contract Sum;
3. Submit copy of Owner's final punch list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance;
4. Submit Consent of Surety;
5. Submit all warranties;
6. Submit Maintenance Bond in amount of 5% of total contract amount or City will hold 5% Retainage for guarantee period of 2 years.

B. Re-inspection Procedure: upon receipt of Contractor's notice that work has been completed, including punch-list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstances, Owner will re-inspect work. Upon completion of re-inspection, Owner will either prepare certificate of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

C. The guarantee period starts with the date of Final Acceptance.

## 27. ERRORS OR OMISSIONS IN DRAWINGS AND SPECIFICATIONS

A. Should the Contractor find any errors or omissions in the specifications or other contract documents or should there be any conflict between such specifications or other contract documents, the Contractor will be required, prior to submission of the signed bid proposals, to notify the Owner in writing and to have such specifications or other contract documents explained and adjusted.

B. If such notice is not furnished to the Owner as herein provided, the Contractor will be deemed to have found such specifications or documents in proper form for execution and the contractor will bear any costs of defect in the work caused by such omission, error or conflict.

C. Where a conflict occurs between or with standards, specifications, drawings, codes, and ordinances, the more stringent or higher quality requirements will apply.

## 28. CONSTRUCTION STAKEOUT/SURVEYS/LINE & GRADE

A. The Contractor will, within the prices bid and without extra cost to the Owner, perform stakeout of line and grade required to properly construct the items shown on the plans and provided for in the specifications, including, but not necessarily limited to, the following efforts:

(1) The general site Contractor will engage an independent, licensed, Maryland Professional Land Surveyor or Property Line Surveyor, qualified in various types of survey work specified herein. The surveying firm will have a trained staff large enough to perform the specified duties. Within fifteen (15) days after the award of the Contract, the Contractor will submit the name of his licensed, Maryland surveyor including his/her qualifications. The surveyor's duties will be as outlined herein;

(2) Surveyor will survey, set, and maintain guide stakes required for earth movement and levels and will establish the baseline of construction. The Contract Drawings may indicate a benchmark. The Contractor will use this benchmark in the execution of the work;

(3) Contractor is responsible for protection of stakes;
   (a) Damaged stakes are to be replaced at Contractor's expense, or
   (b) Replaced by Contractor's engineer.

(4) Contractor is responsible for detailed layout;

(5) City will provide vertical control in the form of benchmarks. Project benchmarks are normally shown on the contract drawings. If the benchmark is not designated on the plan, it will be the Contractor's responsibility to obtain an approved benchmark from the City;

(6) Copy of cut sheet (record of actual grade per station) will be provided to the City Engineer three (3) days prior to construction for approval by the Engineer. Construction WILL NOT begin until the cut sheet (s) is approved in writing by the Engineer;

(7) The Surveyor will establish the locations and grades of all structures and establish the limit of disturbed area, in the field;

(8) The surveyor will check grades, contours and levels throughout earth movement operation;

(9) The surveyor will inform the Engineer immediately if, during the survey, deviations from the Contract Drawings are uncovered.

## 29. SEQUENCE OF CONSTRUCTION

A. The Contractor is responsible for all construction sequencing. The Contractor will submit and obtain approval of his detailed sequence of construction. Acceptance of this plan by the Engineer or the City denotes only lack of objection at the time and in no way implies that the Engineer or the City guarantees that particular sequence of construction as proposed by the Contractor will in fact work. Also, any approval given is done so with the stipulation that all work done will comply with the plans and specifications.

B. As construction proceeds, should the Contractor's sequence of operation cause operational problems that were unforeseen at the time of approval, the City reserves the right to withdraw the previous approval and require the Contractor to submit and obtain approval of an amended Sequence of Construction.

## 30. CONSTRUCTION SCHEDULE

A. The Contractor will submit a construction schedule in accordance with the General Conditions, plotting work increments against time, indicating anticipated date of beginning and completion of each work increment and indicating completion of all increments by the scheduled date. The Contractor will assign such work forces as are necessary to accomplish all increments of the work within the time allotted on the construction schedule.

B. The Construction schedule will be submitted within ten (10) days after the effective date of the Agreement. This schedule is in addition to any other schedule required under the General Conditions.

31. INTERFACE WITH EXISTING FACILITIES

A. Connections to existing pipes and structures will be scheduled and coordinated in advance with the Engineer and Owner. It may be necessary to make connections during the night hours or weekends. No claim for extra compensation or extension of contract time will be allowed on account of the necessity for connections to be made during normal "off" hours. Permission of the Engineer and Owner will be obtained by the Contractor **prior** to making any connections to existing systems.

B. When the Contractor desires certain electrical and/or mechanical functions to be interfaced, he will inform the Engineer, in writing, a minimum of five (5) working days prior to the date he desires those interfaces to be made. The Contractor will not alter the settings of or connect or disconnect any electrical or mechanical equipment without the approval of the Engineer.

32. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. Shop drawings are generally defined as all fabrication and erection drawings, diagrams, brochures, schedules, bills or material and other data prepared by the Contractor, his subcontractors, suppliers or manufacturers which illustrate the manufacturer, fabrication, construction and installation of the work, or a portion thereof.

B. All costs necessary for compliance with the requirements of this Section of the specifications will be included under the lump sum price bid.

C. Detailed shop drawings, data, literature for fabricated materials or equipment to be incorporated in the work will be submitted to the Engineer for review for general compliance with the contract documents before fabrication. The Contractor will obtain and check manufacturer's shop drawings, certified prints and other pertinent data for conformance with all requirements of the Plans and Specifications and in ample time to permit satisfactory progress of the work. After completion of such checking and verification by the Contractor, the Contractor will sign or stamp such drawing, which stamp will state as follows:

Checked by _____
(Contractor's Name)

Signed by _____
(Checker's Name)

D. All data, shop drawings and correspondence from subcontractors, manufacturers or suppliers will be routed through the Contractor. The Owner will review only such data and details as are sent by the Contractor. All correspondence, including shop drawings, data, and literature for fabricated materials or equipment will comply with the following requirements: it WILL BE submitted to the City for review, clearly labeled with the title of the product/service which is being submitted and the specific corresponding specification section, part, sub-part, paragraph, or drawing sheet and detail listed, as applicable. Failure to include all relevant identification information will be cause for the submittal to be returned to the Contractor without it having been reviewed.

E. All shop drawings will be in conformity with all requirements of the plans and specifications. All shop drawings except diagrams; brochures, schedules, and illustrations will be to an appropriate scale, no smaller than 1/8 inch = 1 foot 0 inches, and will give all dimensions necessary for installation and incorporation in the work. All shop drawings will be accurate and complete, showing outline and section views, details, materials, accessories, appurtenances, and related items. Shop drawings showing piping and conduit systems will incorporate sufficient views to show all fittings and specialties including locations and spacing of hangers and supports. Piping and/or conduit systems 3-inches in diameter and smaller may be shown as a single line. Equipment and specialties installed within and/or connected to piping and conduit systems will be cross-referenced to equipment and specialty shop drawings by shop drawing identification number, manufacturer name, catalog or model number and equipment numbers shown on the plans. Electrical shop drawings will include, but are not necessarily limited to, complete terminal identification diagrams and schedule, complete point-to-point interconnection diagram, complete single line and elementary wiring diagrams, for all power, signal, control and lighting systems, together with panel layout drawings. Terminal point and wire identification on all working drawings will be identical to related terminal point and wire identifications on equipment and panels, and absolutely no deviation from this requirement will be permitted.

F. The Contractor will submit to the Owner a minimum of eight (8) copies of shop drawings and approval data plus any additional number required for the Contractor's use. The Owner will retain four (4) copies of each submittal and return four (4) copies to the Contractor. The Owner's notation of the action taken will be noted on all of the returned copies. At the time of each submission, the Contractor will call to the Owner's attention, in writing, any deviations that the shop drawings may have from the requirements of the Plans and Specifications.

G. Upon review by the Owner of the above drawings, lists, samples and other data the same will be come a part of the Contract, and the fabrications furnished will be in conformity with the same, provided that the review of the above drawings, lists, specifications sample, or other data will in no way release the Contractor from his responsibility for the proper fulfillment or the requirements of this Contract.

H. Corrections or comments made on the shop drawings during the Owner's review do not relieve the Contractor from compliance with the requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction, and in performing his work in a safe manner. If the shop drawings deviate from the Contract Documents, the Contractor will advise the Owner of the deviations, in writing accompanying the shop drawing, including the reasons for the deviations, and will request deviation from the Contract Documents.

I. The shop drawings are intended to be utilized by the Contractor for additional fabrication, assembly and erection data. The shop drawings do not change or supersede the Plans and Specifications except in specific cases when the Contractor requests in writing and receives approval in writing for a deviation from the Plans and Specification. The Contractor's request for a change will give, in detail; the specific change requested and will state the reason for the change. Changes requested by the Contractor and approved by the Owner will not be construed to include approval of any change except the changed details specifically requested and approved.

J. The Contractor will also submit to the Owner for review with such promptness as to cause no delay in work, all samples required by the Contract Documents. All samples will have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer any pertinent catalog numbers and the use for which intended.

K. The Contractor's attention is specifically directed to the fact that no work will be fabricated, nor equipment or materials ordered, nor any construction performed, prior to approval by the Owner of shop drawings applicable thereto. Construction performed in violation of this requirement will be neither approved nor certified for payment until applicable shop drawings have been submitted and approved. If the Owner so directs, the Contractor will disassemble and remove any such construction performed prior to approval by the Owner of shop drawings applicable thereto, and the Contractor will be allowed no additional compensation or extension of contract time. If any equipment or materials are ordered by the Contractor prior to submission and approval of shop drawings, he does so at his own risk.

L. It will be the responsibility of the Contractor to make all necessary changes in other items, which result from deviations or changes requested by the Contractor and approved by the Owner, so that all items perform the requirements and intent of the Contract Documents.

M. After review by the Owner, shop drawings will be returned to the Contractor marked as follows: APPROVED, APPROVED AS NOTED, REVISE AND RESUBMIT, OR REJECTED. Unapproved shop drawings (i.e., REVISE AND RESUBMIT or REJECTED) will be returned to the Contractor for necessary modifications: only two (2) copies of unapproved shop drawings will be returned. Subsequently, the Contractor will submit a minimum of eight (8) copies of complete, revised shop drawings to the Owner for approval.

N. Within fourteen (14) days of the pre-construction conference, the Contractor will submit a list of all shop drawings to be submitted. This list will include the title of the product/service which is being submitted and the specific corresponding specification section, part, sub-part, paragraph, or drawing sheet and detail, as applicable. This list can then be used as a check to ensure that all items are submitted.

O. Timing of Submittals:

(1) Make submittals promptly and in such sequence as to cause no delay in the Work;

(2) In scheduling, allow 15 working days for Owner's review of Mechanical and Electrical shop drawings following receipt of the submittal. Allow 10 working days for Engineer's review of all other shop drawings following receipt of the submittal;

(3) Delays caused by tardiness in receipt of submittals will not be an acceptable basis for extension of the Contract duration time.

## 33. OPERATION AND MAINTENANCE MANUALS FOR EQUIPMENT AND PRODUCTS

A. General:

1. The Contractor will furnish Operation and Maintenance Manuals for all products and equipment provided under this contract;
2. Prior to completion of the work, and at least thirty (30) days prior to the 50% payment, the Contractor will furnish for the Engineer's review three (3) Operation and Maintenance Manual draft copies;
3. Prior to completion of the work, and at least sixty (60) days prior to the 85% payment, the Contractor will furnish for the Engineer's review three (3) copies of the final Operation and Maintenance Manual. The final manual must be approved by the Engineer before a final inspection of the work will be conducted, and prior to the issuance of the Certificate of Substantial Completion.

B. Manual Preparation:

1. Manuals will include operation and maintenance information on all systems and items of equipment. The data will consist of: catalogs, brochures, bulletins, charts, schedules, approved Shop Drawings corrected to as-built conditions and assembly drawings and wiring diagrams describing location, operation, maintenance, and other information necessary for the owner to establish an effective operating maintenance program. The following data will also be included:

   a. Title page giving name and location of facility, Contract Drawing Nos. where shown and Specification Section where described;
   b. Performance curves for all pumps and equipment;
   c. Approved Shop Drawings of each piece of equipment;
   d. Manufacturer's cuts and dimension drawings of each piece of equipment and details of all replacement parts;
   e. Manufacturer's erection, operation and lubrication instructions for all equipment and apparatus, and complete listing of nameplate data;
   f. Complete wiring diagrams of all individual pieces of equipment and systems including one line diagrams, schematic or elementary diagrams, and interconnection and terminal board identification diagrams;
   g. Complete piping and interconnecting drawings;
   h. Complete parts list with parts assembly drawing (preferably by exploded view,) names and addresses of spare parts suppliers, recommended list of spare parts to be kept "in stock" and sample order forms for ordering spare parts. Lead time required for ordering parts will be estimated;
   i. Instructions with easily understood schematics or diagrams for disassembling and assembling the equipment for overhaul or repair;
   j. The Contractor will complete the three Forms A, B and C entitled "Equipment Registration, Parts List and Maintenance Procedures Sheet" for each piece of equipment furnished under the contract. These forms will be included in the Operation and Maintenance Manual at the proper place.

2. All items listed above that are of a sheet size of 8-1/2 by 11 inches or can be folded (no more than twice) to this size will be bound in 4 inch maximum loose-leaf three-ring d-post type binders with black plastic-coated covers. The contents will be fully indexed.
3. Shop Drawings 24 by 36 inches in size will be folded to approximately 12 by 9 inches with drawing title box exposed along either edge. Shop Drawings descriptive of a single item of equipment will be grouped together. All Shop Drawings will be placed in accordion-type folders, and fully indexed on the outside of the folders in a neat and uniform manner.

4. All Shop Drawings included in the binders and/or folders will be those copies previously submitted for review and approval and will bear the Engineer's stamp of approval and comments as originally noted thereon.

C. Approval:

1. Subsequent to the Engineer's approval and return of the final manual, the Contractor will submit four (4) complete sets of manuals to the Engineer;
2. Substantial Completion certification will positively not be undertaken until approved Operation and Maintenance Manuals have been submitted. Partial approvals of the final manual will not be made;
3. Delivery of manufacturer's service (O&M) manuals and installation instructions satisfactory to the Engineer is an essential part of the equipment delivery. Incomplete or inadequate manuals will be returned for correction and/or resubmission.

## 34. AS-BUILT DRAWINGS

A. During the progress of the job, the Contractor will keep a careful record at the job site of all changes and corrections to the information shown on the Drawings. The Contractor will enter such changes and corrections on one set of Contract Drawings immediately. The as-built drawings will indicate, in addition to all interior changes and corrections, the actual location referenced from two permanently fixed surface structures of all subsurface utilities installed or uncovered by him. At the time of beneficial occupancy of each facility involved under the Contract, the Contractor will submit to the Owner one set of as-built drawings showing the aforementioned data. If the Contractor fails to maintain the as-built drawings as required herein, final payment, with respect to the Contract as a whole, will be withheld until proper as-built drawings have been furnished to the Owner.

B. The Contractor will keep one copy of all Contract Drawings and approved Shop Drawings at the site in good order with redlined revisions and annotated notes to show all changes made during the construction process. These will be available to the Owner and will be delivered to him upon completion of the Work.

C. Contractor will submit final as-built drawings in Computer Aided Drafting (CAD) form, using the ACAD–Release 2010 or earlier, conforming to standards outlined in the Construction Standards and submittals, one Mylar copy, and one paper copy of same.

## 35. CONTRACTOR SAFETY REQUIREMENTS

A. SAFETY: the Contractor will comply, within the prices bid and without extra cost to the Owner, with all safety regulations or determinations issued by any agency of the Federal Government, including OSHA, the State of Maryland, and the City of Salisbury.

B. Before a Notice to Proceed is issued for any Project, the Contractor must provide to the City a site specific safety plan, material safety data sheets and a hazardous communication policy. These items will be reviewed by the City of Salisbury. No work may begin on the project until these items have been provided.

C. Contractor must also designate an on-site safety contact person from their company. This person must be available at all times.

D. Contractor must provide all subcontractors with a copy of this requirement. Adherence is required of all subcontractors, regardless of tier.

E. A representative of the Contractor and applicable subcontractors must be present at all site progress meetings.

F. Failure to comply with these requirements could result in a finding of DEFAULT on the part of Contractor.

G. The Contractor will promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Item B as the Project caused in whole or in part by the contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible.

H. In an emergency affecting safety of persons or property, the Contractor will act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency will be determined by the City.

36. SEDIMENT CONTROL

A. Contractor is responsible for control of erosion due to the project construction.

B. Wire mesh, filter cloth and stone will be placed around all storm water inlet structures for protection until such areas are stabilized.

C. Pipe outfalls will be protected by silt fence and filter cloth.

D. Sediment control will be in accordance with "Standards and Specifications for Soil Erosion Control and Sediment Control in Developing Areas" by USDA Soil Conservation Service.

E. Sediment Control Plan, latest revision, will be approved by the Soil conservation Service BEFORE the start of construction.

37. SUBSURFACE INFORMATION

A. Test borings by City will be open to Contractor's inspection when available.

B. Test borings by Contractor are subject to City approval of location and type of exploration.

C. Testing of materials will be made at the contractor's expense, by a certified testing laboratory.

D. The Contractor will cooperate with and assist the City in taking samples and packing them for shipment to a laboratory.

38. CHANGE ORDERS & UNAUTHORIZED WORK

A. No claims may be made by anyone that the scope of the project or the Contractor's services have been changed (requiring changes to the amount of compensation to the Contractor or other adjustments to the Contract) UNLESS such changes or adjustments have been made by an approved, written amendment (change order) to the Contract, signed by the Assistant Director of Internal Services-Procurement Division (and the City Council, if required), prior to extra work being initiated.

B. Extra work performed without the Owner's approval of lines and grades, work performed beyond the lines and grades shown on the drawings or as given, and extra work performed without prior, approved, written Change Order will be considered unauthorized, and at the expense of the Contractor. Such work will not be measured by the Owner, nor will payment be made by the Owner. Work so performed may be ordered removed by the Owner and replaced at the Contractor's expense.

C. No **oral** conversations, agreements, discussions, or suggestions which involve changes to the scope of the Contract made by anyone, including any City employee, will be honored or valid.

D. No written agreements or changes to the scope of the Contract made by anyone, including any City employee, other than the Assistant Director of Internal Services-Procurement Division (with City Council approval if required) will be honored or valid.

39. VARIATIONS IN ESTIMATED QUANTITIES

Where the quantity of a pay item in any City contract is an estimated quantity and where the actual quantity of such pay item varies more than twenty-five percent (25%) above or below the estimated quantity stated in this contract, an equitable adjustment in the contract price will be made upon demand of either party. The equitable adjustment will be based upon any increase or decrease in costs **due solely** to the variation above one hundred twenty-five percent (125%) or below seventy-five percent (75%) of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the procurement officer will, upon receipt of a written request for an extension of time within ten (10) days from the beginning of the delay or within a further period of time which may be granted by the procurement officer before the date of final settlement of the Contract, ascertain the facts and make the adjustment for extending the completion date as in his/her judgment the findings justify.

40. DIFFERING SITE CONDITIONS

A. The Contractor will promptly, and before such conditions are disturbed, notify the Procurement Officer in writing of (1) subsurface or latent physical conditions at the site differing materially from those indicated in this Contract, or (2) unknown physical conditions at the site of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in this Contract. The Procurement Officer will promptly investigate the conditions, and if he/she finds that such conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performance of any part of the work under this Contract, whether or not changed as a result of such conditions, an equitable adjustment will be made and the Contract modified in writing accordingly.

B. No claim of the Contractor under this clause will be allowed unless the Contractor has given the notice required in (A) above; provided, however, the time prescribed therefore may be extended by the City.

C. No claim by the Contractor for an equitable adjustment hereunder will be allowed if asserted after final payment under this Contract.

**END OF SECTION**

# CONSTRUCTION METHODS
# UTILITIES
Latest revision 01-01-14

# CONSTRUCTION METHODS
## UTILITIES
Latest revision 01-01-14

## 1. EXCAVATION

A. Excavate to lines and grades shown on drawings:
   1. Contact "Miss Utility" at least 48 hours prior to excavating.
   2. All excavation to be open cut. Protect trench walls as required for safety.
   3. Trenches to be excavated by hand or machine at contractor's option.
   4. Saw pavement before opening trench. See Specifications section entitled Roadway Repair. Hand excavation may be required by SPW Inspector at any time and Contractor will not be permitted any extra compensation for hand excavation.
   5. Any excavation beyond standard trench width shall be included in Contractor's price bid per linear foot of pipe.

B. Material excavated on the job which is unsuitable for backfill shall be removed and disposed of by Contractor in an approved manner:
   1. Unsuitable material is defined as clay, wet soil, silt, etc., which would not, in the SPW Inspector's opinion, provide adequate pipe bedding and compact properly.
   2. Removal and disposal of unsuitable material is included in proposal as a separate bid item.

C. If directed by SPW Inspector, excess suitable material shall be stockpiled for use on the project. No additional payment will be made for additional handling. When directed by SPW Inspector, excess suitable material remaining on the project after completion of work may be removed by the City at no charge to the Contractor.

D. Excavation is unclassified and includes material of all character, type or condition.

## 2. REMOVAL AND/OR STORAGE OF SURFACE MATERIALS

A. Contractor shall clear, grub and dispose of cleared materials as necessary to complete construction. Unless otherwise specified, this shall be considered incidental to construction costs.

B. Upon authorization of SPW Inspector, suitable paving materials removed from excavated area may be stockpiled for re-use by the Contractor as trench stabilization.

C. If directed by SPW Inspector, topsoil shall be stockpiled for later re-use or removal by the City at no extra charge to the Contractor.

3. SALVAGE OF MATERIALS
   A. Materials suitable for re-use shall be stockpiled as necessary for the proposed construction.
   B. All salvaged materials are the property of the City unless declared by the SPW Inspector to be unsuitable for re-use.
   C. Contractor is responsible for removal and disposal of all unsuitable material.
   D. Contractor shall have no rights to any materials except upon direction or written permission of the SPW Inspector.
   E. All salvaged material retained by the City shall be delivered to the City Yard by Contractor.

4. RELOCATION OF STRUCTURES

   A. Poles and other structures in the City Right-of-way shall be moved by others when their presence does not permit construction or future maintenance of this project.
   B. Contractor shall support and preserve as necessary all poles, structures and other property as required to construct the project.
   C. Contractor shall not be entitled to recover damages caused by delay in relocation of structures by others.
   D. Contractor shall not disturb property outside City Right-of-way unless he receives written permission from property owner.

5. TRENCH DIMENSIONS

   A. Per standard details or as directed by SPW Inspector.
   B. Protect trench in accordance with MOSHA requirements.
   C. Construct to minimize loads on pipe as authorized by SPW Inspector.

6. PIPE LAYING

   A. Construct to the line and grade shown on drawings or per SPW Inspector instructions.
   B. Provide materials in accordance with drawings and specifications.
   C. Construct pipelines in accordance with best workmanship and quality of the industry.
   D. Pipe interior including bell and spigot ends to be kept free of dirt and debris.
   E. Cut pipe where required:
      1. Ends to be finished smooth, where required.
      2. No extra compensation for pipe cutting.
   F. Pipe shall not be placed on frozen foundation.
   G. Plug lifting holes in RCP.
   H. Provide pipe bedding in accordance with SPW Standard Details.
   I. Plug pipe end upon completion of work each day.

J. Cover on all water mains shall be (42) forty-two inches, unless otherwise noted on SPW approved Plans.
K. Operating Nuts on valves shall have maximum depth of 48" and minimum depth of 24" from the top of the nut to the finish grade.
L. Pipe shall be installed with the minimum amount of joints possible. Sleeves and/or repair couplings will not be permitted, except in facilitation of tying into existing pipe.
M. Begin laying gravity sewer and storm drain pipe at the lowest point and install the pipe so that the spigot ends point in the direction of flow.

## 7. REFILLING OF TRENCH (BACKFILLING)

A. SPW Inspector may require contractor to backfill at any time, no extra cost permitted.
B. Only suitable material shall be used in backfilling trenches.
C. Backfill shall maintain pace with pipe laying and shall be brought to sub grade within 100 feet of end of last pipe laid at all times. (Within fifty (50) feet at nights and weekends.)
D. Refer to SPW Standard Details.
E. Compaction shall meet specifications as designated in "Testing Procedures".
F. Backfill found not meeting above requirements shall be removed and re-compacted by the contractor at their own expense.

## 8. DE-WATERING EXCAVATION

A. Excavations shall be kept free of water for a minimum of (2) two inches below sub grade of excavation.
B. Cost of de-watering shall be included in prices bid for pipe or structures.
C. Water shall be disposed of in an approved manner at Contractor's expense.

## 9. EXCAVATION BELOW SUBGRADE

A. Where directed by SPW Inspector.
B. Defined as excavation which is deeper than, (4) four inches below underside barrel of the pipe or structure as constructed.

## 10. BRACING OR SHEETING

A. In accordance with MOSHA and best practice of construction.
B. Shall be withdrawn except:
   1. Where directed by Engineer - extra work order or pay item in the schedule of prices.
   2. Where permitted by Engineer upon request of Contractor:
      a. No extra payment will be made.
      b. Sheeting to be cut off (12) twelve inches below finished grade of street.

## 11. ROADWAY REPAIR

A. Incidental to other items of construction:
   1. Contractor to include in price for pipe.
   2. Includes the replacement of curb, gutter and sidewalk damaged during construction.
      a. Must be constructed by approved Concrete Contractor.
   3. No additional payment to be made.
   4. Repair roadway per City of Salisbury Detail STD 400.35.
   5. Repave roadway per the latest version of the City of Salisbury Roadway Paving Policy.
B. Accomplish repaving within (3) three weeks after construction is complete within a street unless otherwise directed by Engineer.
C. Cut back existing pavement with saw a minimum of (24) twenty-four inches on each side of excavated trench and remove sections of pavement damaged during construction. Minimum repaving width to be (48) forty-eight inches plus trench width. All cuts will be perpendicular or parallel to the center line of the road or as directed or approved by the Engineer.
D. Preparation of Sub grade:
   1. Fine grade and compact to density specified in Testing Procedures.
   2. Top of sub grade to be graded four and one-half (4 ½) inches below finished street grade.
E. Repaving
   1. Repair of bituminous roadway paving shall be performed by City approved Contractor.
   2. Paver to be automatic control type meeting Maryland SHA Specifications.
   3. Roller to be approved type capable of achieving 92% - 97% compaction of hot mix.
   4. Hot mix asphalt meeting Maryland SHA requirements for Surface Course required.
F. Trench Settlement
   1. Trench settlement during guaranty period is not acceptable.
   2. If settlement occurs during guaranty period the Engineer may require the Contractor to re-compact and repave as necessary to eliminate settlement at no extra cost to City.

## 12. MISCELLANEOUS UTILITY CONSTRUCTION NOTES

A. The approved utility contractor shall be aware of and/or responsible for:

1. All public improvements including, but not limited to, public water mains, sewer mains, storm drains, roadway, street lights, curb, gutter and sidewalks shall be constructed to City of Salisbury Construction Standards, and Construction and Materials Specifications.
2. The City reserves the right to require structural modifications to the site work following contract drawing approval if, in the opinion of the City, such modifications are necessary to correct deficiencies in the plan.
3. All stabilization, paving and road patching in the public roadway, which is necessitated by the construction of this project, shall be performed by a paving contractor that is approved by the City of Salisbury and shall be the responsibility of the developer.
4. A written "Notice to Proceed" must be obtained and a Pre-Construction meeting scheduled with the City of Salisbury, Department of Public Works, before beginning construction in City public R/W's, easements and/or City maintained utilities or roadways. Contact Frank Ennis of the City of Salisbury Department of Public Works, Room 202, 125 N. Division St., Salisbury, Maryland, 21801-4940, Telephone 410-548-5460, Fax 410-548-5462, e-mail fennis@citylivingsalisbury.com, to schedule a Pre-Construction meeting and obtain a written "Notice to Proceed".
5. The contractor shall designate and submit to the City the name of the person designated as the Maryland Certified Traffic Control Manager, and a copy of the manager's Maryland Certification Card for this project, prior to construction. The contractor shall furnish all signs, arrow boards, barricades, lights, flagmen, etc. needed for maintenance of traffic. All traffic control devices shall be properly maintained to insure that the general public's safety is never jeopardized. All traffic control devices are to conform and adhere to those specified and set forth in the Maryland Department of Transportation "New Work Zone Traffic Control" and/or "Manual on Uniform Traffic Control Devices for Streets and Highways" latest edition.
6. The contractor will be responsible for notification to all properties or businesses directly affected by detours or changes in traffic patterns before beginning of construction and as determined by the City of Salisbury.
7. The contractor is responsible for submitting to, and obtaining from the City, shop drawing and cut sheet approval for structures, equipment, and materials prior to beginning construction.
8. Testing/disinfections of water mains and testing of sewer mains shall be performed prior to placing utilities in service, and shall be conducted according to City of Salisbury Standard Details, and Construction Materials and Specifications.
9. The contractor shall field verify all dimensions of existing public utilities.

10. Utility connections requiring disruption of service to customers shall be performed between 10:00 PM and 5:00 AM. The contractor will be responsible for notification to all properties or businesses 48 hours in advance who are directly affected by disruption of service. Contractor shall submit sample of proposed notification to SPW for approval prior to distribution to customers. Notice to customers shall include the following:
    a. Utility(s) Affected
    b. Date & Time of disruption of service(s)
    c. Date & Time of restoration of service(s)
    d. Brief description of planned work
    e. Contractors company name, Point of Contact (Name & Phone#)

# SANITARY SEWER MATERIALS

Latest revision 01-01-14

# SANITARY SEWER MATERIALS

Latest revision 01-01-14

1. MANHOLE BRICK AND MORTAR
   - A. Exclusively for repair of existing Brick Manholes and/or Flow Channels.
   - B. Brick shall conform to ASTM C32, Grade MM Sewer Bricks.
   - C. Six brick absorption shall not exceed 14.
   - D. Sample shall be provided for inspection one week prior to use.
   - E. Mortar cement shall be an approved non-shrink grout.

2. ADJUSTMENT RINGS
   - A. Only pre-cast concrete adjustment rings will be accepted.
   - B. Brick is not permitted.

3. MANHOLE FRAMES AND COVERS

   - A. Size and type per standard details.
   - B. East Jordan Iron Works # 154514 Frame or approved SPW substitute.
   - C. East Jordan Iron Works # 154523 Cover or approved SPW substitute.
   - D. Only 9" Frames are permitted.
   - E. Rated for H 20 loading.
   - F. Frames shall be anchored to structure per SPW Standard Details.
   - G. Frames shall be set in ½" minimum bed of mortar.

4. PRECAST MANHOLES

   - A. Size per standard details.
   - B. Per ASTM C-478.
   - C. Contractor to provide detailed drawings of each manhole, when required to do so, prior to shipment and installation.
   - D. Joints shall be provided with rubber O-ring gasket meeting ASTM C-361 and shall be watertight when installed.
   - E. Annular space between pipe and pipe openings, including future stubs, shall
     1. Be sealed with a non-shrink type grout and,
     2. Be provided with a flexible rubber pipe to manhole seal that:
        - a. Shall be watertight under a five foot vertical head.
        - b. Meets the requirements of ASTM C923-79 (Draft 3).
   - F. Lifting holes shall be provided to assure a "safe" lift without slippage. If lifting hole projects through manhole, grout flush with non-shrink grout.
   - G. Steps shall be vibrated in place when cast into walls and shall be set vertically per OSHA requirements.
   - H. Install in accordance with SPW Specifications.
   - I. Flow channels shall be pre-cast from manhole manufacturer.
   - J. Shall be furnished with an approved bituminous exterior coating.
   - K. No field cutting or altering of precast manholes is permitted

5. MANHOLE STEPS
   A. Reinforced polypropylene plastic.
      1. Per SPW standard details.
      2. Per OSHA standards.

6. CLEAN OUT STACKS
   A. Per standard SPW details.
   B. Approved Plastic Pipe and fittings.
   C. Combination 6"x 4" wye and 1/8 bend may be used instead of separate parts.
   D. Place 6" Spigot Plug No. 483065 or SPW approved substitute in unused hub.
   E. Install 4" vertical stack from 6" x 4" wye and 1/8 fitting rising to a depth of 2ft. below finished grade with SDR 35 glue cap.

7. POLYVINYL CHLORIDE (PVC) SEWER PIPE AND FITTINGS
   A. SDR 35.
      Manufactured per ASTM D 3034, SDR 35 for 4" – 15" or ASTM F 679 for 18" –27".
      1. Rubber ring joint to provide for expansion and contraction.
      2. Pipe and fittings shipped with gaskets not in place will not be accepted.
      3. Maximum SDR of 35.
      4. Minimum pipe stiffness F/Y = 46 psi.
         a. at 5% deflection.
         b. when calculated in accordance with ASTM D2412.
      5. All pipe must be protected from UV rays immediately upon delivery to project site.
      6. UV protection must be approved by SPW Inspector.
      7. Pipe bleached or discolored by UV rays will not be accepted.
   B. Joints.
      1. Integral bell type or approved substitute to Johns-Manville Ring-Tite.
      2. Solid cross-section rubber O-ring gasket securely locked in place to prevent displacement.
      3. Shall withstand 25-psi internal pressure without leakage.
      4. Rubber gaskets.
         a. shall comply with ASTM D1869.
         b. lubricant shall have no detrimental effect on gasket or pipe.
      5. Manhole connections must be made with elastomeric gasket to provide flexibility and water tightness.
   C. Pipe Markings.
      1. The following information is to be marked on pipe at five-foot intervals:
         a. Manufacturer's name or trademark.
         b. Nominal pipe size.
         c. PVC Cell classification.
         d. The legend (e.g., "Type PSM SDR 35 PVC Sewer Pipe").
         e. Date and location of manufacture.

D. Installation.
   1. SDR 35 to be in accordance with ASTM D2321 and TR-614A by the Johns-Manville Company for SDR 35.
   2. Backfill and Bedding per SPW Standard Details and Specifications.

E. Deflection.
   1. Deflection of Sanitary Sewer Pipe is not permitted.

F. Wye Branches and House Connections.
   1. Per SPW standard details.
   2. Shall be PVC, where main is PVC.
   3. Install 4" vertical stack from 6" x 4" wye and 1/8 rising to a depth of 2 ft. below finished grade, with SDR 35 glue cap. Terminate 1 ft. back of sidewalk when applicable or 1ft. back of the property line.

8. MANHOLE INSERTS

A. Watertight manhole inserts shall be used on all sewer manholes. This is not a pay item, to be incidental to cost of manhole.
B. Shall fit City of Salisbury Std. Manhole frame, 23-3/4" ID. x 24-3/4" OD.

9. DUCTILE IRON PIPE

A. Conform to AWWA/ANSI C151/A21, latest revision.
B. Thickness Class per AWWA/ANSI C150/A21, C151/A21.
   1. 4-inch: Class 51 minimum.
   2. 6-inch and above: Class 50 minimum.
   3. Unless otherwise specified or indicated on drawings.
C. Cement lined per AWWA/ANSI C104/A21, double thickness.

10. FITTINGS FOR DUCTILE IRON PIPE

A. Shall be ductile iron.
B. 4" through 24" ductile iron compact fittings conforming to AWWA/ANSI C153/A21, latest revision.
C. 30" through 48" ductile iron standard fittings conforming to AWWA/ANSI C111/A21, latest revision.
D. Pressure rating 350-psi minimum.
E. Mechanical joint.
F. Outside coating per AWWA/ANSI C110/A21, C153/A21.

## 11. JOINTS FOR DUCTILE IRON PIPE

A. Push-on type.
   1. Rubber gasket.
   2. Tyton by U.S. Pipe and Foundry Company, or SPW approved substitute.
B. Mechanical joint.
C. Joints per AWWA/ANSI C111/A21.

## 12. OUTSIDE COATING FOR BURIED IRON PIPE

A. Outside coating on pipe and fittings per AWWA/ANSI C151/A21.

## 13. OUTSIDE COATING FOR EXPOSED IRON PIPE

A. Manufactured by TNEMEC Co. INC. (or approved SPW substitute.)
B. Outside coating on pipe and fittings per AWWA/ANSI C151/A21.
C. Exposed Ductile Iron Pipe, Fittings, and appurtenances shall be coated with the following:
   1. Modified Aromatic Polyurethane Primer.
   2. Polyamidoamine Epoxy Intermediate Coat.
   3. Low VOC Hybrid Aliphatic Polyurethane Top Coat.

## 14. MECHANICAL JOINT RETAINER GLANDS

A. Conform to AWWA/ANSI C110/A21, C111/A21, C153/A21.
B. Manufactured by American Cast Iron Pipe Company or U.S. Pipe and Foundry Company, or approved substitute.

## 15. CASING SPACERS AND END SEALS

A. Bands shall have a minimum 14 gauge 304 stainless steel bands. Bands shall be two segments, 8 inch wide. For carrier pipes, 26 inch diameter and larger, bands shall be three or more segments and 12 gauge 304 stainless steel.
B. Steel Riser shall be high grade 304 stainless steel, minimum 10 gauge thickness and shall be fabricated to support the carrier pipe, and its liquid load. Riser shall be sized to position the carrier pipe in the casing, support all loads and provide proper contact for the isolation function.
C. Casing spacers shall have ample riser height to limit vertical movement of the carrier pipe within the casing pipe. A maximum of 1 inch clearance shall be provided between the top runner and the ID of the casing pipe for carrier sizes of 6 inch through 12 inch. A maximum of 2 inch clearance shall be provided between the top runner and the ID of the casing pipe for carrier pipe sizes of 18 inch through 64 inch.
D. The liner around the carrier pipe shall have a flexible PVC liner of 0.09 inch thickness with a Durometer "A" 85-90 hardness and a minimum 58,000 volt dielectric strength.

E. Runners shall be of high-pressure molded glass reinforced polymer with a minimum compressive strength of 18,000 psi, 2 inch in width and a minimum of 8 inches long. Polyethylene runners are not an acceptable alternative.
F. The runners shall be attached to the band or riser by 3/8 inch welded stainless steel studs and lock nuts, which shall be recessed far below the wearing, surface on the runner.
G. The band section shall be bolted together with 304 stainless steel studs, nuts and washers. Hardware shall be 5/16 inch for carrier pipes up to 36 inch diameter and 3/8 inch for carrier pipes 36 inch and larger.
H. A minimum of three casing spacers shall be required for each joint of carrier pipe (each end and middle) within casing pipe.
I. End seals shall be a pull-on or wrap around with stainless steel bands. End-seals shall be made of 1/8 inch compounded synthetic rubber.
J. Approved Manufacturers:
    1. Advance Products & Systems , Inc.
    2. Power Seal Pipeline Products, Inc.
    3. CCI Pipeline Systems, Inc.
    4. J-Four Pipeline Products, Inc.

# TYPICAL
# SANITARY SEWER
# LIFT STATION

Latest revision 01-01-14

## INDEX

TYPICAL
SANITARY SEWER
LIFT STATION
Latest revision 01-01-14

1. GENERAL

Contractor shall furnish all labor, materials, equipment, and incidentals required to provide a dual pumping system as specified herein.

2. SEWAGE PUMPS

General

The Submersible chopper pumps shall be specifically designed to pump waste solids at heavy consistencies without plugging or dewatering the solids. Materials will be macerated and conditioned by the pump as an integral part of the pumping action. The pumps must have demonstrated the ability to chop through and pump high concentrations of solids such as, but not limited to, plastics, heavy rags, grease and hair balls, wood, paper products, and stringy materials without plugging, both in tests and field applications. Pumps shall be as manufactured by Vaughan Co., or approved substitute.

Performance

Each pump must have the necessary characteristics and be properly selected to perform under the following conditions:

| | | |
|---|---|---|
| CAPACITY | _____ | GPM |
| TOTAL DYNAMIC HEAD | _____ | FT |
| RPM | _____ | RPM |
| MAX PERCENT SOLIDS | _____ | % |
| SPECIFIC GRAVITY | | |
| TEMPERATURE | _____ | EF |

Pump performance shall be as shown via superimposing system head curve on pump curve.

IMPELLER SIZE (DIAMETER) _____ IN

Design Materials

The impeller shall be semi-open type with pump-out vanes to reduce seal area pressure. Chopping/maceration of materials shall be accomplished by the action of the leading edges of the impeller blades moving across the cutter bar at the intake openings. The pump shall be manufactured with a set clearance between the impeller and cutter bar of 0.010" to 0.015". Cutter bar shall extend diametrically across entire pump suction opening. The impeller and cutter bar shall be a minimum 300 Brinell Hardness, heat-treated A148 Gr. 90-60 cast alloy steel. Pump casing and bearing housing shall be ductile cast iron. A separate oil-filled bearing housing shall be provided between the pump casing and submersible motor to isolate the lower mechanical seal on the motor from the pumped media. An additional mechanical seal below the thrust bearings in the bearing housing shall be provided to isolate pumped media from the bearing housing, with a maximum of 1.2" of overhang from the centerline of the lowest bearing to the seal faces. The mechanical shaft seal shall be Alloy 20 welded metal bellows type with silicon-carbide seal faces. The seal shall ride on a 316 stainless steel shaft sleeve, with the seal bellows tension set by 3 set screws. Shaft thrust in both directions shall be taken up by two back-to-back mounted single-row angular contact ball bearings. The seal faces and bearings shall be oil-bath lubricated by SAE No. 10 turbine oil or equivalent. Oil level shall be monitored by an automatic oil level monitor to be mounted above near the control panel, with a flexible hose feeding down to the bearing housing.

Submersible Electric Motor

The submersible motor shall be U/L listed and suitable for Class I, Group D, Division I hazardous locations, rated at
_____HP, _____RPM, _____Hertz, and 3 phase, with a 1.15 service factor and Class B insulation system with Class F materials rated for continuous duty in 25 deg. C. liquid and for 15 minutes in air without overheating. Motor shall be equipped with tandem mechanical seals in oil bath and dual moisture sensing probes. Motor shall include two normally closed, automatic resetting, thermostats connected in series and imbedded in adjoining phases. Motor frame shall be cast iron, and all hardware and shaft shall be stainless steel.

Surface Preparation
The pump unit shall be prime coated with a modified alkyd primer containing rust inhibitive pigments, and finish coated with modified alkyd enamel.

## 3. PUMP CONTROL SYSTEM

General

All control panels, starters, control alarm, dialer interface, pump station control panels, and display panels shall meet the following general requirements:

A. All external wiring is to terminate at a centrally located terminal strip. The terminal strip shall be constructed of box type copper or tinned copper terminals suitable for minimum wire sizes #22 to #8 AWG. The blocks shall have a large head screw with pressure plate and be mounted on a track. Supply Square D class 9080 type GR6.

B. Where possible, all internal wiring is to be in a plastic wire way with removable cover.

C. All wire shall be rated at 600-volt AC types MTW, TFF, TFFN, or other approved "Control Panel" wire. The minimum size is to be #16 AWG. All instrumentation wiring is to be shielded, minimum size #18 AWG. All wire is to be stranded. All internal AC wiring is to be red in color for none grounded wires and white for all grounded wires (neutral). The GROUNDING wires shall be green. All other control wires and instrumentation wires are to be of a different color.

D. All relays, devices, and equipment shall be mounted on a steel back plate raised off the back of the enclosure.

E. All relays, devices, equipment, switches, pilots, and all other components mounted in or on the enclosure shall be marked and labeled as shown on the factory drawings.

F. All control panels shall be supplied with a complete set of drawings showing control logic, wiring logic, component layout, and wire to component connection.

G. All door mounted switches, pilots, and components shall have an identification plate describing their function. The plates shall be made of laminated plastic with a black background and white engraved characters. All plates shall be mounted with stainless steel.

H. General control relays to perform the interlocking sequential functions shown on the drawings shall be provided for operation on 120 volts, 60 hertz with 3 pole double throw contacts rated at 10 amperes, at 120 volts AC. Control relays shall be of the round pattern 11-pin plug-in type with neon indicator light. Relay shall be as manufactured by Potter and Brumfield type KRPA-N or approved substitute.

I. Plug in timing relays shall be of the solid-state plug-in type with on delay or off delay function as required by the control system. They shall operate in 120 volts, 60 hertz, with contact rated 10 amperes at 120 volts AC. Rocker switches shall adjust the time. Time delay relays shall be as manufactured by Timemark Model 360.

J. Elapsed time meters shall be the non-resetting type, 6 digit, with a time range of 9999.9 hours and shall be Eagle Signal Catalog No. HK410AG or approved substitute.

K. The percent timers shall be mounted in the door and have an external adjustment knob. The timer is to be a motor driven clutch engaged type with one SPDT contact. Contact rating shall be 10 amperes at 120 volts. The unit shall have a removable plug in type NEMA 12 face and timer. Supply an Eagle Signal Controls HQ9 series, with a 15-minute range.

L. The alternating relay shall be a solid-state plug-in type with a LED indicator showing the position of the output. A three-position toggle switch shall be included to select between alternating output or a fixed sequence. Furnish a Diversified Electronics Inc., Model ARB-120-ADA.

M. Control panel shall incorporate a high water/loss-of-power light, and an open contact to these functions for connection to alarm telemeter lines. City forces will perform connections to alarm telemeter lines.

Wet Well Level and Pump Controls

A. Supply and install a complete control system to control the wet well level and pumps. The system shall include, but not be limited to the following major items.

1. Wet Well Level Controller is to house the level Setpoint Controller, control logic relays to control the pump starters, and alarm the functions. The enclosure is to be a hinged NEMA 4 steel enclosure with a steel back plate. The setpoint controller, selector switches, and pilot lights are to be mounted in a hinged dead front panel behind the door. The enclosure is to be adequately sized to contain all the components and provide proper cooling without fans.

2. Wet Well Level Sensor Transducer with mercury float switches as a backup. There shall be two switches "START" and "OFF".

3. The system shall be supplied as a complete and operating system and shall include all items and equipment, shown or not shown on the drawings AND as described herein, necessary to provide a complete system.

4. All necessary installation labor shall be included.

5. A factory representative shall be supplied to inspect the installation, start-up and make final adjustments. The factory representative shall provide up to 8 hours of training at the site for the owner's representative. The start up service is not to be included in the training time. The cost for start-up services and training shall be included in the cost to furnish and install the pump control system.

6. A 120-volt convenience outlet with a 20 amp breaker.

7. Lift station control shall include a water-resistant, automatic transfer switch with a generator back-up system.

B. Wet Well Level Controller

1. Wet well level and pump operation is to be maintained by a solid-state level control system. This system is to consist of a precision heavy-duty pressure transducer installed in the wet well, converting the liquid level to and electrical signal, connected to the Setpoint controller. The Setpoint controller shall send the level start and stop signals to the control logic relays and pump starters.

C. Setpoint Level Controller

1. The Setpoint controller shall include a numerical 10-digit keypad to program the required setpoint on and off functions. The keypad shall have a NEMA 12 membrane. All setpoints shall be made via this key pad and be capable of one tenth of one PSI increments. No dial or potentiometer adjustments will be accepted. The controller shall also have the capability to reset any pressure to zero and scale up from the point. The display shall also be incorporated into the keypad with three 5/8" LED digits, and one decimal point. The reading shall be 0 to 99.9. A LED shall be included on the display to indicate the condition of each setpoint. Each setpoint output shall have a programmable time delay to delay both the "on" and "off" of each setpoint. The delay shall be from 0.1 to 99.9 seconds. A program lockout switch shall be mounted inside the enclosure to prevent the changing of the setpoints by the keypad. All setpoint valves, offset and any other program data shall be accessible and shown on the display. The controller shall have a total of six setpoint outputs. These outputs are to be of SPDT relay type. The relays shall be of the plug in type construction. The unit is to have a microprocessor with 12-bit resolution, fault-check self-diagnostics, and a nonvolatile memory for all parameters and setpoint values. No memory loss should result in case of a loss of power. Battery backup will not be acceptable. The controller is to be a stand-alone unit. No other control functions shall be incorporated in this controller.

2. The Setpoint controller shall be a Shorite Controls Series 8970 or approved substitute.

3. Furnish and install U.L. and F.M. approved Intrinsically Safe Barrier on the wet well level sensor. The barrier shall meet all necessary requirements to isolate and eliminate all voltage and current potentials that could ignite a hazardous atmospheric mixture during normal or abnormal operating conditions.

D. Wet Well Level Sensor Transducer

1. The transducer shall be constructed of 304L stainless steel, non-liquid filled and be rated as submersible, with a 4-20 maDC 1% accuracy signal. The transducer signal cable shall be of the underwater type, suitably strong to support the transducer. The cord shall also incorporate an integral breather tube to vent the inside of the transducer to the atmosphere to assure time gauge pressure. The cord is to have no splices. A 1/4" FPT pressure port is to be provided. Over pressure protection for a minimum of 10 times the rated pressure, and temperature compensation of 2% shall be included. The range shall be 0 to 100 PSIG. A vent tube filter and vapor trap shall be installed in the vent tube at the enclosure. The filter shall have a 20-micron element, and contain a minimum of 30 grams of indicating desiccant. The minimum flow rate shall be 300 cubic centimeters per minute.

2. Supply a Shorite Controls Series 8970-311 transducer with vent filter or approved substitute.

E. Pump Starters

1. Provide 2 NEMA rated type starters to match the pump motor horsepower, voltage, service factor current, and all other motor specifications. A NEMA rated melting alloy, manual reset type overload relay shall be supplied for each motor leg.

F. Pump Control Settings

| | |
|---|---|
| Top of Chamber | Elev |
| Influent Pipe Invert | Elev |
| High Level Alarm | Elev |
| Start Pump 2 (Both pumps running) | Elev |
| Start Pump 1 (One pump running) | Elev |
| Pumps Off | Elev |
| Bottom of Chamber | Elev |
| Base Slab Elev | Elev |

(Check chamber bottom construction at job site to determine distance below bottom of chamber.)

## 4. OPERATION OF SYSTEM

On sump level lower switch shall first be energized, then upper level switch shall next energize and start lead pump. With lead pump operating, sump level shall lower to low switch turn-off setting and pump shall stop. Alternating relay shall index on stopping of pump so that lag pump will start first on next operation and become lead pump. If sump level continues to rise when lead pump is operating, override switch shall energize and start lag pump. Both lead and lag pump shall operate together until low-level switch turns off both pumps. If level continues to rise when both pumps are operating, alarm switch shall energize and signal the alarm. If one pump shall operate on the override control and if level rises above override control, alarm shall signal. All level switches shall be adjustable for level setting from the surface.

## 5. PIPING AND VALVES

Station sewage piping shall be class 150 cast iron. Each discharge line shall be fitted with an AWWA standard full turn pinch valve equipped with an adjustable memory stop and a 2" square actuating nut as manufactured by Red Valve or approved substitute. Each discharge line shall be fitted with a non-shock check valve of the full opening swing type as manufactured by NIBCO Industrial or approved substitute. Critical dimensions are to comply with ANSI B16.1 and AWWA C 504-80. Pressure test to comply with AWWA C 504-80 Section 5.3 and 5.4. The discharge piping shall terminate in a mechanical joint wall sleeve passing through the basin wall. Discharge from station shall be fitted with NPT coupling(s). Check valves shall be flanged for removal and maintenance. All piping external to the station shall be furnished and installed by Contractor in accordance with the City of Salisbury specification.

## 6. PUMP CHAMBER

The Contractor shall furnish and install a factory built automatic duplex submersible pumping station as manufactured by Usemco, Inc. or approved substitute. The equipment chamber shall be fabricated of 1/4" minimum structural grade steel plate continuously welded to form a cylinder with dimensions as shown on the plans. The chamber top shall include a steel access cover with suitable lifting handle and locking clasp. Mechanical joint wall sleeves shall be provided where the pump joints are made to the inlet and discharge lines. The wall sleeves shall be welded both inside and outside the bulkhead. The seal shall have two compression joints, one inside and one outside, sized to receive the pipe specified. The joint shall also be so designed to absorb any vibration, distortion, and normal settling and maintain a leak proof seal. The wall sleeve shall receive a 12-mil coating of coal tar epoxy after being welded into the bulkhead (See chamber elevations). The Contractor may submit a concrete tank as an alternate to the steel tank specified for pump chamber. Fiberglass tank is not acceptable.

## 7. VALVE BOX

A. A valve box as shown on the drawings shall be furnished as an integral part of the pump chamber. The valve box shall be constructed of 1/4" minimum structural grade steel plate with a steel access cover as stated for the pump chamber.

B. All welding for the valve box and pump chamber shall be in accordance with standard AWS practices, with proper fillet section and continuity to assure a sound watertight structure. The welds in contact with soil or water shall be checked for leakage.

## 8. PROTECTION COATINGS

A. All mill scale, rust, weld flux or other foreign matter shall be removed from all steel surfaces by sandblasting to SSPC-SP-10 specifications. All surface irregularities shall be removed by grinding and filing.

B. A protective coating such as Amercoat 78HE or approved substitute, shall be used to resist moisture, soil chemicals, oils, abrasion, and impact, be compatible with cathodic protection and provide the maximum corrosion protection possible.

## 9. CATHODIC PROTECTION

The effects of underground corrosion upon the lift station shall be attenuated by means of a cathodic protection system. Protection shall be provided by two #17 magnesium anode packs with insulated copper leads for connection to grounding lugs spaced at equal intervals around the station wall on the vertical centerline of the station.

## 10. SPARK-PROOF GUIDE RAIL SYSTEM

A. The guide rails used to direct the pump in proper alignment with the stationary discharge piping shall be of a stainless steel dual rail design incorporating cast bronze pump guide bracket and cast ductile iron discharge elbow with mounting feet and 125 lb. flanges, an upper guide rail mounting bracket, and intermediate guide brackets every 10 feet. The rail shall be a 2" corrosion resistant pipe and positioned on the centerline of the pump to each side so that no weight of the pump bears on either of the two guide rails at any time. The guide rails shall serve truly as a guide rail. Units which do not have the guide rails positioned on the centerline of the pump with off-centered weight distribution shall not be considered an approved substitute or acceptable, as a binding action on the guide rails is possible, making removal and/or re-installation much more difficult. System design shall prevent spark ignition of explosive gases during pump installation and removal.

B. The pump shall be automatically connected to the discharge connection below when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter the pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump.

C. A sliding guide bracket shall be attached to the pump. The sliding carrier guide bracket shall be fabricated from cast bronze. The carrier shall be mounted on the pump so lifting it is done from the carrier and no strain is placed on the pump or guide rails. Fasteners shall be 300 series stainless steel. Carrier shall be designed to lift from a centered loop.

D. A discharge elbow shall be furnished for each pump. The discharge base elbow shall be attached to a flat steel fabricated base plate, which rests squarely on the wet-well floor. The flat base plate shall assure the pump has a smooth surface on which to rest when lowered into position. The base plate shall include a leveling bolt adjustment as well as adjustable guide rail supports which hold the guide rail pipes at the bottom. The pump discharge with hydraulic sealing flange shall align with the base elbow of the base plate assembly. The sealing face of the base discharge elbow shall be smooth and shall be heavily coated with zinc spray to provide a smooth corrosion resistant surface. All fasteners shall be 300 series stainless steel.

E. When pump is lowered into place, it shall rest squarely on the base plate, supported only by the feet on the pump. Units that hang from the discharge elbow shall not be acceptable as undue stress may occur on the volute case casting of the pump or on the base elbow of the base plate assembly.

## 11. ELECTRICAL CONNECTION TO SANITARY LIFT STATION

A. Contractor Responsibility

The Contractor shall be responsible for providing the meter socket and double throw, double pole disconnect switch mounted to the lift station. The Non-Fusible Safety disconnect shall allow emergency generator connection by City personnel. The switch size varies due to power supply requirements. Contractor shall determine the size of switch and service conduit by contacting the local Power Company. The Contractor shall install conduit of sufficient size for service wiring at the lift station. Conduit shall be stubbed out beyond the concrete slab area. The Contractor shall have electrical service and appurtenances inspected by an approved electrical inspector. Electrical certification, of acceptance, for permanent service will be presented to the City by the Contractor.

B. City Responsibility

The City will make application to the local electrical utility for the meter and appropriate electrical connection from the power source for permanent service. The City will be responsible for cost of service connection and service wiring (when cost is incurred) at the time of connection to the Power company's power supply.

## 12. TELEMETER CONNECTION TO LIFT STATION

A. Contractor Responsibility

The Contractor shall provide hardwire and contacts for the following alarms

a. High level alarm.
b. Air fail alarm when required.
c. Power loss Alarm
d. SCADA Pack

The Contractor shall install 1" minimum conduit for telemeter wiring at the lift station. Conduit shall be stubbed out beyond the concrete slab area.

B. City Responsibility

The City shall be responsible for providing and installing telephone wires from a telephone company service to the lift station pump control panel. The telephone cable shall be installed into the pump control panel by the City. The telephone service wire shall remain unconnected at both ends. Wire shall be left coiled in sufficient amount to make connection at telephone service pedestal. The City will arrange to have telephone service connected after acceptance of utilities. The City will make application to the local telephone utility for permanent service. The City will be responsible for cost of telephone service connection and service wiring (when cost is incurred) at the time of connection to the telephone company power supply.

## 13. CONCRETE BASE

Concrete base and concrete slab around the top of the lift station shall be provided with wire mesh or No. 4 rebar used for reinforcement.

## 14. INSPECTION AND TEST

Prior to assembly, all station components shall be inspected for quality and tested for proper function and freedom from defects. Upon completion, the station shall be connected to a test tank and an operational test performed under simulated field conditions while a final inspection is conducted. Any deficiencies or irregularities shall be corrected at the factory. Automatic controls shall be adjusted to approximate job requirements.

15. INITIAL OPERATION

After the job installation is complete, an initial quality control inspection shall be performed by the City. The station shall be approved for initial operation by the City before operation. A qualified factory representative shall place the station in operation, conduct a complete junction check, and make all necessary adjustments for regular service.

16. GUARANTEE

The manufacturer of the lift station shall guarantee, for one year from the date of shipment, that the entire station and all equipment therein shall be free from defects in design, materials, and workmanship. In the event a component fails or is proven defective during the guarantee period, the manufacturer will provide a replacement part without cost upon return of the defective part. Normal use items such as grease, light bulbs, mechanical seals, packing, and belts are excluded.

17. GRADING, LANDSCAPING, AND ACCESS ROAD

The Contractor shall grade and landscape the area adjacent to the lift station as needed. The Contractor shall provide a depressed curb driveway entrance and an access road to the lift station for City maintenance vehicles. The road shall be graded, as needed, and be stabilized using CR-6 or #57 stone, a minimum of 6" in depth.

18. OPERATION AND MAINTENANCE MANUALS

Prior to or upon delivery of the Lift Station equipment, the Contractor shall furnish to the City two (2) copies of operation and maintenance information for all equipment, consisting of catalogs, brochures, schedules, assembly drawings, and diagrams describing the location, operation, maintenance, lubrication, and other information necessary for the City to establish an effective operating and maintenance program for the equipment.

19. PRELIMINARY APPROVAL

The Contractor shall supply to the City complete plans and specifications of the lift station "package" for review and approval prior to shipment of the lift station. All alternatives to lift station must include plans and specifications sealed by a professional engineer.

20. FINAL APPROVAL

Final quality control inspection shall be performed by the City. All items noted on inspection form shall be repaired, constructed, or supplied by the Contractor. The lift station will not be turned over to the City for operation and maintenance until all items are completed per specification and to the City's satisfaction. Contractor shall furnish to the City a copy of As-Built Drawings. This shall include lift station pump, control panel, utility depth and alignment, etc.

# WATER MAIN MATERIALS

Latest revision 01-01-14

# WATER MAIN MATERIALS

Latest revision 01-01-14

## 1. DUCTILE IRON PIPE

A. Conform to AWWA/ANSI C151/A21, latest revision.
B. Thickness Class per AWWA/ANSI C150/A21, C151/A21.
   1. 4-inch: Class 51 minimum.
   2. 6-inch and above: Class 50 minimum.
   3. Unless otherwise specified or indicated on drawings.
C. Cement lined per AWWA/ANSI C104/A21, double thickness.
D. Outside coating for buried ductile iron pipe per AWWA/ANSI C110/A21, C153/A21

## 2. FITTINGS FOR DUCTILE IRON & PVC PIPE

A. Shall be ductile iron.
B. 4"through 24" ductile iron compact fittings conforming to AWWA/ANSI C153/A21, latest revision.
C. 30" through 48" ductile iron standard fittings conforming to AWWA/ANSI C110/A21, latest revision.
D. Pressure rating 350-psi minimum.
E. Mechanical joint.
F. Outside coating per AWWA/ANSI C110/A21, C153/A21.
G. Sleeves are not permitted, except as necessary to tie into existing pipe.

## 3. JOINTS FOR DUCTILE IRON PIPE

A. Push-on type.
   1. Rubber gasket.
   2. Fastite by American Cast Iron Pipe Company or Tyton by U.S. Pipe and Foundry Company, or approved substitute.
B. Mechanical joint.
C. Joints per AWWA/ANSI C111/A21.

## 4. OUTSIDE COATING FOR EXPOSED IRON PIPE

A. Suitable for Potable Water applications.
B. Manufactured by TNEMEC CO. INC. (or approved SPW substitute).
C. Outside coating on pipe, fittings and valves to be per AWWA/ANSI C151/A21.
D. Exposed Ductile Iron pipe Fittings and appurtenances shall be coated with the following:
   1. Modified Aromatic Polyurethane Primer.
   2. Polyamidoamine Epoxy Intermediate Coat.
   3. Low VOC Hybrid Aliphatic Polyurethane Top Coat.

5. MECHANICAL JOINT RETAINER GLANDS

A. Conform to AWWA/ANSI C110/A21, C111/A21, C153/A21.
B. Manufactured by American Cast Iron Pipe Company or U.S. Pipe and Foundry Company, or approved substitute.
C. Shall be used on all mechanical joint fittings.

6. POLYVINYL CHLORIDE (PVC) WATER TRANSMISSION PRESSURE PIPE

A. 4"-12" Diameter Pipe.
   1. Shall be designated C-900 or approved substitute.
   2. Conform to ANSI/AWWA C900, all sections, latest revision.
   3. Integral bell and spigot conforming to ASTM D3139.
   4. Thickness Class per DR 18.
   5. Pressure Class - 150-psi minimum. Hydrostatic design basis (HDB) of 4000 psi.
   6. Outside diameter - Ductile iron or Cast Iron pipe (C.I.O.D.) size compatible.
   7. Unless otherwise specified, pipe shall be furnished in standard laying lengths of 20'(+/- 1") for all sizes.
B. 14"-36" Diameter Pipe.
   1. Shall be C-905 or approved substitute.
   2. Conform to ANSI/AWWA C905, all sections, latest revision.
   3. Integral bell and spigot conforming to ASTM D3139.
   4. Thickness Class per DR 18.
   5. Pressure Class - 150-psi minimum. Hydrostatic design basis (HDB) of 4000 psi.
   6. Outside diameter - Ductile iron or Cast Iron pipe (C.I.O.D.) size compatible.
   7. Unless otherwise specified pipe shall be furnished in standard laying lengths of 20'(+/- 1") for all sizes.
C. Joints.
   1. Integral bell and spigot push on elastomeric gasket type conforming to ASTM F477 for Joint Plastic pipe.
   2. PVC couplings, saddles and other fittings are not allowed.
   3. Ductile iron mechanical joint fittings shall be used.
D. Pipe Markings.
   1. The following information is to be marked on pipe at five-foot maximum intervals:
      a. Manufacturer's name or trademark.
      b. Nominal pipe size.
      c. Thickness Class (e.g., DR 18).
      d. Pressure Class (e.g., PC 150).
      e. The legend (e.g., "Type AWWA C900 PVC Pressure Pipe").
      f. Date and location of manufacture.
E. Tapping PVC Mains.
   1. Direct tapping is not allowed.
   2. All service taps for PVC water pipe shall be provided with saddles per SPW Standard Details.

F. Installation.
   1. To be in accordance with AWWA Standard C605, "Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and fittings for Water" or pipe manufacturer's installation guide for pipe approved for this project.
   2. All new non-metal Water Mains and appurtenances shall be installed with tracer wire. In open trench installations, the wire shall be 12 AWG wire (min.) solid copper, coated with a 30-mil (min.) polyethylene jacket designed specifically for buried use. In directional bore installations, the wire shall be 8 AWG (min.) solid copper, coated with a 30-mil (min.) polyethylene jacket designed specifically for buried use.
   3. The tracer wire shall be connected to the top of the pipe with duct tape at 10 foot intervals maximum, the wire shall not be wrapped around the pipe. It shall be installed continuously with access points at 300 feet maximum and any change in direction. The tracer wire shall be brought to the ground surface at the access points and provide an extra 24" of wire. Access points shall include valve boxes, vaults, tracer wire access boxes or other covered access devices and the covers shall be clearly marked Water.
   4. Metallic pipes do not require a tracer wire. Metallic pipe systems require access points along the route for direct connection.
   5. Splices in the tracer wire shall be connected by means of a split bolt or compression type connector to ensure continuity. Wire nuts shall not be used. A waterproof or corrosion-proof connector for direct bury applications shall be used. After installation, the tracer wire shall be tested to verify continuity of the tracer wire system. (Refer to Testing Procedures).

G. Permissible Deflection
   1. Pipe joint deflections are only allowed at joint, bending of pipe is not permitted.
   2. No deflection is allowed at connection to DIP or at fittings.
   3. Pipe joint deflection shall be limited to 70% of the pipe manufacturer's recommended allowable joint deflection.

## 7. WATER MAIN MATERIAL DESIGNATION

A. All locations where construction of PVC water pipe are proposed shall be shown on utility plan and contract drawings and shall be designated as PVC.
B. All water mains, which are not designated on plan and contract drawings as PVC or other material, will be considered Ductile Iron Pipe.

## 8. FIRE HYDRANTS

A. Hydrants shall meet or exceed all requirements of AWWA C-502, latest revision for dry barrel fire hydrants, and the following detailed specifications. Hydrants approved are the American Flow Control B-62-B, or the Kennedy K-81-D Guardian, provided each complies with the City of Salisbury detailed specifications. Alternates will not be considered.

B. Operating Nut.
Size, shape and direction of opening shall be the same as those presently in the City of Salisbury Water System, shall open to the right, be 1 1/2" in size, and pentagon in shape.

C. Bonnet Assembly.
Shall be constructed so that disassembly may be accomplished with "conventional" hand tools.

D. Hose Nozzles.
The upper barrel shall provide two hose and one pumper outlet. The nozzles shall be cast of AWWA Bronze and the threading shall be the same as those presently in the City of Salisbury Water System, consisting of 1 (one) 4 1/2" Pumper nozzle, and 2 (two) 2 1/2" hose nozzles. Shall be National Standard threads on all nozzles. The nozzles shall be connected to the upper barrel by means of a quarter turn system, and held in place with a 304 Stainless Steel Screw.

E. Paint, Traffic Safety Feature & Major Casting.
The primary castings; bonnet, upper barrel, lower barrel and shoe shall be made of either cast or ductile iron. The lower barrel shall be ductile iron. The hydrant shall be primed and painted yellow by manufacturer in accordance to City specifications. Hydrants installed with chips, scratches, etc. shall be repainted with Rustoleum 3400 System DTM 340 VOC Alkyd Enamel, Product # 3446402 Yellow, or approved substitute. Partial or touch-up painting is not permitted. Hydrants shall be provided without chains. The traffic safety feature shall be designated to break clearly upon impact and will consist of a two-part breakable safety flange located on the top of the lower barrel flange, or incorporate a "Quick Fix" Coupling Design. It shall also have a cast iron breakable stem coupling. The design shall permit 360° rotation of the upper barrel without assembly.

F. Depth of Bury.
The depth of bury shall be as shown in City "Construction Standards" booklet. Hydrants are to be extendable in 6" increments, at the ground line, without excavation.

G. Main Valve Assembly.
The main valve opening shall be 5 1/4". The hydrant shall open against and close with the line pressure. The rubber valve shall be made of a synthetic rubber confined between the upper and lower valve plate. The upper valve plate, seat ring and seat ring bushing shall be made of AWWA Bronze and be made to ASTM or CDA alloy specifications. All pressure seals shall be made by use of rubber o-rings. The main valve assembly must be removable through the upper barrel by use of a short lightweight wrench. A Bronze-to-Bronze seating arrangement is required.

H. Inlet Shoe Connection.
The inlet shoe connection will be 6" mechanical joint, complete with glands, bolts, nuts and gaskets. Hydrants must use a standard M.J. Accessory Set for Installation. The distance from the face of the shoe connection inlet flange shall be great enough to allow the insertion of mechanical joint tee head anti-rotation bolts or tee rods without interference from the shoe casting or other hydrants parts.

9. HYDRANT LEADS

A. 6" Ductile Iron pipe between the MJ tee or the hydrant tee at the main and the fire hydrant. PVC pipe not allowed.
B. Mechanical joint pipe with retainer glands required.

10. GATE VALVES

A. All gate valves to be mechanical joint resilient seated wedge gate valves. Shall be American Flow Control or approved substitute. Other than American Flow Control shall require approval by Engineer before delivery to project site.
B. Shall meet AWWA C515 specifications for gate valves.
C. Hub ends for mechanical joints, square wrench nut.
D. Open counter-clockwise.
E. Depth of valve operating nut shall be a minimum of 24" from the finish grade to the top of the operating nut.

11. VALVE BOXES

A. Refer to SPW Standard Details
B. Buffalo screw type, three pieces.
C. 5 1/4" shaft.
D. Only Bingham-Taylor, Tyler/Union, or East Jordan Iron Works cast iron three piece (lid extra) screw type valve boxes or approved substitute will be permitted.
E. Base to be size and shape recommended by manufacturer for diameter of pipe specified.
F. Lids.
   1. Extra deep.
   2. Two holes.
   3. Word "WATER" cast in upper surface.
G. # 4 Base shall not be permitted.
H. Only # 6 or # 160 Bases will be accepted.

## 12. TAPPING SLEEVES AND VALVES

A. Ford stainless steel tapping sleeve FTSS, ROMAC stainless steel tapping sleeve SST III or approved substitute.
B. American Flow Control or approved substitute, resilient seated wedge-tapping valve.
C. Outlet flange shall be 304 stainless steel.

## 13. WATER SERVICE CONNECTIONS

A. Fittings
   1. Shall be "No Lead Brass".
   2. For 1" and 2" service connections.
   3. For 1" service refer to Standards drawing 300.14 .
   4. For 2" service refer to Standards drawing 300.27.
B. Plastic Pipe for 1" and 2"service connections shall be Polyethylene (PE) tubing class 200, SDR 9 CTS OD (copper tube size) 200 PSI.
   1. Stainless Steel (SS) insert fittings shall be used with all fittings used for P.E. tubing.
   2. #12 solid copper coated wire shall accompany all PE Tubing. The copper wire shall be duct taped to the top of the PE tubing every (5) feet. It shall be connected to the tracer wire on the water main and terminate and connect to the supply side angle valve of pit setter, provide sufficient length of wire to facilitate testing a minimum of 2' above frame and cover.
   3. PE Tubing shall be cut with ratchet or scissor cutter designed to cut plastic pipe, saws are not permitted.
C. Meters.
   1. Supplied and installed by the City, unless otherwise specified, by the City of Salisbury.
   2. Meter type.
      a. Approved meter, as approved by City. No others considered. The City shall install meters.
   3. Size of meter.
      a. Size of meter to be determined by the City. Meters will be sized by the City using the Water Customer Data Sheet available from the City. Plumbing layout or fixture count must be available.
      b. The City reserves the right to supersede meter size designations on plans, drawings, or specifications when it is in the best interest of the City.

## 14. CASING SPACERS AND END SEALS

A. Band shall have a minimum 14 gauge 304 stainless steel band. Bands shall be two segments, 8 inch wide. For carrier pipes, 26 inch diameter and larger, bands shall be three or more segments and 12 gauge 304 stainless steel.

B. Steel Riser shall be high grade 304 stainless steel, minimum 10 gauge thickness and shall be fabricated to support the carrier pipe. And its liquid load. Riser shall be sized to position the carrier pipe in the casing, support all loads and provide proper contact for the isolation function.

C. Casing spacers shall have ample riser height to limit vertical movement of the carrier pipe within the casing pipe. A maximum of 1 inch clearance shall be provided between the top runner and the ID of the casing pipe for carrier sizes of 6 inch through 12 inch. A maximum of 2 inch clearance shall be provided between the top runner and the ID of the casing pipe for carrier pipe sizes of 18 inch through 64 inch.

D. The liner around the carrier pipe shall have a flexible PVC liner of 0.09 inch thickness with a Durometer "A" 85-90 hardness and a minimum 58,000 volt dielectric strength.

E. Runners shall be of high-pressure molded glass reinforced polymer with a minimum compressive strength of 18,000 psi, 2 inch in width and a minimum of 8 inches long. Polyethylene runners are not an acceptable alternative.

F. The runners shall be attached to the band or riser by 3/8 inch welded stainless steel studs and lock nuts, which shall be recessed far below the wearing, surface on the runner.

G. The band section shall be bolted together with 304 stainless steel studs, nuts and washers. Hardware shall be 5/16 inch for carrier pipes up to 36 inch diameter and 3/8 inch for carrier pipes 36 inch and larger.

H. A minimum of three casing spacers shall be required for each joint of carrier pipe (each end and middle) within casing pipe.

I. End seals shall be a pull-on or wrap around with stainless steel bands. End-seals shall be made of 1/8 inch compounded synthetic rubber.

J. Approved Manufacturers:
   1. Advance Products & Systems, Inc.
   2. Power Seal Pipeline Products, Inc.
   3. CCI Pipeline Systems, Inc.
   4. J-Four Pipeline Products, Inc.

# STORM DRAIN MATERIALS

Latest revision 01-01-14

# STORM DRAIN MATERIALS

Latest revision 01-01-14

## 1. REINFORCED CONCRETE PIPE

A. In accordance with AASHTO M-170.
B. Pipe class as shown on the drawings.
C. Joints to be tongue and groove.
D. Joints shall be watertight under full flow conditions.
E. No grouting of any kind will be permitted on RCP joints.
F. All storm drain pipe installed below roadbed and curb shall be reinforced concrete pipe.

## 2. CORRUGATED METAL PIPE (ALUMINIZED OR GALVANIZED)

A. In accordance with AASHTO M-36. Base metal per AASHTO M-274 for aluminized pipe; base metal per AASHTO M-218 for galvanized pipe.
B. Gage thickness, unless otherwise indicated on the drawings.
    1. 24" diameter shall be 16 gage.
    2. 30"-36" diameter shall be 14 gage.
    3. 42" diameter or greater, refer to drawings.
C. Coating materials in accordance with AASHTO M-190.
D. Pipe may be fabricated with either annular or helical corrugations:
    1. Annular corrugated pipe or pipe-arch:
        a. Riveted construction with rivets on exterior crest of corrugations.
        b. Connecting bands to be same material as pipe and provided with bituminous coating. Dimpled bands not permitted. Minimum width to be 7" for round pipe 30" in diameter or smaller or pipe-arch 35" x 24" and 12" for all others.
        c. Minimum gage of bands to be 16-gage for 16 and 14-gage pipe, 14-gage for 12-gage pipe, and 12-gage for 10 and 8-gage pipe.
    2. Helically corrugated pipe or pipe-arch:
        a. Butt-welded or continuous lock seam construction.
        b. Minimum of 2 annular corrugations on ends where connecting bands are used.
        c. Connecting bands to be same material as pipe with bituminous coating and shall be annular corrugated
        d. Dimpled bands not permitted
        e. Minimum width of bands: 10" for all sizes.
        f. Minimum gage of bands: 16-gage for all sizes.
E. Two lifting lugs shall be firmly fixed to the pipe to facilitate handling.
F. Bituminous Coating
    1. Uniformly coated by immersion in hot bitumastic material in two stages.
    2. Minimum thickness at crests of corrugations shall be 0.05 inches.
G. Full smooth - Interior paving
    1. In pipe segments shown in the drawings.
    2. Fill pipe interior with additional bitumastic material to achieve minimum 1/8" thickness over corrugations to provide a smooth interior surface.
    3. Square edges on interior lining at pipe ends where required.

3. CORRUGATED HDPE DRAINAGE TUBING (ADS N12 or approved substitute)

   A. 4" to 10" inside diameter.
   B. High Density Polyethylene double wall Pipe (HDPE) is corrugated polyethylene pipe having a smooth interior, which has a Mannings roughness coefficient of 0.013 or lower. The HDPE pipe and fittings shall meet the requirements of AASHTO M252, latest revision.
   C. As specified by the Engineer, the HDPE pipe shall be joined by:
      1. Bell type coupling or bell type integral joint and shall be watertight to 2 psi maximum acceptable leakage of 200 gallons/inch of diameter/mile/day. Joints shall remain watertight when subjected to a 1.5□ axial misalignment. Bell type coupling shall be installed at the factory by the manufacturer.

4. CORRUGATED HDPE PIPE (ADS N12 or approved substitute)

   A. 12" and larger, inside diameter.
   B. High Density Polyethylene Pipe (HDPE) is corrugated polyethylene double wall pipe having a smooth interior, which has a Mannings roughness coefficient of 0.013 or lower. The HDPE pipe, joints and fittings shall meet the requirements of AASHTO M252 or AASHTO M294, latest revision or be approved by the Engineer
      1. Bell type coupling or bell type integral joint and shall be watertight to 2 psi maximum acceptable leakage of 200 gallons/inch of diameter/mile/day. Joints shall remain watertight when subjected to a 1.5□ axial misalignment. Bell type coupling shall be installed at the factory by the manufacturer

5. POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

   A. SDR 35
      Manufactured per ASTM D 3034, SDR 35 for 4" – 15" and or ASTM F 679 for 18" – 27".
      1. Rubber ring joint to provide for expansion and contraction.
      2. Pipe and fittings shipped with gaskets not in place will not be accepted.
      3. Maximum SDR of 35.
      4. Minimum pipe stiffness F/Y = 46 psi.
         a. at 5% deflection when calculated in accordance with ASTM D2412.
   B. Joints
      1. Johns-Manville Ring-Tite integral bell type or approved substitute.
      2. Solid cross-section rubber O-ring gasket securely locked in place to prevent displacement.
      3. Shall withstand 25-psi internal pressure without leakage.

4. Rubber gaskets
   a. shall comply with ASTM D1869.
   b. lubricant shall have no detrimental effect on gasket or pipe.
5. Manhole connections must be made with elastomeric gasket to provide flexibility and water tightness.

C. Pipe Markings
1. The following information is to be marked on pipe at five foot intervals:
   a. Manufacturer's name or trademark
   b. Nominal pipe size
   c. PVC Cell classification
   d. The legend (e.g., "Type PSM SDR 35 PVC Sewer Pipe")
   e. Date and location of manufacture

D. Installation
1. SDR 35
   To be in accordance with ASTM D2321 and TR-614A by the Johns-Manville Company for SDR 35.

E. Deflection
1. Deflection of storm drain pipe is not permitted.

## 6. MANHOLE AND INLET - BRICK AND MORTAR

A. All new manholes and inlets shall be precast concrete. This section shall only apply to filling pipe annular space where permitted by SPW.
B. Brick shall conform to ASTM C32, Grade MA Sewer Bricks.
C. Six brick absorption shall not exceed 14%.
D. Sample shall be provided for inspection one week prior to use.
E. Mortar cement shall be mixed to provide 1 part Portland cement and 2 parts clean sand.
F. Brick shall not be permitted to bring frame to finish grade. Only concrete rings will be allowed.

## 7. MANHOLE FRAMES AND COVERS

A. Size and type per standard details.
B. East Jordan Iron Works # 154514 Frame or approved SPW substitute.
C. East Jordan Iron Works # 154524 Cover or approved SPW substitute.
D. Only 9" Frames are permitted.
E. Rated for H 20 loading.
F. Frames shall be anchored to structure per SPW Standard Details.
G. Frames shall be set in ½" minimum bed of mortar.

## 8. PRECAST CONCRETE MANHOLES

A. Size per standard details.
B. In accordance with ASTM C-478.
C. Contractor to provide detailed drawings of each manhole prior to shipment and installation.
D. Joints shall be provided with rubber O-ring gasket meeting ASTM C-443 and shall be watertight when installed.
E. Annular space between pipe and pipe openings, including future stubs, shall
    1. Be sealed with a SPW approved non-shrink type grout (Full Depth).
    2. Be provided with a flexible rubber pipe to manhole seal that
        a. Shall be watertight under a five foot vertical head, and
        b. Meets the requirements of ASTM C923-79 (Draft 3).
F. Lifting holes shall be provided to assure a "safe" lift without slippage. If lifting hole projects through manhole, fill hole with non-shrink cement.
G. Steps shall be vibrated in place when cast into walls and shall be set vertically per OSHA requirements.
H. Flow channels shall be constructed of SHA concrete Mix #2.
I. Field cutting/altering of pre-cast manholes is not permitted.

## 9. MANHOLE STEPS

A. Reinforced polypropylene plastic.
    1. Per SPW standard details.
    2. Per OSHA standards.

## 10. INLET FRAMES AND GRATES

A. Class "NR" shall in accordance with SPW Standard Details.
B. Type “A-1” and “B-1” frames and covers.
    1. Cover shall be pre-cast concrete with a cast iron sidewalk frame and cover.
    2. Sidewalk cast iron frame - 4" deep with 20" clear opening.
    3. Sidewalk cast iron cover shall weigh no less than 100 pounds.
    4. Shall meet ASTM A-48.
    5. In accordance with SPW Standard Details.

## 11. RIP-RAP

A. Shall be stone.
B. Stone specific gravity shall be at least 2.5.
C. Dimensions:
   1. Minimum is 4" in any class or dimension.

| | $D_{50}$ | Max Diameter | Bed Thickness |
|---|---|---|---|
| 2. Class I | 9.5" | 15" | 19" |
| Class II | 16" | 24" | 32" |
| Class III | 23" | 34" | 46" |

D. Rip-rap shall be underlain by a Class "C" geotextile and installed in accordance with the approved plan.

## 12. PRECAST INLETS

A. Inlets shall be precast concrete.
B. Contractor to provide detailed drawings of each inlet to SPW for approval prior to shipment and installation.
C. Lifting holes shall be provided to assure a "safe" lift without slippage. If lifting hole projects through inlets, fill hole with non-shrink cement.
D. Steps shall be vibrated in place when cast into walls and shall be set vertically per OSHA requirements.
E. Flow channels shall be constructed of SHA concrete mix #2.
F. Field cutting/altering of precast inlets is not permitted.

# CONSTRUCTION METHODS
# ROAD CONSTRUCTION
Latest revision 01-01-14

# CONSTRUCTION METHODS
# ROAD CONSTRUCTION
Latest revision 01-01-14

## 1. GENERAL

A. This specification encompasses street construction within the City of Salisbury Corporate Limits. Any conflict between these construction methods, and specification or plans from sources outside the Public Works Department shall be brought to the attention of the City Engineer and will be considered not acceptable unless approved by the Engineer before construction. All construction methods are considered minimum standard.

## 2. RIGHTS OF VARIOUS INTERESTS

A. Wherever work being done by the owner's forces, utility companies or by other contractor's forces is contiguous to work covered by this contract, the respective rights of the various interests involved shall be established by the engineer to secure the completion of the various portions of the work in general harmony.

## 3. ENGINEER

A. The term "Engineer" as used in these specifications refers to the designated representative(s) of the City Public Works Department on this job. During normal working day, call Department of Public Works at (301) 548-3170 or visit the Department in room 202, Government Office Building, 125 North Division Street and Route 50, Salisbury, Maryland 21801.

## 4. CONCRETE CONSTRUCTION

A. Curb, gutter and sidewalk shall be constructed by a City approved curb gutter and sidewalk contractor, approved before construction.
B. The Contractor will be responsible for damage to existing curb, gutter and sidewalk during construction. All disturbed or damaged areas shall be replaced in-kind to equal or better condition at no additional cost to the City.

## 5. STORM DRAIN AND INLETS

A. All storm drain piping and inlets will be installed by contractors approved by City before construction.

## 6. MANHOLES AND VALVE BOXES

A. Exposed Utilities in the streets, and other areas are set to a rough grade, by the Utility Contractor, using grades on the utility construction plan or as directed by the Engineer. Manholes, valves, etc. must be adjusted to final grade by roadway Contractor. Unless otherwise specified, the Contractor will raise existing manholes, valve boxes, etc. to the proper grade before blacktopping.

1. Streets
   The Contractor shall construct streets using applicable City Standard details. The Contractor must adjust manholes and water valve boxes to grade, cross slope and minus ¼" of proper elevation. Elevations will be supplied (on a cut sheet) by the Developer's layout personnel. Use of a string line and the top of curbing is the recommended procedure for final adjustment.
2. Parking lots, grass areas, etc.
   Adjust manholes, valves, etc. to the finish grade in all areas, unless otherwise instructed by Engineer.

B. When instructed by the Engineer, the manholes and water valve boxes will be ringed with 8" wide by 8" deep City approved concrete.

C. The Contractor will be responsible for any damage to manholes and water valve boxes during construction.

## 7. EXISTING UTILITIES STRUCTURES

A. The Contractor will be responsible for damage to existing structures during construction. All disturbed or damaged areas shall be replaced in-kind to equal or better condition at no additional cost to the City.

## 8. TRAFFIC CONTROL

A. Unless otherwise specified all signs, arrow boards, barricades, lights, flagmen, etc. needed for maintenance of traffic shall be furnished by the Contractor. All traffic control devices shall be properly maintained to insure that the general public's safety is never jeopardized. All traffic control devices are to conform and adhere to those specified and set forth in the Maryland Manual on Uniform Traffic Control Devices.

B. A traffic control plan must be approved by the City when working on a City of Salisbury street is required and a traffic control plan must be approved by the State of Maryland when detouring or signing for construction, on or adjacent to State Highway roads.

9. COMPACTION TESTS: See "General Conditions" - Testing Procedures

   A. The Engineer may at his discretion require compaction and or proctor test results from an approved agency hired by the Contractor or developer when soil conditions are considered to be marginal for roadway construction. Testing procedures, as outlined in "General Conditions" - Testing Procedure shall be adhered to by the testing agency.

10. ROADWAY PROOF ROLL: See "General Conditions" - Testing Procedures

   A. The Contractor will be required to proof roll materials to determine if roadway is acceptable for stabilization and paving. The roadway shall be proof rolled as described in "Testing Procedures", unless otherwise directed or approved by Engineer.

11. MANHOLE WORKMANSHIP AND SAFETY

   A. All work shall be done by qualified workers using proper equipment. The contractor shall be responsible for maintaining a safe working condition in and around the manhole area. This shall include but not be limited in testing of the atmosphere in the manholes prior to entering and also continuously during the workday. The atmosphere is to be checked for flammable gas, toxic gas (including hydrogen sulfide) and oxygen deficiency. Provision for proper ventilation of the atmosphere in the manhole in order to insure a safe working environment shall be the responsibility of the contractor. All electrical equipment must be explosion-proof (also lighting). Specific attention must be paid to the possible presence of flammable gas, toxic gas, and oxygen deficiency in manholes.
   B. The Contractor shall stop work, except ventilation efforts, and clear the area if the atmosphere does not meet Maryland Occupational Safety Administration and OSHA requirements for confined space entry. All other MOSHA and OSHA requirements are to be met. This is the responsibility of the Contractor.

12. PAVEMENT MILLING

   A. The Contractor shall furnish a pavement-milling machine with operator for the milling of existing bituminous concrete. Milling machine shall be equipped with automatic sensor for grade control and be capable of removing, in one pass, a layer of asphalt pavement at the specified depth and at least half the lane width. At the time of bidding, the Contractor shall submit information and the type of machine he intends to use. The cold milling process shall be utilized. Unless otherwise specified the Contractor shall supply all manpower and equipment for milling and delivery of milled materials.

B. The Contractor will be responsible to check the pavement ahead of the milling operation for any buried metal objects such as manholes and valves. Unless otherwise specified milling materials from City streets shall belong to the City and shall be delivered by the Contractor to an agreed upon location for usage by the City. Maryland State Highway Standards Specification for Construction and Materials Section 508 will also be applicable unless otherwise directed or approved by the Engineer.
C. For areas that are less than 2000 square feet, a skid steer mounted with a 30" wide milling attachment may be utilized as long as the proper grade and profile of the road surface can be maintained.

13. INSPECTION SCHEDULE

A. An inspection shall be made by the Engineer, of the rough graded subbase before continuing construction to assure material is suitable for construction without additional undercutting.
B. An inspection shall be made by the Engineer, of the graded select borrow or existing material before placement of stone. The Engineer shall determine satisfactory compaction and proper cross section grade according to the template.
C. An inspection shall be made by the Engineer, of the placed and fine graded stone stabilization before placement of Bituminous Asphalt. The Engineer shall determine proper cross section grade according to the template and proper adjustment of manholes, water valve boxes, and other structures.
D. A pre-final inspection of all areas of construction will be made by the Engineer at which time a punch list of unfinished or unsatisfactory construction items will be submitted to the Contractor.
E. After completion of punch list items, a final inspection of all construction areas shall be made by the Engineer, before total acceptance of work by the City and before the beginning of warranty period by the Contractor.
F. If the Engineer deems it necessary, the Engineer may require at his/her discretion additional inspections or eliminate inspection steps throughout the construction period.

14. UNSUITABLE MATERIAL

A. Where existing or placed base soil is of unsuitable material, the Engineer at his discretion may require removal and replacement with approved select borrow. Existing material, which would normally be acceptable but was removed due to excessive moisture, may be used after adequate removal of moisture at the Engineers discretion.

15. MOISTURE CONTENT OF MATERIAL

A. Where material is determined, by Engineer, to be to dry for proper compaction, paving, or dust control, the Engineer may require the Contractor to incorporate a wetting technique, such as placement of water on the material, or an application of calcium chloride. The wetting technique must be approved by the City before application.
B. Where material is determined, by Engineer, to be too wet for proper compaction or paving, the Engineer will require the Contractor to remove material or suspend construction operations until a proper drying technique can be performed or suitable backfill is brought to the site. The method utilized by the contractor must be approved by the Engineer.

16. DRAINAGE

A. Where ground water or runoff due to construction or other factors is encountered the Engineer may require suitable under drainage of roadbed or other drainage relief as deemed necessary. Contractor shall not leave roadway in a condition so as to impede drainage or pocket water when storms are expected and when leaving construction area for extended time periods such as over the weekend.

17. SEDIMENT CONTROL

A. Sediment control requirements, per Soil Conservation "Standards and Specifications for Soil Erosion and Sediment Control in Developing Areas" latest revision, shall be adhered to when soil is disturbed.

18. TYPICAL STREET SECTIONS

A. Unless otherwise specified, all streets shall be constructed to City of Salisbury typical sections and templates for the street as designated by the Engineer. All streets shall be constructed as shown on template drawings.

19. CONSTRUCTION SEQUENCE

A. Shall be as specified or shown on plan or as directed by the Engineer.

20. Roadway Patching

A. See Page CMU-4 Section 11

# MATERIALS
# ROAD CONSTRUCTION
Latest revision 01-01-14

# MATERIALS
# ROAD CONSTRUCTION
Latest revision 01-01-14

## 1. MATERIALS, EQUIPMENT AND CONSTRUCTION PROCEDURE

A. Bituminous concrete and wearing course shall be constructed in accordance with - Section 500 Paving, of the Maryland State Highway Administration Standard Specifications for Construction and Materials.

## 2. BITUMINOUS SURFACE COURSE & BASE COURSE

A. Bituminous concrete material to be used on this project will be placed in depths as shown on plan and/ or as directed by the Engineer. The Contractor will submit an approved Maryland State Highway Administration Mix Design to the Engineer at least one (1) week prior to actual construction and receive approval before starting.

## 3. BITUMINOUS CONCRETE TESTING

A. Testing shall conform to Maryland State Highway Administration Specifications, latest edition, with errata and addenda.
B. The City of Salisbury reserves the right to require the Contractor to provide testing to insure proper asphalt content of the mix, and specified compaction requirements of the in place mat.

## 4. MINERAL AGGREGATE

A. Shall be 100% commercially graded aggregate and shall conform to Maryland State Highway Administration Specifications, latest edition, with errata and addenda. It shall be dried and brought to the mixer at a temperature between 250□F. and 350□F. It is the intent that when combined with asphalt cement, the resultant bituminous concrete mixture shall be at a temperature of between 250□F. and 300□F.
B. The principle aggregate shall be crushed stone of gradation and specific gravity suitable to the Engineer.
C. A controlled amount of commercially graded washed sand and special gradations of crushed stone will be permitted not exceed 50% of the batch.
D. THE ENGINEER RESERVES THE RIGHT TO DISAPPROVE ANY SOURCE OF AGGREGATE WHICH, IN HIS OPINION, IS UNSUITABLE FOR USE ON THIS CONTRACT. APPROVAL OF SOURCE OF AGGREGATE SHALL BE SECURED BEFORE SUBMITTAL OF BID.

5. BORROW EXCAVATION

A. Borrow material shall meet the requirements of Maryland State Highway Administration Classification A-2 or better, with maximum P.I. of 10.0 and a dry weight not less than one hundred and ten (110) pounds per cubic foot as determined by "Standard Laboratory Method for Test for Compaction and Density of Soil", A.A.S.H.O. Designation T-180.

B. THE ENGINEER RESERVES THE RIGHT TO DISAPPROVE ANY SOURCE OF AGGREGATE WHICH, IN HIS OPINION, IS UNSUITABLE FOR USE ON THIS CONTRACT. APPROVAL OF SOURCE OF BORROW MAY BE SECURED BEFORE SUBMITTAL OF BID.

6. STONE

A. Material shall meet the requirements of Maryland State Highway Administration CR-6, GAB Crushed Stone or Recycled Concrete. All stone or Recycled Concrete shall be composed of clean, hard crushed stone and shall be free from excess of thin or elongated pieces, frozen lumps, vegetable or other deleterious matter, organic matter, metal, wood Etc. and not become slippery under conditions of wetting. In all other aspects, the stone or Recycled Concrete shall meet the requirements of the Maryland State Highway Administration's Specifications for Materials, Highways, Bridges and Incidental Structures except as may be otherwise noted in this specification.

B. THE ENGINEER RESERVES THE RIGHT TO DISAPPROVE ANY SOURCE OF AGGREGATE WHICH, IN HIS OPINION, IS UNSUITABLE FOR CONSTRUCTION. APPROVAL OF SOURCE OF STONE SHALL BE SECURED BEFORE SUBMITTAL OF BID

7. RC6 (RECYCLED CONCRETE)

A. **RC6 Recycled Concrete to be used as roadway stabilization only, not to be used as pipe bedding, not to be in contact with metals i.e. manhole frames, water valve boxes, utility mains, etc. A minimum 3' separation shall be provided.**

B. Material must meet the requirements of Maryland State Highway Administration CR6 Crushed Stone in addition to Salisbury Public Works requirements for Stone M-3 #7 and requirements listed herein. The following supplemental items and testing requirements are required for acceptance of recycled concrete (RC6) as stabilization on City of Salisbury Roadways:

1. For every 500 tons or fraction thereof.

2. Upon receipt of passing test reports performed by a licensed professional engineering consulting firm Salisbury Public Works will approve RC6 stock piles for use within City of Salisbury Right of Ways or Easements. Stockpiles at the time the test samples are taken shall be designated as captive, meaning no new material may be added.
3. Salisbury Public Works representative shall meet the approved engineering consulting firm on site and determine sampling locations for all testing.
4. Base paving shall be placed within reasonable time after placement of RC6 due to possible leaching.
5. Questionable loads delivered to any site may at the inspector's discretion require retesting.
6. Per the Maryland State Highway Administration Standard Specifications for Construction and Materials:
    a. One sieve analysis for aggregate grading requirements per table 901A.
    b. One Sodium Sulfate test will be required per 5,000 ton captive stockpile or portion thereof. Additional tests may be required at the Engineer's discretion per SHA table 901B.
    c. One Flatness & elongation test will be required per 5,000 ton captive stockpile or portion thereof. Additional tests may be required at the Engineer's discretion per SHA table 901B.
    d. One Los Angeles Abrasion test will be required per 5,000 ton captive stockpile or portion thereof. Additional tests may be required at the Engineer's discretion per SHA table 901B.
    e. Material sources may be rejected where it is evident that the material tends to be of marginal quality when compared to the Specification limits of its specified properties per SHA 900.01.
    f. Materials represented by samples taken and tested in accordance with the specified tests and failing to meet required values shall be considered to be defective regardless of prior tests or approvals per SHA GP-6.03.
    g. The cost of replacing, correcting and or removal of defective material will be the responsibility of the contractor, developer, owner, or material vendor per SHA GP-6.03 d.
    h. One Analysis of aggregate physical property requirements test will be required per 5,000 ton captive stockpile or portion thereof. Additional tests may be required at the Engineer's discretion per SHA table 901B

C. Per EPA method 9045C Soil and Waste PH.
    1. One PH test with results greater than 2 and less than 12.5 (EPA Corrosivity Limits)
    2. EPA Toxicity Characterizing Leaching Procedure (TCLP) test will be required per 5,000 ton captive stockpile or portion thereof. Additional tests will be performed at the Engineer's discretion where any material is suspected to be hazardous or toxic per SHA TC-6.09 and SHA TC-6.10.

## 8. TESTING

A. The City of Salisbury reserves the right to require the Contractor to provide any testing to insure that the placement of material and the material itself conforms to City of Salisbury specifications.

## 9. ROADWAY SUBGRADE CONSTRUCTION

A. Subgrade preparation
   1. Prior to any work being performed on roadways, a determination shall be made by an licensed engineering or geotechnical firm and submitted to the City of Salisbury Department of Public Works (SPW) and developer as to type of stabilization to be utilized and the type and thickness of paving to be used.
   2. The type of stabilization used with this specification is Crushed Stone GAB. For stabilization types other than Crushed Stone GAB advance approval is required in writing from the SPW prior to any work being performed.
   3. Before grading is started, the entire right-of-way area shall be first cleared of all stumps, roots, brush and other objectionable materials and all trees not intended for preservation. All tree stumps, boulders and other obstructions shall be removed to a depth of two (2) feet below the subgrade.
   4. At the discretion of SPW, material from roadway cuts conforming to the standard for select fill may be used on-site as needed.
   5. When unsuitable material is encountered, the unsuitable material shall be removed as directed by the SPW. The unsuitable material shall be replaced with acceptable cut material from the project or of borrow excavation in accordance with the City of Salisbury Public Works Construction and material Specifications and section 203- "borrow excavation" (select borrow) of Maryland S.H.A. latest edition specifications including all errata and addenda. Compaction and moisture control for the materials finally used shall be accomplished in accordance with section 204- "embankment and subgrade" of Maryland S.H.A. specifications including errata and addenda.
   6. The roadways and their appurtenances shall be graded to the proper cross-section as shown in the City of Salisbury Book of "Construction Standards" and to the lines and profile grades shown on approved plans. The acceptability of the final subgrade shall be determined by the SPW before any stabilizing aggregate is applied.

B. Roadway subgrade stabilization for good, medium, and poor soils
   1. Subgrade preparation roadway subgrade stabilization for good, medium and poor soils % of dry density modified proctor to establish California bearing ratio values. The subgrade must be tested at 95 subgrade with CBR above 20 will be classified as good class subgrade, CBR between 5 and 20 will be classified as medium class subgrade and CBR less than 5 as poor class subgrade. Compaction of the aggregate subbase % modified proctor density.
      a. good class subgrade- CBR above 20 = use 6 inches of Crushed Stone GAB (ASTM d2940(h)).
      b. medium class subgrade- CBR 5 to 20 = use 10 inches of Crushed Stone GAB (ASTM d2940(h)).
      c. poor class subgrade - CBR 2 to 5 = use 14 inches of Crushed Stone GAB (ASTM d2940(h)). Tensar bx1200 or equal with 10-inches of stone.
      d. very poor class subgrade - CBR less than 2 = design must be approved by the SPW and unsuitable material shall be removed and replaced with select borrow as directed by the SPW.
   2. Crushed Stone GAB stabilization shall be applied by an approved mechanical spreader or approved alternate at the rate designated. After the stabilizing aggregate has been applied at the designated rate, the aggregate shall be carefully shaped so as to avoid segregation, brought to the proper grade and cross-section and thoroughly compacted. Water shall be added by sprinkling in sufficient quantity to attain proper compaction. Compaction and moisture control shall be accomplished in accordance with section 501-"aggregate base courses" of Maryland S.H.A. latest edition specifications including all errata and addenda.
   3. The SPW or their representative must be present as the stabilizing aggregate is being applied. Proof of aggregate weights shall be determined by certified weigh slips, which must be presented to the City of Salisbury representative prior to the stabilizing aggregate being applied.
   4. High ground water and field conditions significantly different than 95% dry density will require design review at the time of subbase placement.

C. CBR testing
   1. Soil sampling locations shall be determined by SPW prior to testing for new subdivision streets. Tests shall be at roadway entrances, intersections, cul-de-sacs, and 500 feet on center of roadway. Failure to get SPW approval of locations may result in the need for additional testing.
   2. Provide soil classifications at each location to a depth of 6 feet and note groundwater if encountered.
   3. Test and report shall conform to ASTM d-1883
   4. Road design will be based on CBR testing.

# CONSTRUCTION METHODS & MATERIALS CONCRETE

Latest revision 01-01-14

# CONSTRUCTION METHODS & MATERIALS CONCRETE

Latest revision 01-01-14

## 1. STANDARD DETAILS

A. The Contract or project as described shall be built in accordance with the "Construction Standards" Manual of the City of Salisbury, latest revision. Pertinent standard drawings are included in this contract. All others are available at the City of Salisbury Public Works Department.

## 2. VERTICAL ELEVATIONS & HORIZONTAL ALIGNMENT (Grades and layout)

A. Concrete construction which will be located inside of City R/W, Easements, Alleys, Street Beds, or is City maintained, or located on private property which connects to City maintained concrete; shall not be placed at any time without City approved horizontal alignment and/or vertical elevations.

B. Layout and/or cut sheets shall be submitted to City Engineer or representative in advance of construction (three (3) days minimum). Approval shall be in writing from the Engineer (Cutsheet stamped and signed by City Engineer or representative will be acceptable).

C. Contractor will be responsible for the removal and re-alignment of any unapproved concrete placed on private property which does not tie-in to City profile grades when approaching City maintained concrete. The amount of concrete to be removed and re-aligned shall be the City Engineer or representative's decision.

D. The City shall not be held responsible for any concrete construction on private property which does not provide proper drainage, due to prior design which insufficiently incorporates City profiled streets etc., into the site-work design.

## 3. METHODS, MATERIALS, WORKMANSHIP

A. Shall be as described in the Maryland State Highway Administration's "Specifications for Construction and Materials for Maryland State Highway Projects", latest revisions except as herein specified. The City of Salisbury reserves the right to reject all concrete construction which is not placed and finished as specified in City of Salisbury Specification and Details to a quality, which is consistent, with other concrete construction, accepted by the City, within the City Limits. The Contractor shall familiarize himself with existing concrete finishing standards and techniques considered acceptable in the City. The Engineer will, upon request, arrange a field tour of different concrete construction sites to help the Contractor establish the finished construction quality, which is expected from the Contractor when working in the City limits.

4. MINIMUM SAFETY PRECAUTIONS:

A. "CAUTION" Freshly mixed cement, mortar, concrete or grout may cause skin injury. Avoid contact with skin whenever possible and wash exposed skin areas promptly with water. If any cement or cement mixtures get into the eyes, rinse immediately and repeatedly with water and get prompt medical attention. Keep children away from cement powder and all freshly mixed cement products.

B. Take these simple precautions to avoid skin contact with cement powder, freshly mixed concrete, grout or mortar.

1. Wear rubber boots high enough to keep out cement products. Tops of boots should be tight to protect feet.
2. Wear rubber gloves to protect hands.
3. Wear long pants tucked inside boots to protect knees.
4. Wear knee pads when finishing concrete to protect knees.
5. Wear long-sleeved shirts buttoned on the sleeves and neck to protect upper body and arms.
6. Wear tight-fitting goggles when handling cement powder to protect eyes.

5. FORMING

A. All form work shall be completed with City of Salisbury Standard Curb, Gutter and Sidewalk steel forms, except short radii curves with a radius of 500' or less, and where approved by the Engineer. All steel forms will be straight and free of defects and debris.

6. JOINT FILLER

A. Shall be of a non-extruding bituminous fiber type conforming to A.S.T.M. Specifications (latest revision) for pre-formed expansion joint filler for concrete (non-extruding and resilient), latest revision.

B. Felt roofing paper, polyethylene, or other approved substitute joint material shall be placed around utility poles, anchors, signs, hydrants and other stationary objects in the sidewalk area. The material shall be placed flush with the finished grade of the sidewalk and extend the complete depth of the concrete.

## 7. CONCRETE BATCH DESIGN

A. The concrete mix used in performing this work shall be Maryland S.H.A. No. 3 (See S.H.A. Specifications Section 902, latest revision) and shall meet the approval of the Engineer.
B. Fly ash shall meet the requirements of A.S.T.M. C-618 pozzolan Class F and may be used as a partial substitute for cement when approved by the Engineer.
C. The concrete temperature shall not exceed 90EF. when delivered to the job-site or at any time prior to placement in the forms.
D. Type I - Portland Cement: Shall be used from October 1st thru May 1st and when the air temperature in the shade and away form artificial heat is 70EF or less, or as directed by the Engineer.
E. Type II Portland - Cement: Shall be used from May 1st thru October 1st and when the air temperature in the shade and away from artificial heat is above 70EF, or as directed by Engineer.
F. When required by the Engineer, Hi-Early strength concrete (S.H.A. Mix No. 6 having no less than 7.5 bags of Portland cement per Cubic yard, will be used. When Hi-Early strength concrete is used, the Engineer shall determine the period of time required for curing and the time necessary prior to opening construction to traffic. This shall normally be no less than 24 hours after placing.
G. Concrete must be supplied by a Maryland State Highway Administration approved batch plant.

## 8. PLACING AND FINISHING

A. Concrete not in excess of 3" slump shall be placed in a single layer and shall be scored as directed by Engineer, and finished by steel trowel, cork float, roller, broom, or by a combination of the above, as directed by the Engineer.

## 9. REINFORCING WIRE MESH

A. 6" x 6" - #10 gauge to meet A.S.T.M. Designation A-185 (latest revision).

## 10. REINFORCEMENT FOR CONCRETE STRUCTURES

A. Shall meet all the requirements of Maryland State Highway Administration "Standard Specifications for Construction and Materials" (latest edition) Sections 420 and 902. Reinforcement shall be deformed and must conform to A.S.T.M. A-615 GRADE 60. Size, location, and spacing shall be as shown on details.

## 11. CURING

A. A sample of the curing compound shall be submitted to the Engineer for approval, before use by the Contractor.

B. The temperature of freshly placed concrete shall be at least 50 degrees F and shall be maintained at a temperature in excess of 50 degrees F for a period of three (3) days after pouring and placement.

C. After the forms have been stripped and all necessary finishing completed, the Contractor shall apply **TWO (2)** APPLICATIONS OF APPROVED COLORLESS CURING COMPOUND. The second coat shall be applied in a direction perpendicular to the first coat. The compound shall form a uniform, continuous, coherent, film that shall not check, crack, or peel and be free from pin holes and other imperfections. If pin holes or other discontinuities exist, additional coat shall be applied within 30 minutes to the affected areas.

D. Concrete surfaces which are subjected to heavy rainfall within three hours after the compound has been applied shall be re-sprayed, by the Contractor, at no additional cost to the City. Concrete surfaces which in the opinion of the Engineer have insufficient coverage shall be re-sprayed, by the Contractor, at no additional cost to the City.

## 12. COLD WEATHER CONCRETE PLACEMENT

A. After November 15th of each calendar year no concrete is to be placed without special permission from the City Engineer's Office. The Contractor shall be governed by Maryland State Highway Administration Specifications, Section 501.0302 Cold Weather Concreting.

B. Principal among these is the following:

1. Do not pour concrete on frozen sub grade (suggest excavating for concrete on the morning of the day concrete is to be poured or place adequate insulation on prepared sub grade to prevent freezing).
2. Pour no concrete when the air temperature in the shade and away from artificial heat is 40 degrees F. or less, without specific permission from the Engineer.
3. Have available all times, to the job-site, adequate insulating cover material such as large burlap bags filled with straw or straw in between two layers of burlap or plastic sheeting. Under conditions where it might be expected that the air temperature will fall below freezing, these cover materials should be applied to all concrete and remain in place for five (5) days. In the event High-Early strength is poured, this may be reduced to three (3) days.
4. If the Contractor desires to use any other effective way of protecting against damage by cold weather, the Contractor shall have approval of the Engineer before placement at job-site.

5. Any materials which meet Maryland State Highway Administration cold weather concrete procedures will be satisfactory.

## 13. EXCAVATION AND BACKFILL FOR CONCRETE PLACEMENT

A. All excavation for concrete placement shall be incidental to the various items of this Contract. Backfilling with earth to the typical section shall be incidental to the various items of this Contract and will not be a pay item.

## 14. ACCEPTANCE OF COMPLETED WORK

A. The Contractor will be required to bring each curb, gutter and sidewalk improvement to a finished condition without undue delay.
B. The Contractor shall be entirely responsible for the safety of the public, until final acceptance of each job-site by the City.
C. The Contractor shall remove all forms, scrap lumber, excess earth, materials, and tools incidental to construction, and shall shape the earth in the vicinity of the improvement and leave it in a neat and presentable condition.
D. Upon completion of work at each job-site, the Contractor may submit a final completion report to the Engineer. The Engineer will cause final inspection to be made, in a reasonable amount of time, and formally accept each job-site for City maintenance.
E. Contractor payments will not be made on any areas, which have not been formally accepted by the Engineer.

# CONSTRUCTION METHODS & MATERIALS
# STREET LIGHTS
Latest revision 01-01-14

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1. STANDARD DETAILS

   A. The Contract or project as described shall be built in accordance with the "Construction Standards" Manual of the City of Salisbury, latest revision. Pertinent standard drawings are included in this contract. All others are available at the City of Salisbury Public Works Department.

2. METHODS, MATERIALS AND WORKMANSHIP

   A. Shall be as described in the Specifications for the project or as directed by the Engineer, or City of Salisbury, Traffic Department representative. Shall meet all local and national electrical codes. Handicap accessibility shall be maintained for sidewalks when placing poles and base.

3. MATERIAL APPROVALS

   A. A materials list showing all materials to be used for street lighting purposes shall be submitted to the City of Salisbury, prior to ordering or shipping of materials and/or delivery of materials to jobsite. The City reserves the right to standardize on specific brands or models, of products, when the Engineer or representative of the City feels it is in the best interest of the City to do so. It shall be the Contractors responsibility to use only materials previously approved, in writing, by the City for the project. See Approved Substitutes section.

4. POLE SPACING (Unless otherwise specified)

   A. Shall be 250' maximum distance from center of poles except when decorative lighting is installed. If decorative lighting is installed, then pole spacing shall be determined by wattage of lamp and manufacturer's recommended fixture spacing. Poles should be a minimum of 5' from any utility laterals.

5. POLE SIZE (Unless otherwise specified)

   A. Aluminum: (see construction standards detail Std. 600.01)
      a. Height = 28'0"
      b. Base diameter = 8"
      c. Top diameter = 4.5"
      d. Base bolt circle template = 10"
      e. Base bolt circle range = 10"-11"
      f. Base bolt spacing = 7-1/2" square.

g. Base flange casting = 10 ½" x 10 ½" outside.
h. Base flange casting = 13 5/8" diagonal.

B. If decorative lighting is used, pole height shall be determined by wattage of lamp and manufacturer's recommendations.

6. POLE MATERIAL (Unless otherwise specified)

A. Aluminum
   a. Manufactured by Hapco # 21-647
   b. Removable aluminum pole top.
   c. Cast aluminum base flange w/bolt covers.
   d. 2 (two) 1/16" base shims per pole.
   e. Arm bracket to be factory drilled for 4(four) 3/8" bolts.

B. Decorative poles shall be Hadco, SP 6855-14A, and approved by City.

7. POLE ARM

A. Aluminum
B. Spread = 8' (excluding luminaire)
C. Rise = 2'6" from center of bracket
D. Aluminum tube tapered & flattened.
E. Luminaire end of arm sized for 2" slip-fit luminaire.
F. Center of arm support bracket to be 6" below top of pole, before pole top placement.
G. Arm hardware to include 4 (four) 3/8" bolts, flat washers, and 1" I.D. Grommet.
H. Luminare to be installed with 30' minimum height, from centerline of luminaire to ground level.

8. POLE ACCESS HANDHOLE

A. Opening = 8"H x 4"W (when pole is vertical)
B. Reinforced frame and cover
C. 1/2'-13 NCR tap for electrical ground connection to cover.
D. Cover shall be mounted to pole and all hardware included.

9. LUMINAIRE (unless otherwise specified)

   A. Hubbell RLG-33 Cobrahead with RLD-25G38-3 power door, 250 W High pressure sodium lamp, with electric eye.
   B. For Metal Halide and Mercury Vapor applications, all power doors must be 400 W, unless otherwise specified, and power door must accept both Metal Halide and Mercury Lamps.
   C. All fixtures shall be equipped with photoelectric receptacles.
   D. All Luminaires or decorative fixtures to operate at 240v. (unless otherwise specified).
   E. Decorative lighting shall be Hadco, 56855-2B5NNG250SG, and approved by City.
   F. Decorative lighting circuits shall be controlled by approved lighting contactor controlled by photocontrol.

10. POLE BASE (for Aluminum poles)

   A. Concrete
      a. Top must be set level
      b. Bottom Diameter = 24" square
         Top Diameter = minimum 13" square.
      c. Depth = 42" minimum. Actual depth of concrete varies, according to soil conditions and possible under-ground conditions.
      d. Top of base to be set 2"-4" above proposed ground level or set to proposed top of curb grade, per City.
      e. Unless otherwise specified 2(two) 1-1/2" PVC electrical conduit elbows shall be installed in each base and extended above the base and outside the base on each side. The conduits shall be stubbed out at a depth of 18" below proposed ground level and placed to, couple to, main line conduits connecting pole to other poles or service.
      f. Galvanized Anchor bolts = 4 (four)- 1" diameter x 40" long anchor bolts placed on 10" bolt circle size and 7-1/2" square. 2 (two) anchor bolts must be placed, parallel with, and on the curbside of base. Top 12" of bolt is threaded and projects 4" above top of base.
      g. Mounting of pole-to-pole base: Install 2 (two) galvanized adjusting hex nuts to each anchor bolt (8 (eight) total). Install 2 (two) galvanized flat washers to each anchor bolt (8 (eight) total)

   B. Galvanized metal (Screw-In)
      a. AB Chance Co. # C1124NG4VP or approved substitute.
      b. Dixie # N 1202-0053

   C. Decorative base shall be Hadco, D1202-0231 Dixie Base, and approved by the City.

## 11. ALUMINUM POLE ADJUSTMENT

A. Pole shall be plumbed vertical, by Contractor, using 2(two) 1/16" galvanized shims below aluminum pole base flange. 4(four) hex nuts to be tightened securely after adjustment and covers secured in place over bolt ends.

## 12. CONDUIT AT/BETWEEN POLES OR TO SERVICE

A. Unless otherwise specified, it shall be 1-1/2" PVC Schedule 40 Electrical conduit.
B. Shall be 18" minimum depth at all locations, may be deeper where required by City or specification.
C. Shall be enclosed at all locations
D. Shall terminate in City approved box or fixture
E. Conduit installed under street will be IMC or approved substitute
F. Conduit shall be installed per approved site plan prior to lot driveway construction, lot sodding or roadway surface application.

## 13. ELECTRICAL SERVICE/METER PANEL MOUNTS

(Unless Otherwise Specified by City)

A. Metered Service - Pedestal
   a. Midwest part #M101 CP 6 HP or
   b. M208CP 6 HP for larger loads
B. Metered Service - Wood Mount
   a. Panel mount shall be constructed using 2" x 8" or 2" x 10" salt treated boards, which shall be fastened securely to 4" x 6" salt treated post(s). Top of post(s) shall be beveled to shed water. Boards shall be placed perpendicular to the post and boards shall be added to post(s) in a sufficient quantity, to allow for installation of the meter and panel on the same mount. Upright Post(s) shall be buried in the ground to a minimum depth of 4' below the finished ground elevation. Top of meter shall be mounted to height of 3' to 6' above finished ground elevation. Bottom of panel shall be mounted to a minimum height of 12" above finished ground level. Posts shall be plumbed vertically when placed in the ground. Top of mount shall be plumbed horizontally when placed in the ground.
   b. Service panel shall be Square "D" brand panel, approved by City before beginning construction.
C. Service to be located next to power source (ie: transformer pad).

14. ELECTRICAL WIRING (Must comply with the National Electrical Code)

A. Inside pole/Conduit (No direct burial accepted).
   a. Copper
   b. T.H.H.N. Insulation
B. In line fuses, 10 Amp 250 Volt, maximum size, required at handhole opening at each pole
C. Circuits shall be 240 volt.
D. Breakers shall be double pole and sized to accommodate load.

15. ACCEPTANCE OF COMPLETED WORK

A. The Contractor will be required to bring light poles, wiring, services, and other appurtenances to a finished operational condition without undue delay.
B. The Contractor shall be entirely responsible for the safety of the public, until final acceptance of each jobsite by the City.
C. The Contractor shall remove all materials, forms, scrap lumber, excess earth, materials, and tools incidental to construction, and shall shape the earth, and seed disturbed areas in the vicinity of the improvement and leave it in a neat and presentable condition.
D. Disturbed roadways and driveways shall be restored by an approved contractor for the particular repair, using materials, standards, and workmanship previously approved by the City. See City "Construction Standards" pertaining to each type of repair.
E. Upon completion of work at each jobsite, the Contractor may submit a completion report and any necessary Electrical Inspection Certificates to the proper Power Company representative. The Engineer or Traffic Department representative will also conduct a final inspection, in a reasonable amount of time, and formally accept each jobsite for City maintenance if all City specifications have been met.
F. Contractor payments will not be made on any areas, which have not been formally accepted by the Engineer.
G. The City will apply for Customer service and establish an account with the local Power Company, after receipt of certification from Contractor.
H. Contractor will maintain streetlights for a period of one (1) year from date of acceptance of completed work.

# TESTING PROCEDURES

Latest revision 01-01-14

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Latest revision 01-01-14

## 1. RESPONSIBILITY

A. Unless otherwise specified, testing shall be the responsibility of the Contractor. The City shall approve the Testing Agency before beginning of testing. Prior to roadway construction/re-construction, including but not limited to, paving and concrete, the required and acceptable test reports for all water, sewer, storm drain and roadway sub-grade must be approved by the City of Salisbury, Dept. of Public Works, technical support branch

B. All test reports must be submitted directly to Salisbury Public Works by the Testing Agency via fax, e-mail, hand delivery or the U.S. Postal Service.

C. Test reports must be delivered within 1 week of testing and prior to the placement of CR6, Crushed Stone GAB, paving, sidewalks, etc.

D. Testing Agencies must provide access to all documentation regarding tests performed within City of Salisbury Right of Ways and or Utility Easements to Salisbury Public Works upon request by the City.

E. All test reports must reflect:
   1. Type of material tested, including but not limited to CR6, Crushed Stone GAB, RC6, sand, select borrow, etc.
   2. The depth of the test from finished grade.
   3. Stationing of tests to correspond with pipe and or roadway stationing depending on test required.
   4. A written description of test performed i.e. a copy of technician's field report.
   5. The number of tests performed and the test results.
   6. A sketch or orientation map for tests taken.

F. Only items B, C and D apply to Bacteria Testing.

G. All Public Underground Infrastructure must be completely installed and backfilled, in accordance with SPW standards, within the phase of project, prior to any testing requiring observation and approval by SPW inspector.

## 2. SUB-GRADE COMPACTION

A. See Standard Detail Drawing in "Construction Standards" Manual.

B. Approved mechanical compactors required.

C. 95% of maximum soil density required below top 12" of street sub grade.

D. 97% of maximum soil density required on top 12" of street sub grade.
   1. Density by Modified Proctor Method (AASHTO T-180, AASHTO T-191)
   2. Contractor to conduct density tests. The cost of tests not meeting the density requirements shall be deducted from the Contractor's invoice.

E. Contractor shall perform compaction test at the time of backfill. If the Contractor is unable to have the tests done at the time of backfill the City is to be notified. The City will then have compaction test performed, this will be charged to the Contractor.

F. Backfill or sub-grade found not meeting above requirements shall be removed and re-compacted by the contractor in a manner determined by the SPW Inspector.
G. The moisture content of the select borrow base course material at the time of compaction shall be within 2% of the optimum.
H. The material shall either be moistened or dried, as needed, and thoroughly mixed before compaction. Field compaction shall comply with the requirements of the following AASHTO test methods as modified by the Department:
   1. AASHTO T 180 Method A, Moisture-Density Relationship; Modified Proctor Test.
   2. AASHTO T 191 Density By Sand Cone.
   3. AASHTO T 224 Coarse Particle Correction.
   4. AASHTO T 238 Density By Nuclear Methods.
   5. AASHTO T 239 Moisture Content by Nuclear Methods.
   6. AASHTO T 272 Method C, Moisture-Density Family of Curves.

## 3. WATER UTILITY PRESSURE TESTING:

A. SPW Inspector must be present to observe the pressurizing process for Water Mains and appurtenances.
B. No testing shall be observed or approved prior to SPW Inspector possessing approved Red Lined Drawings.
C. Contractor shall not operate any valves without a SPW Inspector present.
D. Pressurize Main to 150 P.S.I. at the high point of the Main.
E. Maintain for a minimum of one hour.
F. Repeat test after replacing section(s) of Main and/or appurtenance if previous tests have failed to hold required pressure. Sleeves or repair couplings will not be permitted in the replacement of failed Mains and/or appurtenances.
G. Contractor is required to furnish all labor, tools, and equipment for performance test(s).
H. When Air Test is permitted by SPW for Water utilities, the air compressor shall not have any oil (For Automatic Oil to Tools) discharging into water pipes. Test pressure and time requirements are the same as Hydrostatic method.
I. All Fire Service lines shall be tested per applicable code requirements. Refer to Wicomico County Fire Safety Inspector.

## 4. WATER UTILITY DISINFECTION

A. Contractor shall not operate any valves with out a SPW Inspector present.
B. Provide minimum residual chlorine content of 5 ppm after (12) twelve hours.
C. Flush utility to an approved discharge site, until maximum of 1.5 PPM residual chlorine content remains in the water pipe.
D. Utility must meet local Health Dept. requirements for bacteria levels for potable water before placing into service.

E. Utility piping for horizontal and vertical realignment shall be disinfected per SPW's requirement.
F. All test reports must be submitted directly to Salisbury Public Works by the Testing Agency via fax, e-mail, hand delivery or the U.S. Postal Service.
G. Passing test reports must be delivered within 1 week of testing and prior to the placement of aggregate base, paving, sidewalks, etc.
H. Testing Agencies must provide access to all documentation regarding tests performed within City of Salisbury Right of Ways and or Utility Easements to Salisbury Public Works upon request by the City.

5. TRACER WIRE TEST

A. Tracer wire test will be required for all non-metallic Water Mains and appurtenances.
B. Tracer wire Tests for Water Mains and/or appurtenances will be performed by SPW Utilities Branch. Contractor shall contact SPW Inspector 3 days prior to required testing, for scheduling. Failed sections shall be repaired by Contractor in manner approved by SPW inspector. Test will be repeated after repairs are made by Contractor.

6. SANITARY SEWER

A. SPW Inspector must be present to observe the pressurizing of Sewer Mains and appurtenances.
B. No testing shall be observed or approved prior to SPW Inspector possessing approved Red Lined Drawings.
C. Air testing under the conditions approved by the SPW Inspector will be required. Air testing of Gravity Sewer Mains and appurtenances shall be accomplished by applying 5 PSI of for 5 minutes. Air Testing of Sewer Force Mains and appurtenances shall be accomplished by applying 100 PSI of air for 1 hour.
D. Repeat test after replacing section(s) of Main and/or appurtenance if previous tests have failed to hold required pressure. Sleeves or repair couplings will not be permitted in the replacement of failing Mains and/or appurtenances.
E. Mandrel test (deflection test) shall be performed by the Contractor in order to verify the roundness and proper installation of the pipeline. Mandrel shall be approved by the SPW Inspector prior to use and shall meet the following requirements:
    1. See Standard Detail in "Construction Standards" manual.
    2. Mandrel shall have a diameter equal to 95% of the inside diameter of the pipe.
    3. Mandrel shall have an odd number of gauging plates. The minimum number of plates shall be nine (9) with a contact surface length equal to the inside pipe diameter plus two inches (2") for pipeline ten inches (10") in diameter and smaller. On larger diameters, the contact surface length shall equal the inside pipe diameter.

4. Mandrel shall be pulled through the pipeline from manhole to manhole by hand. If mandrel is unable to pass the pipe without applying excessive force, as determined by the SPW Inspector it will be construed as evidence that pipe has deflected more than five percent (5%) of the inside pipe diameter.
5. A permanent record of all testing with locations where excessive pipeline deflections occur shall be kept by the Contractor and forwarded to the Engineer after completion of testing on each line.
6. Repeat test after replacing section(s) of Main and/or appurtenance if previous tests have failed Mandrel Tests. Sleeves or repair couplings will not be permitted in the replacement of failing Mains and/or appurtenances.

F. Mirror Testing shall be required for Gravity Sewer Mains and/or appurtenances. Mirror Testing shall be performed by SPW Inspector. Contractor must replace all failed sections of Mains and/or appurtenances. Sleeves and/or repair couplings will not be permitted in the replacement of failed mains and/or appurtenances.
   1. Repeat test after replacing section(s) of Main and/or appurtenance if previous tests have failed Mirror Tests. Sleeves or repair couplings will not be permitted in the replacement of failing Mains and/or appurtenances.

G. Tracer wire Tests for Force Mains and/or appurtenances will be performed by SPW Utilities Branch. Contractor shall contact SPW Inspector 3 days prior to required testing for scheduling. Failing sections shall be repaired by Contractor in manner approved by SPW inspector. Test will be repeated after repairs are made by Contractor.

## 7. ROADWAY PROOF ROLL

A. A proof roll shall be performed with a fully loaded, ten-wheel dump truck to reveal any soft, yielding, or spongy areas. The equipment shall be run longitudinally with less than 18" (500 mm) of unrolled area between tire strips.
B. If the test rolling shows the subgrade to be unstable, the Contractor shall remove/replace, scarify, disc, aerate, or add moisture, and recompact the subgrade to the extent necessary to achieve stability. Acceptance of the proof roll by the Engineer will be a requirement prior to placement of subsequent lifts.
C. Compaction and/or modified proctor tests are to be used in areas where proof rolling is not sufficient to determine if existing materials are acceptable for road construction or as determined by the Engineer.