WYTHE COUNTY, VIRGINIA
BARRETT MILL WATER IMPROVEMENTS

February 2024

TECHNICAL SPECIFICATIONS

Prepared for
Wythe County

Prepared by
PEED & BORTZ, LLC
Civil and Environmental Engineers
20 Midway Plaza Drive Suite 100
Christiansburg, Virginia 24073
540-394-3214

22-24

SECTION 01100 – SUMMARY OF THE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Speedwell Water Extension

1. Project Location: South of Wytheville, VA on U.S. Route 21 south and Barrett Mill at the following locations:
   a. Division I-Grayson Turnpike and Barrett Mill Road water mains.
   b. Division II-Stone Meadow Lane, Carrington Lane, Whippoorwill Road, Edenwood Lane, Blackberry Drive, Homestead Lane and Lookout Drive water mains.
   c. Division III-Pump Station on Lookout Drive.

2. Owner: Wythe County, Virginia, Stephen D. Bear-County Administrator, 340 South 6th Street, Wytheville, VA 24382

B. Engineer Identification: The Contract Documents, dated February 2023 were prepared for this Project by Peed & Bortz, LLC, Civil and Environmental Engineers, 20 Midway Plaza Drive Ste. 100, Christiansburg, VA 24073.

C. The Work consists of installation of 4", 6" & 8" water mains and associated appurtenances. The Work also includes the construction of a local water booster station. The project location is southwest of Wytheville, Virginia.

D. Division I Contractor will install a project sign at location to be coordinated with Owner and VDOT.

E. Contractor will obtain current versions of all required VDOT forms. Forms provided in the Contract Documents are for reference only.

1.3 CONTRACT

A. Project will be constructed under three divisions.

   a. Division I- Grayson Turnpike and Barrett Mill Road.
   b. Division II- Eastern Area.
   c. Division III-Pump Station.

1.4 WORK SEQUENCE

1. General: The Work will be constructed in one phase.
2. Prior to construction, Owner and Inspector will meet with the Contractor for the first section of water main to be laid to verify materials, procedures, and expectations regarding the installation of the water line. Specific items to be discussed will be the general condition of the trench backfill (both initial and final), compaction methods, shaping the trench for bells, and any other construction issues.

3. Prior to installation of the first residential meter setter and box, Owner and Inspector will meet with the Contractor to verify materials, procedures, and expectations regarding the installation of the meter setter and box. Specific items to be reviewed are backfill of the setter base, alignment of the meter components for adjustment with the frame installed and depth of setter installation within the box. Contractor will utilize a meter blank to properly set the meter (and S-tube plus PRV) within the box during the installation.

4. Water Lines:
   a. The Division I Contractor will install water main from the existing water main at the intersection of Route 21 and Galilee Church Road north along Grayson Turnpike. The work continues along Grayson Turnpike until Barrett Mill Road, then along Barrett Mill Road down to the intersection with Whippoorwill Road.
   b. The Division II Contractor will install water main throughout the remainder of the project area generally east of Barrett Mill Road.
   c. The Division III Contractor will construct a water booster station on Lookout Drive.

1.5 USE OF PREMISES

A. Unless easements or property delineations are shown on the plans, all work will be performed in existing right-of-way, within County property, or within easements procured by the Owner.

B. VDOT Land Use Permit: Contractor will be responsible for application for permit, paying for permit fee, and providing bond for the Land Use Permit.
   1. Permit Fees and VDOT bonds are as follows:
      a. Division I — Fee: $2510 Bond: $985,000
      b. Division II — Fee: $2010 Bond: $610,000
      c. Division III — No VDOT fee or Bond
   2. Contractor will be required to provide a traffic management plan in accordance with the latest version of the Virginia Work Area Protection Manual to VDOT as part of the LUP submittal.
   3. All land use permit applicants will be required to provide at least one person verified by VDOT in basic work zone traffic control for all activities involving installation, maintenance or removal of work zone traffic control devices within state maintained right of way. An employee verified by VDOT in Intermediate Work Zone Traffic Control will be required to be on-site to provide supervision during work zone adjustments or changes to traffic control due to field conditions. These employees will provide evidence of these verifications upon request from VDOT personnel.
   4. All work on VDOT right of way must be in accordance with VDOT requirements, which will take precedence if there is any conflict with the plans/specifications.
   5. The Contractor will endeavor to keep the edge of the trench in any location no closer to the edge of pavement than the depth, or about 48”, to prevent undermining the pavement. Waterline installed between the edge of pavement and the guardrail with less than 4’ of clear space between the face of guardrail will require VDOT review of the trench and backfill along Route 21. VDOT (Mike Phipps 276-484-9335) shall be contacted to inspect these installations prior to backfilling at which point Gravel Shoulder Backfill may be required by VDOT. Contractor is responsible for any and all measures required to protect and/or relocate buried underground electrical, phone, cable or other utilities. After marking by Miss Utility, Contractor will review constrained work areas prior to construction with the Engineer to determine if Gravel Shoulder Backfill is necessary. Contractor will review (with Engineer) other site constrained areas (ditches within 2’ of EP with a backslope 1:1 or greater, less than 4’ of shoulder between EP and ROW, etc,) prior to construction to determine if Gravel Shoulder Backfill is warranted. Contractor will contact the Engineer prior to installation of any Gravel Shoulder Backfill to be paid for under the contract unit prices.
   6. Any pavement that is undermined or damaged shall be cut out and replaced in accordance with VDOT requirements within the LUP-OCPR. This detail also applies if any of the road crossings end up having to be open-cut instead of bored.
   7. Any guardrail that is damaged, undermined, or loosened by construction activities shall be repaired or replaced in accordance with VDOT guardrail specifications.

8. All trenches on the right of way shall be backfilled in lifts and properly compacted in accordance with VDOT requirements. Compaction testing should be performed by an independent third party testing agency, and the test reports will be required before the permit is completed and the bond is released.
9. There shall be no manholes or boxes, or any appurtenances installed in the ditchline or on the shoulder between the ditch and pavement. The top of any manholes or boxes installed on the shoulder of fill sections shall be approximately 2" below grade.
10. There shall be no fire hydrants or any other above grade appurtenances installed on the shoulder, in the ditchline, or within the clear zone as defined by the VDOT Road Design Manual, Appendix A-2. (See Table A-2-1 included in the Contract Documents.)
11. In general the waterline shall be installed below or beyond the end of drainage pipes and structures. Waterline installed above the pipe, with a full section of waterline pipe to be centered on the crosspipe, will require VDOT review to inspect these crossings before installation, and prior to covering.
12. All crossings of VDOT asphalt paved roadways will be jack & bore or directional drilled. Contractor may not open-cut roadway without written authorization from VDOT and in compliance with VDOT permits.

C. The Contractor shall provide all water required for earthwork operations. Wythe County will supply potable water for pipeline testing and disinfection equal to two times the pipeline volume. All water in excess of this volume will be purchased by the Contractor from the County.

D. The Contractor will contact individual property owners when the work crosses their driveway or otherwise impacts the use of their property.

E. The Contractor will coordinate all open-cutting of roadways, with the County and adjacent property owners to allow for through traffic at all times. If through traffic cannot be maintained continuously, notify the County, Engineer, and effected property owners at least 48 hours in advance. Contractor will make provisions to allow for through traffic as necessary. All roadways & access drives will be fully passable and the end of the workday.

F. Rural Development Mitigation Requirements: The work will be completed in compliance with the following requirements:

- All required Federal, State and Local permits will be obtained prior to beginning any construction activities.

- For any land disturbing activities equal to or exceeding 10,000 square feet, or equal to or exceeding 2,500 square feet in all areas subject to the Chesapeake Bay Preservation Act, an erosion and sediment control (ESC) plan must be approved by the appropriate local agency and approval official. Depending on local requirements, the area of land disturbance requiring an ESC plan may be less. The ESC plan must be approved by the locality prior to any land-disturbing activity at the project site. All regulated land-disturbing activities associated with the project, including on- and off-site access roads, staging areas, borrow areas, stockpiles and soil intentionally transported from the project must be covered by the project specific ESC plan. [References: Virginia Erosion and Sediment Control Law, Virginia Code 62.1-44.15 *et* seq.; Virginia Erosion and Sediment Control Regulations, 9VAC 25-840-30 *et seq.*]

- If Karst features are encountered during the project, please coordinate with Wil Orndorff at the Virginia Dept. of Conservation and Recreation to document and minimize any adverse impacts. If the project involves filling or "improvement" of sinkholes or cave openings, DCR would like detailed location information and copies of the design specifications. In cases where sinkhole improvement is for stormwater discharge, copies of VDOT Form EQ-120 will suffice. A link to the "Karst Assessment Guidelines" developed by the Virginia Cave Board for land development can be found at http://www.dcr.virginia.gov/natural-heritage/cavehome. Mr. Orndorff may be reached at (540) 553-1235 or Wil.Orndorff@dcr.virginia.gov.

- In order to protect the Northern Long Eared Bat, a time of year restriction will be implemented to prohibit any required tree removal from June 1-July 31 (pup season) and/or April 15-September 15 (active season).

- Fugitive dust caused by the movement of construction materials and construction equipment will be controlled by adherence to the Virginia Department of Environmental Quality (DEQ) regulations and 9 VAC 5-50-60 et. seq., which governs the abatement of visible emissions and fugitive dust emissions. Measures include, but are not limited to, the following: Use, where possible, of water or chemicals for dust control, Installation and use of hoods, fans and fabric filters to enclose and vent the handling of dusty materials, Covering of open equipment for conveying materials, and Prompt removal of spilled or tracked dirt or other materials from paved streets and removal of dried sediments resulting from soil erosion. Land clearing wastes (vegetative debris) generated during construction should be properly managed in accordance with applicable regulations and local ordinances. Shredding/chipping of vegetative debris and reuse on-site is recommended over open burning. If project activities include open burning or the use of special incineration devices, this activity must meet the requirements under 9 VAC 5-130-10 through 9 VAC 130-60 and 9 VAC 5-130-100 of the *Regulations* for open burning. In addition, the *Regulations* provide for, but do not require, the local adoption of a model ordinance concerning open burning. The applicant should contact local fire officials to determine what local requirements, if any, exist. Contact the local DEQ Regional Office with questions related to air pollution control and permitting.

- Construction will be limited to normal daylight hours, Monday – Friday, except in emergency situations.

- When encountering inadvertent or unanticipated discoveries, the following requirements will be implemented and included in on-site construction documents.

    1. Inadvertent discoveries on state and private lands shall comply with applicable state notification standards, federal laws, 36 CFR Part 800.13, and the A*CHP's Policy Statement Regarding treatment of Burial Sites, Human Remains, or Funerary Objects* (February 23, 2007). The Rural Utilities Service (RUS) applicants shall ensure that their contractors maintain a copy of the inadvertent discoveries plan onsite for review.

2. Discoveries on private and state lands:

    1. If historic properties are discovered, all work, including vehicular traffic must immediately stop within a 50ft. radius of the discovery.
    2. If discoveries are made that contain burial sites or human remains, all work, including vehicular traffic must immediately stop within a 100ft. radius of the discovery.
    3. For all discoveries work should also stop in the surrounding area where further historic properties, subsurface burial sites, or human remains can reasonably be expected to occur.
    4. The relevant law enforcement authorities will be immediately contacted by onsite personnel to reduce delay times, in accordance with tribal, state, or local laws. If law enforcement determines the remains to not be part of a criminal investigation or a crime scene, the applicant will notify the RUS, SHPO, and Indian tribes. The evaluation of human remains will be conducted at the site of discovery by an SOI-qualified professional. Remains that have been removed from their primary context and where that context may be in question may be retained in a secure location, pending further decisions on treatment and disposition.
    5. Within 48 hours of receiving notification of an inadvertent discovery, the RUS applicant and appropriate local authorities will inspect the work site to ensure that all work, including vehicular traffic, has ceased, and protect the area of discovery from looting and vandalism.
    6. All archaeologists or other specialists, as appropriate, employed in response to inadvertent discoveries will be SOI-qualified and have the knowledge to assess the resources within an undertaking's APE.
    7. Work may continue in other areas of the undertaking where no historic properties, burial sites, or human remains are present. If the inadvertent discovery appears to be a consequence of illegal ac-

tivity such as looting, the onsite personnel will contact the appropriate legal authorities immediately if the landowner has not already done so.

8. Work may not resume in the area of the discovery until a notice to proceed has been issued by the RUS. The RUS will not issue the notice to proceed until it has determined that the appropriate local protocols and consulting parties have been consulted.

3. Inadvertent discoveries on federal and tribal land shall follow the processes required by the federal or tribal entity.

- All work with the potential to effect roadways or other transportation facilities will be reviewed and coordinated with the VDOT District office and the local residency office. Construction along roadways will require some flagging of traffic, however, road closures will be limited and will be coordinated with VDOT and the County. Road signs should be provided to alert drivers, bicyclists and pedestrians of utility and construction work ahead, and any detours necessary to navigate around the utility work. All VDOT permits will be obtained prior to construction.

- Depending on local requirements, a Stormwater Management (SWM) plan may be required. SWM requirements should be requested from the appropriate County/Town office. [References: Virginia Stormwater Management Act, Virginia Code 62.1.44.15 *et seq.*; Virginia Stormwater Management Program Permit Regulations, 9 VAC 25-870-54 et seq.] Additional guidance may be obtained from DEQ's Office of Stormwater Management.

- For any land disturbing activities equal to or exceeding one acre, or equal to or exceeding 2,500 square feet in all areas of the jurisdictions designated as subject to the Chesapeake Bay Preservation Area Designation and management Regulations adopted pursuant to the Chesapeake Bay Preservation Act, the operator or owner of a construction project is required to register for coverage under the General Permit for Discharges of Stormwater from Construction Activities (VAR10) and develop a project-specific stormwater pollution prevention plan (SWPPP). The SWPPP must be prepared prior to submission of the registration statement for coverage under the general permit and it must address water quality and quantity in accordance with the VSMP Permit Regulations. General information and registration forms for the General Permit are available from DEQ at http://www.deq.virginia.gov/Programs/Water/StormwaterManagement/VSMPPermits/ConstructionGeneralPermit.aspx. [References: Virginia Stormwater Management Act, Virginia Code sections 62.1.44.15 *et seq.*; VSMP Permit Regulations, 9 VAC 25-870-10 *et seq.*]

- Solid wastes generated at the site will be reduced at the source, reused, or recycled. All hazardous wastes will be minimized. Any soil or groundwater that is suspected of contamination or wastes that are generated during construction-related activities must be tested and disposed of in accordance with applicable federal, state, and local laws and regulations. All construction waste, including excess soil, must be characterized in accordance with the *Virginia Hazardous Waste Management Regulations* prior to disposal at an appropriate facility. It is the generator's responsibility to determine if solid waste meets the criteria of a hazardous waste and is subsequently managed appropriately. If evidence of a petroleum release is discovered during implementation of this project, it must be reported to DEQ, authorized by Virginia Code §62.1-44.34.8 through 9 and 9 VAC 25-580-10 *et seq*. The removal, relocation or closure or the installation and operation of any regulated petroleum storage tanks (aboveground storage tank (AST) or underground storage tank (UST)) must be conducted in accordance with the requirements of the Virginia Tank Regulations 9 VAC 25-91-10 *et seq.* (AST) and/or 9 VAC 25-580-10 *et seq.* (UST). Contact the local DEQ Regional Office concerning the location and availability of waste management facilities in the project area, report petroleum contamination or to register fuel storage tanks.

- The use of herbicides or pesticides for construction or landscape maintenance should be in accordance with the principles of integrated pest management. The least toxic pesticides that are effective in controlling the target species will be used.

- For unavoidable impacts to streams and wetlands, the following practices will be implemented: use of directional drilling from upland locations; operation of machinery and construction vehicles outside of

stream-beds and wetlands; use of synthetic mats when in-stream work is unavoidable; stockpiling of material excavated from the trench for replacement if directional drilling is not feasible; and preservation of the top 12 inches of trench material removed from wetlands for use as wetland seed and root stock in the excavated area.

- If the project will impact any streams and/or wetlands, a Joint Permit Application (JPA) will be required. The Virginia Marine Resources Commission (VMRC) serves as the clearinghouse for the JPA used by: 1. US Army Corps of Engineers for issuing permits pursuant to § 404 of the Clean Water Act and § 10 of the Rivers and Harbours Act; 2. Department of Environmental Quality for issuance of Virginia Water Protection Permit pursuant to § 401 of the Clean Water Act, Virginia Code § 62.1-44.2 et.seq., Virginia Code § 62.1-44.15:5, and Virginia Administrative Code 9 VAC 25-210-10 et.seq.; and 3. Virginia Marine Resources Commission regulates encroachments on or over state-owned subaqueous beds as well as tidal wetlands pursuant to Virginia Code § 28.2-1200 through 1400.

- Any impacts to floodplains will be unavoidable and temporary. No permanent structures will be constructed within the 100-year floodplain. All disturbed areas will be restored to pre-construction contours and all denuded areas will be re-vegetated immediately.

- To comply with the spirit and letter of the MBTA, site clearing during breeding season will be avoided from the period March 15 to August 15. The applicant will consult directly with FWS and state wildlife agencies for locality-specific data on migratory birds and their nesting season. Should compliance with this seasonal restriction be unavoidable, a site survey must be conducted to determine the presence of any migratory birds. Implementation of FWS Nationwide Standard Conservation Measures may be required with the goal of reducing impacts to birds and their habitats. These measures are grouped into 3 categories: General, Habitat Protection, and Stressor Management. These measures are updated over time so the Conservation Measures website for the most up-to-date list may be found at: https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures/nationwide-standard-conservation-measures.php.

1.6 FUTURE WORK

A. Future Contract: No future contractors are anticipated at this time.

1.7 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "Master Format" numbering system.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred, as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.8 RECORD DRAWINGS

A. General: The Contractor will submit to the Engineer at the Final Completion inspection, record drawings of the project. Engineer will provide Contractor with one set of reproducible plan sheets upon request. The record drawings provided to the Engineer will be in a legible, reproducible format and show all revisions/changes to the plans made during construction, including horizontal and vertical location changes.

1. The Contractor will locate the following elements post construction:
   a. Water line horizontal alignment
      1) Locate straight alignment at intervals not to exceed 200 l.f.
      2) Locate alignment at all bends in excess of 8 degrees.
      3) Locate centerline of alignment on State Plane Coordinate system to +/- the diameter of the water line.
      4) Valves
      5) Fire Hydrants
      6) Meters
      7) Vaults
      8) Plugged or capped abandoned water lines
2. The Contractor will identify all depth changes which deviate from the plan drawings.

B. Contractor will provide a benchmark at the tank site consisting of a surveyed mark (chiseled concrete, nail in concrete, or other acceptable benchmark) with State Plane coordinates including elevation.

1.9 MATERIAL TESTING

A. Concrete testing: The Contractor will provide an approved testing agency to test concrete in accordance with the Specifications.

B. Earthwork and aggregate material testing: The Contractor will provide an approved testing agency to test earthwork and aggregate material in accordance with the Specifications.

1.10 SCHEDULE OF VALUES

A. Schedule of Values: The estimated unit prices from the Bid Form will serve as the schedule of values for each bid item citing estimated material quantities and the associated unit costs.

B. Water meters will be staked out by the inspector prior to installation. If, due to rock conditions agreed upon by the Contractor and Inspector, the service casing bore must be relocated from the design location, the Contractor will be responsible for installing service line within the ROW back to the design water meter location. Any additional service line will be paid for at the contract unit price.

C. Service Crossing of VDOT Roadways-Rock Conditions
1. Contractor will notify the Inspector if he believes that a service bore will not be able to be installed in the design location due to rock conditions.
2. Contractor will be required to attempt one Service Casing installation at the design location or a relocated location. Should this installation fail and the Contractor opts to utilize the successfully installed portion and complete the casing with the Service Casing-Guaranteed Install, Contractor will be paid the Service Casing length successfully installed at the appropriate unit price. The remainder of the installation will be paid for at the Service Casing-Guaranteed Install unit price.

3. Should the Contractor choose to not use the partially installed casing, Contractor will not be paid for the first failed attempt or any future failed attempts unless the Owner specifically directs the Contractor to make future casing install attempts.
   a. All casing installed & utilized using directional drill methods or jack & bore will be paid for at the appropriate size Service Casing unit price.
   b. All casing installed by open cut or with rock directional drill or rock jack & bore will be paid for at the appropriate Service Casing-Guaranteed Install unit price. Inspector must concur and Engineer must be notified prior to Guaranteed Install casing construction.
   c. If service is open cut, all milling, asphalt, stone backfill & asphalt patching will be paid for under the Service Casing-Guaranteed Install unit price.

D. Casing and Conduits

1. Contractor may use larger casings and conduits than specified in the Contract Documents at no additional cost to the Owner. Owner will not be responsible for any additional cost for appurtenances required for upsized casings including spiders, spacers, end caps, additional construction area or any other material or labor required to properly complete the work. Contractor will notify Owner at least 48 hours prior to installing larger casings or conduits.

2. Contractor may extend casings and conduits beyond the specified plan design length at no additional cost to the Owner. If the Contractor believes the casing or conduit must be extended due to site conditions, Contractor will notify and must receive Owner and/or Engineer approval for extended casings prior to requesting payment for casing.

1.11 CONSTRUCTION STAKING

A. General: The Contractor will be responsible for providing all construction staking and all other surveying needs.

B. Benchmarks: The Engineer will assist the Contractor in laying out the waterline alignment in all locations adjacent to property lines/fencelines or roadway pavement. The Owner will provide adequate horizontal and vertical benchmarks at the booster station site.

C. After Contractor stakes the work, Contractor, Engineer and Owner will field review the stakeout prior to construction. Contractor will provide at least 48 hours notice prior to field review.

D. After stakeout or prior to construction of water mains, Contractor will notify Engineer of all high points without air release valves or fire hydrants. Contractor will notify Engineer of such conditions prior to construction of the water main to allow for Engineer to decide if an air release valve or fire hydrant is required at suspect locations. No additional payment, beyond the unit cost of the item(s), will be paid if the Contractor must add such devices after water main installation if the Contractor does not notify the Engineer.

E. Contractor will stakeout and coordinate all fire hydrant locations, air release valves, and blow-off hydrants with the Inspector and VDOT prior to installation.

F. Owner will provide field verified meter locations prior to installation by the Contractor. Contractor will notify the Inspector at least 48 priors to installing a service connection for a meter in order to allow Owner/Inspector time to verify the meter location.

1.12 EROSION CONTROL

A. General: The Contractor will be responsible for complying with all provisions of the erosion and sediment control narrative, erosion control permit, plans and notes including the construction, installation and maintenance of all mechanical and vegetative erosion and sediment control measures for the duration of the project. If unforeseen erosion or sediment problems arise during the construction, the Contractor will implement corrective measures acceptable to the Inspector or Engineer. Contractor will comply with the erosion control provisions of the contract documents, requirements of the local governing municipality (county, town and/or city), and the latest edition of the Virginia Erosion and Sediment Control Handbook.

B. Stabilization: MS-1 Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site. Temporary Soil stabilization shall be applied within seven days to denuded areas that may not be at final grade but will remain dormant for longer than 30 days. Permanent stabilization shall be applied to areas that are to be left dormant for more than one year. Gravel will be applied to all disturbed paved areas immediately following installation of pipeline.

C. Wythe County Erosion Control Permit: The Owner/Engineer will be responsible for applying for, paying for permit fee, and obtaining the permit based on the erosion control plan provided by the Engineer. The Contractor will be responsible for complying with the requirements of the Wythe County E&S permit.

D. VSMP Permit: The Owner will be responsible for applying for, paying for permit fee, and obtaining the VSMP permit based on the erosion control plan provided by the Engineer. The Contractor will be responsible for complying with the requirements of the VSMP permit which includes compliance with the Erosion and Sediment Control Narrative and installation and proper maintenance of E&S controls shown on the plans. The Contractor will be responsible for maintaining a copy of the VSMP permit at the job site.

E. Wythe County Building Permit: The Contractor will be responsible for applying for and obtaining the permit. Permit fee will be waived by the County. The Contractor will be responsible for complying with the requirements of the Wythe County Building permit.

1.13 PRESSURIZED PIPELINE TESTING AND RECONNECTIONS

A. General: The Owner will provide a volume of water equal to 2 times the volume of the line for pressure testing of each line and for disinfection of the water line. Any additional water required by the Contractor may be purchased from the Owner.

B. Contractor is responsible for installing (and properly abandoning) any additional taps, waterline, temporary piping, pumps, flushing appurtenances, de-chlorination of flushing water, etc., as required to property test and disinfect the water line.

C. Contractor will test all mains prior to installation of any service taps. All service taps will be made in the wet under pressure.

D. Contractor(s) is responsible for ensuring the condition of the water in the booster station and within the water lines is potable and ready for distribution when turned over to the Owner at Substantial Completion.

1.14 BLASTING

A. General: Blasting will not be permitted

1.15 OSHA REQUIREMENTS

A. General: The Contractor will be responsible for performing all excavation, pipe installation and backfilling in accordance with the 1990 OSHA Excavation Standards 29 CFR Part 1926, Subpart P. The Contractor's responsibility also extends to providing a "Competent Person" as defined by the OSHA regulation referenced above on the job site.

1.16 TRAFFIC AND ROADWAYS

A. Contractor will comply with the most recent versions of VDOT form LUP-SP and VDOT form LUP-WZ Special Provisions.

B. This project includes extensive work in VDOT right-of-way. The contractor shall provide all necessary traffic control to ensure safety of the traveling public and in accordance with VDOT requirements.

C. No trench will be left open overnight or while otherwise unattended without permission by the Owner/Engineer. Any trench left open will be suitably protected with steel plating suitable for H-20 loading.

D. Bore pits will not be left overnight unless protected by steel plating or concrete barriers as acceptable to VDOT. Contractor will verify location and layout of steel plating and/or concrete barriers by VDOT prior to leaving the work area overnight.

1.17 BURNING

A. Contractor may burn brush provided contractor complies with all local, state and federal regulations. Contractor will obtain all permissions required to burn debris on private lands and restoration of area when complete. Burning debris and associated activities will be at no additional cost to the Owner. Contractor will obtain permission from the Wythe County Fire Marshall prior to any burning.

1.18 FENCING

A. Contractor will replace (in-kind or better) or repair all disturbed fencing. Fencing which is obviously unusable within the easement area will be removed and will not be replaced.

1.19 PRE-CONSTRUCTION AUDIO-VISUAL SURVEY

A. Prior to starting construction within two weeks of a work area, Contractor shall perform an audio-visual survey of the project site. Record shall be printed on new, high-resolution DVD or provided in digital form on a USB drive or memory card. Video display will show location, description of existing structures and landscaping, including time, date, address, and compass direction of travel and view. Footage shall be correlated to plan sheet stationing. Vulnerable, damaged, or deteriorated areas within the zone of influence will be shown. Travel speed shall be approximately 50 ft/min. with a minimum camera elevation of 5 feet over the work with a minimum 30-foot width showing construction area. Recording must be compatible with standard DVD or PC video players. Contractor shall provide copies to the Engineer and Owner at the Pre-construction Conference and as construction progresses. Due to the duration of this project, if the Contractor opts to video portions of the project just prior to working in individual areas, the

video of the existing conditions will be turned over to the Owner/Engineer no later than the payment application request for that portion of the work. Contractor shall provide a remake of any tape not to the Engineer's and Owner's satisfaction. The first partial payment request will not be processed until the first acceptable recording is provided by the Contractor.

PART 2 - PRODUCTS

2.1 American Iron and Steel (AIS): The project is funded in part by USDA-Rural Development and requires domestic material preference per American Iron and Steel CAIS) - Section 746 of Title VII of the Consolidated Appropriations Act of2017 (Division A- Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2017) and subsequent statutes mandating domestic preference applies an AIS requirement to obligations made after May 5, 2017.

A. No Federal funds made available for this fiscal year for the rural water, wastewater, waste disposal, and solid waste management programs authorized by the Consolidated Farm and Rural Development Act (7 USC 1926 et seq.) shall be used for a project for the construction, alteration, maintenance, or repair of a public water or wastewater system unless all of the iron and steel products used in the project are produced in the United States.

B. The term "iron and steel products" means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

C. The requirement shall not apply in any case or category of cases in which the Secretary of Agriculture (in this section referred to as the "Secretary") or the designee of the Secretary finds that:
1. Applying the requirement would be inconsistent with public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

D. Owners are ultimately responsible for compliance with AIS requirements and will be responsible for the following:
1. Signing loan resolutions, grant agreements, and letters of intent to meet conditions which include AIS language, accepting AIS requirements in those documents and in the letter of conditions.
2. Signing change orders (i.e. C-941 of EJCDC) and partial payment estimates (i.e. C-620 of EJCDC) and thereby acknowledging responsibility for compliance with American Iron and Steel requirements.
3. Obtaining the certification letters from the consulting engineer upon substantial completion of the project and maintaining this documentation for the life of the loan.
4. Where the owner provides their own engineering and/or construction services, providing copies of engineers', contractors', and manufacturers' certification letters (as applicable) to the Agency to insert into the Agency me. All certification letters must be kept in the engineer's project me and onsite during construction. For owner construction (force account), all clauses from this section must be included in the Agreement for Engineering Services.
5. Where the owner directly procures AIS products, including AIS clauses in the procurement contracts and obtaining manufacturers' certification letters and providing copies to consulting engineers and contractors.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01100

SECTION 01270 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders and stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: The Bid in Section 5.01 of the Bid Form consists of Unit Price bid items. The general scope of work included in these bid items is included at the end of this Section.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

D. List of Unit Prices: A list of unit prices is included at the end of this Section.

E. Schedules: The bid has been divided into three schedules to subdivide project costs.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. Bid Items:

1. Mobilization: Mobilization will not be measured but will be considered as a lump sum payment limited to 3% of the original contract amount. Project sign shall be included in mobilization bid item.

2. Water and Service Line: Water and service lines will be measured in linear feet for each size and type installed. Measurement will be horizontally through all valves and fittings and will be paid for at the contract unit price per linear foot for each size of pipe specified and to the points noted on the plans. This price will include compensation for all labor, materials, tools, equipment, and incidentals necessary to complete this work in accordance with these specifications. This unit price also includes installing waterline and water services in casings. Casing installation will be paid under a separate line item.

3. Fire Hydrant (Complete): Hydrants will be measured by the number and type of each installed and paid for at the contract unit price per each. This price will include hydrant, 6" gate valve, 6" x 6" or 8" tee, hydrant base elbow, up to 10 lf of 6" DIP for hydrant lead and incidentals. In addition, the price will be full compensation for excavation, backfill with suitable material, compaction, connections, concrete blocking, tie rods, crushed stone drain, disposal of surplus or unsuitable materials, restoration of property, testing, and for furnishing all labor materials, tools, equipment and incidentals necessary to complete the work. All joint restraints on the branch side of the mainline tee to the hydrant will be considered incidental to this line item. If the 6" DIP water main lead exceeds 10 lf, the additional pipe required will be paid for under the 6" DIP Water main line item.

4. Valves: Valve price shall include box & lid and will be measured by the number of each size installed and will be paid for at the contract unit price for each size specified. This price will be full compensation for furnishing all labor, materials, tools, equipment and incidentals necessary to complete the work.

5. Fittings: Pipe fittings, couplings, reducers, tees, elbows, plugs, crosses and similar connectors will be paid for per weight for standard ductile iron fittings as listed in AWWA C110. Fittings and connectors smaller than 4" diameter will not be paid for under this item but will be considered incidental to the pipe line item. The weight used for payment will be per the chart included at the end of this section. Contractor has the prerogative to utilize restrained joint or compact fittings at no additional compensation or increase in the contract price.

6. Joint Restraint: Joint restraints will be paid for per size per each as installed. Restraints installed on the branch run of a mainline tee will be considered incidental to the fire hydrant price and will not be paid for under this line item. This price shall be full compensation for furnishing all labor, materials, tools, equipment and incidentals necessary to complete the work.

7. Residential Meter: Residential Meter price will be measured and paid per each item per each type installed and includes saddle at water main, corporation stop at water main, tandem meter setter, meter, PRV, fittings, box, frame, and cover for a residential meter per the contract documents. If no PRV is required, the price for this line item will include the straight through setter and will not include the PRV. This price will include compensation for all labor, materials, tools, equipment, unclassified excavation, and incidentals necessary to complete this work as shown on the plans and in accordance with these specifications. Water meter will be purchased by the contractor & installed by the Contractor.

8. Residential Meter Reconnection: Residential Meter Reconnection price will be measured and paid per each item installed. This unit price will include all of the components of the Residential Meter unit price item and if the existing service meter is adjacent to the existing service meter, connection to the service downstream of the existing meter per the contract documents. If the new meter location is not within 20 lf of the existing meter box, no connection to the existing water service downstream of the existing meter is required. This price will include compensation for all labor, materials, tools, equipment, unclassified excavation, and incidentals necessary to complete this work as shown on the plans and in accordance with these specifications. If any service tubing is required for reconnection, service tubing will be paid for under a separate line item.

9. Blow off Hydrant: Blow off hydrant price will be measured and paid per each item installed and shall include a vault with frame & cover per the contract documents. This price will include compensation for all labor, materials, tools, equipment, unclassified excavation, and incidentals necessary to complete this work as shown on the plans and in accordance with these specifications. Contractor will provide standpipe for each blowoff as incidental to this item.

10. Air Release Valve: Air Release Valve price will be measured and paid per each type installed and shall include a vault or box with frame & cover. Price will include main line saddle, corp stop, any piping/nipples and ball valve under ARV unit. Copper service tubing from the corp stop to the box will be included for the cut slope installation. This price will include compensation for all labor, materials, tools, equipment, unclassified excavation, and incidentals necessary to complete this work as shown on the plans and in accordance with these specifications.

11. PRV: PRV pay item shall include a concrete vault, PRV, piping connections, and miscellaneous appurtenances per the contract documents. This work shall be paid for as a lump sum bid item and shall include all labor, materials, tools, equipment, and incidentals necessary to complete this work in accordance with these specifications.

12. Service Casing: Water service casing pipe will be measured and paid for per linear foot for size and at each location as installed. This unit price will include casing pipe installation, installation of carrier pipe within the casing, and other associated work items according to the drawing details. Carrier pipe will be paid under appropriate water line item. All Casing Pipe crossings will be bored and jacked, directionally drilled or otherwise bored such as to not disturb the pavement– no open cuts will be permitted under this unit price. This price will include compensation for all labor, materials, tools, equipment, insurance, permitting, flagmen, coordination costs, spacers, excavation and backfill of boring pits, and incidentals as required by VDOT necessary to complete the work in accordance with these specifications and VDOT requirements. Payment length of casing will extend 36” beyond the edge of pavement, back or curb, or outside of sidewalk unless otherwise specified on the plans. Contractor may use larger size casings or steel casings at no additional cost to the Owner. When a directional drill/bore fails due to rock or if failure is evident, Contractor will continue water main excavation at least 50’ on both sides of service crossing location to determine if a suitable crossing location exists which would allow for a bore/directional drill. If a suitable location cannot be determined in conjunction with the Inspector and/or Engineer, Contractor will open cut the casing per VDOT LUP-OCPR detail. Contractor will request Owner, Engineer, & VDOT approval prior to open-cutting U.S. Route 21.

13. Service Casing Crossing-Guaranteed Install: Guaranteed Install Water service casing crossing will be measured and paid for per linear foot for size and at each location as installed from edge of pavement to edge of pavement when installed for the full width of the roadway or linear footage installed within pavement for partial installations. This unit price will include all construction & materials required to install a service casing across the roadway including rock directional drilling and/or open cut casing pipe installation, installation of carrier pipe within the casing, milling, backfill, pavement and other associated work items according to the drawing details. Carrier pipe will be paid under appropriate water line item. If casing is open cut, installation of casing pipe will be in accordance with VDOT LUP-OCPR Open Cut Pavement Restoration detail. This price will include compensation for all labor, materials, tools, equipment, insurance, permitting, flagmen, traffic control, coordination costs, spacers, excavation and backfill of boring pits, and incidentals as required by VDOT necessary to complete the work in accordance with these specifications and VDOT requirements. Payment length of crossing will be from edge of pavement to edge of pavement regardless of the method of installation (rock bore, rock directional drill, open cut install & patch, etc.). Contractor will extend casing at least 36” beyond the edge of pavement, back of curb or outside of sidewalk. Contractor may use larger size casings or steel casings at no additional cost to the Owner. Asphalt trench repair, milling & asphalt overlay will be per VDOT LUP-OCPR Open Cut Pavement Restoration detail to be included in this unit price.

14. Steel Casing: Steel casing pipe will be measured and paid for per linear foot for size and type installed. This unit price will include casing pipe installation, carrier pipe installation within the casing, and other associated work items according to the drawing details. Carrier pipe will be paid under the water line item. This price will include compensation for all labor, materials, tools, equipment, insurance, permitting, flagmen, coordination costs, spacers, excavation and backfill of boring pits, and incidentals to complete the work in accordance with these specifications and VDOT traffic control requirements. Unit price will include up to three (3) attempts at three different locations per bore per VDOT requirements. If the Contractor is unable to bore due to rock after three attempts or if VDOT allows open-cutting prior to the 2nd or 3rd attempt, the Contractor will open cut and proceed with construction according to the documents. Unit price for this bid item shall also apply in the event casing pipe is installed by open cut, in which case

backfill and pavement materials will be included in this pay item. Contractor will be paid for the linear footage of steel casing abandoned under the roadway at failed bore attempts. All abandoned casing will be abandoned per VDOT requirements at no additional cost to the Owner. Payment length of casing will extend 36" beyond the edge of pavement, back or curb, or outside of sidewalk unless otherwise specified on the plans. Payment length of casing will extend 60" beyond the edge of pavement for the Route 21 Grayson Road crossings.

15. Concrete Cradle: Concrete Pipe Cradle for existing pipe crossings will be measured and paid for per linear foot installed. Carrier pipe will be paid for under the water line item. This price will include compensation for all labor, materials, tools, equipment, and incidentals necessary to complete this work in accordance with these specifications. All filter fabric, shoring, traffic division and any other temporary measures will be incidental to this item.

16. Concrete Slope Anchors: Concrete Slope Anchors will be measured and paid for per each installed per the contract documents. This price will include compensation for all labor, materials, tools, equipment, and incidentals necessary to complete this work in accordance with these specifications.

17. Driveway Crossing: Driveway Crossing will be measured and paid per linear foot of pipeline installed within gravel, asphalt or concrete driveway or gravel roadway pavement. Gravel driveway and roadway will be backfilled completely with stone. Asphalt will be installed to match existing asphalt depth and backfilled completely with gravel. Concrete driveway will be installed to match existing concrete depth & reinforcement and backfilled completely with gravel. This price will include compensation for all labor, stone trench backfill, materials, tools, equipment, unclassified excavation, and incidentals necessary to complete this work as shown on the plans and in accordance with these specifications.

18. Gravel Backfill Within Shoulders: Gravel Backfill within Shoulders will be measured and paid per linear foot of pipe installed and shall include gravel, compaction, traffic control and any other incidentals required to properly install VDOT approved gravel mix backfill of the excavated trench area from springline of pipe to finished grade. This price will include compensation for all labor, materials, tools, equipment, unclassified excavation, disposal of excavated material, and incidentals necessary to complete this work as shown on the plans and in accordance with these specifications.

19. Check Dam: This item will be measured and paid for by each item as installed. This price will include compensation for all labor, materials, tools, equipment, excavation, backfill, compaction and incidentals necessary to complete this work in accordance with these specifications. Incidentals included with this line item are maintenance, removal and disposal of accumulated silt, and any other incidental as may be required to properly install and maintain this item. Additional check dams required to be installed by VDOT, the Inspector or the Wythe County E&S will be paid for at the associated unit price.

20. Culvert Inlet Protection: This item will be measured and paid per each item as installed. This price will include compensation for all labor, materials, tools, equipment, excavation, backfill, compaction and incidentals necessary to complete this work in accordance with these specifications. Incidentals included with this line item are maintenance, removal and disposal of accumulated silt, and any other incidental as may be required to properly install and maintain this item. Additional culvert inlet protections required to be installed by VDOT, the Inspector or the Wythe County E&S will be paid for at the associated unit price.

21. Silt Fence: This item will be measured and paid per linear foot as installed. This price will include compensation for all labor, materials, tools, equipment, excavation, backfill, compaction and incidentals necessary to complete this work in accordance with these specifications. Incidentals included with this line item are trenching, maintenance of silt fence, removal and disposal of accumulated silt, and any other incidental as may be required to properly install and maintain this item. Additional silt fence required by Wythe County erosion control or VDOT due to the Contractor <u>not</u> complying with the contract documents will <u>not</u> be paid for by the Owner. Additional silt fence required by Wythe County erosion control or VDOT while the Contractor has complied with the contract documents will be paid for under this item.

22. Erosion Control (EC-2) matting: This item will be measured and paid per linear foot as installed per disturbed width to coincide with pipeline construction. This price will include compensation for all labor, materials, tools, equipment, excavation, backfill, compaction and incidentals necessary to complete this work in accordance with these specifications and per VDOT standards. Additional matting required to be installed by VDOT, the Inspector or the Wythe County E&S will be paid for at the associated unit price.

23. Riprap: This item will be measured and paid per type of stone per ton installed. This price will include compensation for all labor, materials, tools, equipment, excavation, backfill, compaction and incidentals necessary to complete this work in accordance with these specifications. Incidentals included with this line item are installation of filter fabric, maintenance, removal and disposal of accumulated silt, and any other incidental as may be required to properly install and maintain this item. Additional riprap required to be installed by VDOT, the Inspector or the Wythe County E&S will be paid for at the associated unit price.

24. Booster Station: This item will be measured and paid as lump sum installed. This price will include compensation for all labor, materials, tools, equipment, excavation, backfill, compaction and incidentals necessary to complete the pre-cast concrete or concrete masonry building and all stone, concrete slab, conduit, pumps, pump skid, pump control panel, heater, dehumidifier, lighting, painting, sealing, wiring internal appurtenances, all electrical elements, piping within and under the building including all piping within the booster station property, and any other item associated with the booster station and not itemized in unit prices in accordance with these specifications. This item will include all water main pipe from the in-line gate valve on the downstream and upstream sides of the booster station water. Both gate valves will be included with the booster station line item as well. Incidentals included with this line item are all erosion and sediment controls not itemized in the bid form, and any other incidental as may be required to properly construct this item.

25. SCADA: This item will be measured and paid as lump sum installed. This price will include compensation for all labor, materials, tools, equipment, and incidentals necessary to complete the SCADA system for the Booster Station including wiring internal appurtenances, all electrical elements, and any other item associated not itemized in unit prices in accordance with these specifications. Incidentals include any other incidentals as may be required to properly construct and install this item.

B. Related Items:

1. Clearing and Grubbing: All necessary clearing and grubbing is to be considered incidental to the other items of work and no separate payment or additional compensation will be made.

2. Rock: Rock and its excavations will be considered subsidiary to the work and will not be measured for separate payment. No additional payment will be made for the excavation and disposal of rock.

3. Unsuitable Material: No additional payment will be made for unsuitable material excavation, disposal, or excavation & compaction of suitable material required to backfill unsuitable material excavations.

4. Pipe Select Backfill Material: Where necessary, select backfill material for pipe installation will be considered incidental to the work and will be obtained from approved sources to replace unsuitable backfill material encountered or materials excavated under paved areas including driveways. No additional payment or additional compensation will be made for this item.

5. Seeding: All necessary seeding, including fertilizer, lime, topsoil preparation, and mulch in accordance with the specifications, will be considered incidental to the other items of work and no separate payment or additional compensation will be made.

6. Protection of existing asphalt pavement: All measures and materials utilized by the Contractor to prevent damage to existing asphalt pavement will be considered incidental to the other items of work and no separate pavement or additional compensation will be made.

7. Erosion Control Measures: All erosion control measures not specified as payment line items will be considered incidental to the work and no additional payment will be made. Maintenance, repair, replacement of damage erosion control measures and removal of installed measures will be considered incidental to the work and no additional payment will be made.

8. Fencing: All fence repair or removal & construction will be considered incidental to the work and no separate payment or additional compensation will be made.

9. Traffic Control: All documentation, material, equipment, and labor required for proper traffic control per VDOT requirements will be considered incidental to the other items of work and no separate payment or additional compensation will be made.

10. Ditch repair: All equipment and labor required for the repair/re-establishment of rip-rap or grass lined ditches including residential driveway culverts will be considered incidental to the other items of work and no separate payment or additional compensation will be made.

11. VDOT Inspection: Any VDOT inspection fees will be considered incidental to the other items of work and no separate payment or additional compensation will be made.

12. Guardrail repair: Any repair/replacement or temporary dismantling of existing guardrail required will be considered incidental to the other items of work and no separate payment or additional compensation will be made.

13. Temporary utility pole shoring: Any temporary shoring of existing utility poles or any other coordination efforts/charges/fees with utility companies required will be considered incidental to the other items of work and no separate payment or additional compensation will be made.

14. Testing and Disinfection: All water line testing and disinfection is to be considered incidental to the other items of work and no separate payment or additional compensation will be made.

15. Record Drawings: Record Drawings will be considered part of the mobilization bid item, and will not be measured nor paid for separately.

3.2 PIPE FITTING WEIGHT SCHEDULE

1. Weights are in US pounds based on ductile iron, mechanical joint, minimum 250 psi fittings as listed in AWWA C110. Weights excludes glands, bolts, and gaskets.

Diameter	90° bend	45° bend	22 ½° bend	11 ¼° bend	Plug
12”	255	215	220	220	85
10”	190	155	160	160	65
8”	125	110	110	110	45
6”	85	75	75	75	25
4”	55	50	50	50	15

SIZE X	SIZE	CROSS	TEE	REDUCER
12”	12”	495	410	N/A
12”	10”	460	390	190
12”	8”	385	340	165
12”	6”	360	325	150
10”	10”	380	310	N/A
10”	8”	310	260	135
10”	6”	285	250	115
10”	4”	260	235	105
8”	8”	235	185	N/A
8”	6”	205	175	95
8”	4”	185	165	80
6”	6”	160	125	N/A
6”	4”	140	115	60

2. Any fitting not listed will be paid for at the listed weight in the “American Pipe Manual, 19th edition” or on approved product submittals.

END OF SECTION 01270

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: The Contractor shall provide submittals for the Engineer's approval to show compliance with the specifications. Unacceptable submittals shall be revised and resubmitted as necessary until compliance with the specifications is achieved.

B. Related Section: Additional Sections of the Documents which are referenced in this Section include:

1. Section C-700 – General Conditions

1.2 QUALITY ASSURANCE

A. Coordination of Submittals: The Contractor shall be responsible for reviewing the Specifications to ensure that the items being submitted conform in all respects with the requirements. All submittals shall be provided to the Engineer at least 3 weeks prior to commencing work on the items being submitted.

B. Substitutions:

1. The Contractor is bound to the standards of quality established in the Contract Documents. Refer to Article 7 of the General Conditions regarding “Equals”.
2. The substitution of materials or equipment shall not be permitted unless the Engineer has given prior approval for the substitution in writing.
3. The Contractor shall certify that the proposed substitution has been determined to be equal or superior to the product specified. The proposed substitution shall be in complete compliance with the provisions in the Contract Documents.

PART 2 - PRODUCTS

2.1 SUBMITTALS

A. General: The Contractor shall comply with Article 7 of the General Conditions regarding “Submittals”.

B. Submissions: Submittals will be stamped by the Engineer in one of the following ways:

1. “Approved” – No exceptions are taken, subject to compliance with the Contract Documents.
2. “Approved as Corrected” – Minor corrections are noted and a resubmittal is not required, subject to compliance with the corrections and the Contract Documents.
3. “Not Approved” – The submittal material, method or system is totally rejected and does not meet the intent of the Specifications.
4. “Revise and Resubmit” – Revise prior to resubmittal is required.

C. Printed Submittals: If printed copies are provided, the Contractor shall provide a minimum of 6 copies of each submittal to the Engineer for review. The Engineer will retain 1 copy, the Inspector receives 1 copy, the Owner receives 2 copies, and the Contractor receives the remaining copies.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., BMWI-02510.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., BMWI-02510.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer.
4. Transmittal Form for Electronic Submittals: Use a standard cover page format acceptable to Owner**,** containing the following information:

    a. Project name.
    b. Date.
    c. Names of subcontractor, manufacturer, and/or supplier.
    d. Specification Section number and title.
    e. Drawing number and detail references, as appropriate.
    f. Transmittal number**, numbered consecutively**
    g. Other necessary identification.
    h. Remarks.

E. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files. If files are too large for email, coordinate with Engineer to receive files via FTP upload, website upload, USB or other means as necessary.

    a. Engineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2.2 SHOP DRAWINGS

A. Scale and Measurements: Shop drawings shall be to a scale sufficiently large to show all pertinent aspects of the item.

B. Review Comments: The Engineer will show all review comments on each copy of the submittal to be distributed as stated in Article 7 of the General Conditions.

2.3 MANUFACTURER’S LITERATURE

A. General: The Contractor shall provide all manufacturers’ data pertinent to the submittal, clearly showing which portions of the contents are being provided for review.

PART 3 - EXECUTION

3.1 IDENTIFICATION OF SUBMITTALS

A. Numbering: All submittals shall be consecutively numbered. Resubmittals shall cite the original submittal number for reference.

B. Transmittal: Each submittal shall be accompanied by a transmittal letter showing all the information required for identification and checking, including the appropriate Specification sections.

C. Submittal Log: The Contractor shall maintain a submittal log for the duration of the Work that indicates current status of all submittals. The submittal log shall be available to the Engineer at all times for the Engineer's review.

3.2 ENGINEER’S REVIEW

A. General: Review by the Engineer does not relieve the Contractor from responsibility for errors that may result from the submitted data.

B. Revisions: All revisions requested by the Engineer will be required. If the Contractor is considering any required revision to be changed, he shall notify the Engineer as provided in the General Conditions.

END OF SECTION 01330

SECTION 02230 - SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Protecting existing trees and shrubs to remain.
2. Removing existing trees.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place and removing site utilities.

B. Related Sections include the following:
1. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
2. Division 2 Section "Lawns and Grasses" for finish grading including preparing and placing planting soil mixes and testing of topsoil material.

1.3 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil or other materials indicated to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 COORDINATION WITH PROPERTY OWNER

A. Contractor will contact all property owners affected by clearing operations to determine if the property owner has a request for vegetation adjacent to easements not to be disturbed. Contractor will notify all property owners of trees or shrubs within the easement that are to be cleared as part of the construction.

B. Contractor will document and flag vegetation areas not to be disturbed.

1.6 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
   1. Provide pictures and document areas of vegetation not to be disturbed.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

B. Improvements on Property covered by easements: Authority for performing site clearing indicated on property covered by easements will be obtained by Owner.

   1. Do not proceed with work on adjoining property until directed by Engineer.

C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag trees and vegetation to remain or to be relocated.

C. Protect existing site improvements to remain from damage during construction.

   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

A. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer.
   1. Replace trees that cannot be repaired and restored to full-growth status, as determined by Engineer.

3.3 UTILITIES

A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

1. Arrange with utility companies to shut off indicated utilities.

2. Notify local fire department of work area, approximate work schedule, and all water mains & fire hydrants which may be impacted by utility work.
   a. Provide signage and/or provide cover to denote fire hydrants which are not usable by fire department. Coordinate signage and/or cover with local fire department.

B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Engineer and Owner no less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Engineer's written permission.

C. Excavate for and remove underground utilities indicated to be removed.

D. Excavate and cap or otherwise enclose/encapsulate underground utilities to be abandoned in place. Abandon utilities in accordance with Virginia Department of Health and Virginia Department of Environmental Quality regulations.

E. Removal of underground utilities is included in Division 2 Sections covering site utilities.

3.4 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind stumps and remove roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
3. Clear all trees and remove all stumps within the permanent utility easement.
4. Clear trees as necessary within temporary construction easement.

3.5 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.7 DISPOSAL

A. Topsoil: Respread topsoil along the waterline within the designated easement.

B. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 02230

SECTION 02300 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Specification Sections, apply to this Section.

1.2 REFERENCES

A. Virginia Department of Transportation (VDOT) publications:

1. Road and Bridge Specifications: latest edition.
2. Road and Bridge Standards: latest edition.

1.3 SUMMARY

A. This Section includes the following:

1. Base course for pavement repair.
2. Excavation and backfilling for utility installation.

B. Related Sections include the following:

1. Section “Unit Prices” for a schedule of unit prices..

1.4 UNIT PRICES

A. General: Section 01270 "Unit Prices” defines unit price bid items.

1.5 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed above bedding beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

C. Excavation: Removal of material encountered above subgrade elevations.

1. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.

D. Fill: Soil materials used to raise existing grades.

E. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for trenches that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted. No additional compensation will be paid for rock excavation.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

H. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.6 SUBMITTALS

A. Product Data: For the following:

1. Plastic Warning Tape

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.
3. Field quality control testing for earthwork compaction.

C. Blasting plan approved by authorities having jurisdiction, for record purposes.

1.7 QUALITY ASSURANCE

A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code."

B. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials testing, as documented according to ASTM D 3740 and ASTM E 548. The testing agency shall be approved by the Engineer prior to providing services.

1.8 PROJECT CONDITIONS

A. Existing Utilities: Do not damage existing utilities in the work areas.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: If any borrowed material is required for this project, it shall be obtained from offsite at the contractors' expense.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, SM, CH, CL, MH, and ML or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, OL, OH, and PT, or a combination of these group symbols.

1. Unsatisfactory soils also include satisfactory soils not maintained within 3 percent of optimum moisture content at time of compaction.

2. If undercutting material is required, the trench subgrade shall be established using VDOT #57 material. No additional payment will be provided for undercut excavation, removal of undercut, or backfill of trench to subgrade.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: VDOT Standard 21-B aggregate. Refer to Virginia Department of Transportation: Road and Bridge Specifications, latest edition; for aggregate mix specifications.

F. Trench Bedding: VDOT #57 aggregate in rock conditions and initial trench backfill in soil conditions.

G. Initial Trench Backfill: Satisfactory soil materials free of rocks or gravel larger than 1-inch

H. Final Trench Backfill: Satisfactory soil materials

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities/casings, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; width may be reduced to 2 inches wide if copper tracing wire is installed with water mains and water services for tracing; colored as follows:

Blue: Water Systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect existing structures, utilities, fills, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Obtain written permission from authorities having jurisdiction before bringing explosives to project site or using explosives on Project site.

1. Do not damage adjacent structures, property, or site improvements or weaken the bearing capacity of rock subgrade when using explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials and obstructions.

B. Undercut Excavation: Excavation below subgrade elevation required to support bedding, piping, structures and backfill with VDOT #57 material. Excavate as necessary at no additional cost to the owner. Dispose of material offsite at location determined by the Contractor.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections. Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Unclassified Excavation: Excavation to trench subgrade regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.

C. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.

D. Trench Bottom in Rock: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped bedding material.
2. Excavate trenches 6 inches deeper than pipe invert elevation required to allow for bedding material.

E. Trench Bottoms in Native Soil Material: Excavate trenches 4 inches deeper than bottom of pipe invert elevation to allow for initial backfill material. Hand excavate for bell of pipe.

F. Trench Protection: Furnish and install such sheathing, bracing, shoring and furnish necessary signs, barricades and temporary lighting as may be pertinent for the protection of the work, employees, the public, and to guard against contingencies which might give rise to delays in the work. Sheathing left in place shall be at the Contractor’s expense. Where trench wall sloping is necessary for safety or other reasons, the Engineer shall be notified to determine if additional strength pipe will be required. Responsibility for preservation of trench banks and other excavated spaces and the prevention of injury to any persons or property shall rest entirely with the Contractor. Trench construction and safety shall be governed by the Virginia Occupational Safety and Health Standards for the Construction Industry, 29 CFR 1926-Subpart P.

G. Open Trenches: No trench shall remain open overnight.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavations under pavement, structures, or utility pipe as directed by Engineer. Lean concrete fill may be used when approved by the Engineer.

3.8 UTILITY TRENCH BACKFILL

A. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Place and compact bedding course on all trench bottoms. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Bedding depths are shown on the drawings.

C. Hand place and compact initial backfill of subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Fill voids with approved initial backfill materials while shoring and bracing, and as sheeting is removed.

E. Place and compact final backfill of satisfactory soil material to final grade. Place backfill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment.

F. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under pavement and concrete, road shoulders, backfill trench with stone, scarify and compact each layer of backfill at 95 percent.
2. Under lawn compact each layer of backfill at 85 percent.
3. Back fill which cannot be compacted to requirements will be disposed of by the contractor, backfill trench with suitable material. Dispose and import backfill at no additional cost to the owner.
4. Under gravel areas compact each layer of backfill at 95 percent.

G. Coordinate backfilling with utilities testing.

H. Coordinate backfill compactive measures with VDOT and Inspector prior to commencing backfill operations.

I. Install detectable warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.9 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under pavements, use compacted stone.
3. Under structures, use satisfactory soil material or engineered fill.

3.10 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 3 percent of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

B. All moisture control (aeration or watering) of material excavated for use as fill or backfill will be performed by the Contractor at no additional cost to the Owner.

3.11 COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under pavements and structures, compact backfill and fill material at 95 percent of the maximum dry density. In addition, the uppermost 6 inches of the road subgrade shall be compacted to 100 percent of the maximum dry density at a moisture content greater than optimum.
2. Compact backfill and fill material in lawn areas at 85 percent of the maximum dry density.

3.12 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from structures as shown on the drawings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn, Pasture, or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Structures: Plus or minus 1/2 inch (25 mm).
3. Pavements and Graveled Drives: Plus or minus 1/2 inch (13 mm).

3.13 SUBBASE COURSE

A. Under pavements, place subbase course on prepared subgrade according to VDOT Specifications Section 315.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified licensed independent geotechnical engineering testing agency to perform field quality control testing. The Engineer will approve or disapprove of the selected agency. If the agency is disapproved, the Contractor must select another agency until approved by the Engineer.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work complies with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies (unless more frequent testing is required by VDOT within the VDOT ROW):

1. Pavement Areas: At subgrade and at each compacted fill and backfill layer, at least two tests for every 5,000 sq. ft. or less of paved area, with a minimum of two tests per lift.
2. Graded Structural Pad Areas: At subgrade and at each compacted fill and backfill layer, one test for every 200 sq. ft. or less of graded pad area. The Owner may require, at his discretion, less frequent testing.
3. Trench Backfill: At each compacted initial and final backfill layer.
   a. Within VDOT right-of-way: Provide at least one test for each 300 feet or less of trench length, but no fewer than two tests for water main installed between the edge of pavement and the ditchline (unless more stringent testing is required by VDOT). Provide at least one test for each 500 feet or less of trench length, but no fewer than two tests for water main installed outside of the ditchline (unless more stringent testing is required by VDOT).
   b. Within easements and non-VDOT property: Provide at least one test for each 500 feet or less of trench length, but no fewer than two tests.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.15 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. The Contractor will dispose of all extra soil, unsuitable material and landfill materials such as posts, wire, trash, garbage, etc., off of the Owner's property.

END OF SECTION 02300

SECTION 02510 - WATER DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping and specialties for potable water system.

1.3 DEFINITIONS

A. The following are industry abbreviations for materials:

1. DI: Ductile Iron
2. HDPE: High Density Polyethylene
3. PE: Polyethylene
4. PVC: Polyvinylchloride

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Maximum Working Pressures: The following are maximum pressure requirements not including surges pressure for piping and specialties, unless otherwise indicated:

1. Combined Potable-Water and Fire-Protection Water Service: **250 psig.**

1.5 SUBMITTALS

A. Product Data: For the following:

1. Pipe and fittings.
2. Mechanical Pipe restraint systems.
3. Valves and valve boxes.
4. Fire hydrants.
5. Blow-offs
6. Air Release Valves
7. Meters and meter components
8. Casing pipe

B. Record Drawings: At Project closeout of installed water-service piping according to Division 1 Section "Summary of the Work."

C. Test Reports: As specified in "Field Quality Control" Article in Part 3.

D. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

1.6 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered unless noted otherwise in these specifications. Refer to Division 1 Section "Submittal Procedures."

B. Comply with requirements of utility supplying water.

C. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.

D. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.

E. Provide listing/approval stamp, label, or other marking on piping and specialties made to specify standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors, unless necessary for inspection, then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use hand-wheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt and elevate above grade.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Contractor will purchase and deliver the meters to the Owner.

1.8 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact Wythe County Utility Department prior to construction.

B. Verify that water-service piping is installed in compliance with original design and referenced standards.

1.9 SEQUENCING AND SCHEDULING

A. Coordinate connections to water mains with the Wythe County Utility Department and Town of Wytheville Utility Department.

B. Coordinate with other utilities located within the Work Area.

C. Coordinate work within the public right-of-way with VDOT.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.

B. PVC Pipe: PVC

1. Water Main pipe: PVC pipe shall be manufactured in accordance with specifications ASTM D2241 for smaller than 4-inch and AWWA C900 (or AWWA C909 for PVCO) for 4-inch and larger diameter. Joints should be push-on type with rubber rings conforming to ASTM D3139 and ASTM F477. Pipe shall be DR14 and rated for a minimum working pressure of **250 psi.**
2. Schedule 40 PVC: Schedule 40 PVC pipe for building drain line shall be Type 1, Grade 1, plain end conforming to ASTM D 1784 and ASTM D 1785 with solvent weld joints and fittings.
3. Schedule 40 and Schedule 80 piping will only be utilized as casings or within structures or vaults unless otherwise noted on the plans. No PVC pipe will be exposed to direct sunlight with the exception of daylighted drain pipe.

C. Ductile-Iron, Push-on-Joint Pipe: AWWA C151 pressure class 350, with cement-mortar lining according to AWWA C104 and bituminous seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111. Pipe shall be rated for a minimum working pressure of **350 psi.**

D. Ductile-Iron, Mechanical Joint Pipe will meet requirements of the AWWA/ANSI C151/A21.51 pressure Class 350. Include rubber compression gasket according to AWWA C111. Thickness classes shall met requirements of AWWA/ANSI C150/A21.50, Pipe interior will have a cement-mortar lining according to AWWA C104 and pipe exterior will have a bituminous seal coat according to AWWA C104. Pipe shall be rated for a minimum working pressure of 3**50 psi.**

E. Flanged Joint, Ductile Iron Pipe: AWWA C151 with flanged ends:

1. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face, unless otherwise indicated.

a. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

F. Service Line: Copper Tube ASTM B 88, Type “K” hard drawn for services. Pipe shall be rated for a minimum working pressure of **250 psi.**

G. Copper Tubing within structures and vaults: All copper tubing shall meet the requirements of ASTM B 88 for Type “L” copper, hard drawn for above ground**.**

H. Service Line: HDPE Tubing, CTS sizing, AWWA C901-08, PE 4710, minimum SODR 9. Pipe shall be rated for a minimum working pressure of **250 psi.**

1. Factory installed minimum 10 gauge insulated tracer wire integral to tubing per Endot Endotrace pipe or approved equal.

I. PE Casing: PE casing pipe shall conform to ASTM D 3035, minimum DR 17 or thickness as required to protect the carrier pipe at A16 loading at the installed depth of the casing, whichever is thicker.

1. PE tubing utilized as water service line casing will be minimum 1" larger diameter (nominal) then service tubing diameter.

J. Steel Casing: Steel casing pipe shall conform to ASTM A-139, Grade B, have a minimum wall thickness of 0.250" for road crossings and a bituminous exterior coating.

1. End Seals: Neoprene rubber, pull-on seals with minimum ½" stainless steel banding with worm gear screw.

2.2 PIPE AND TUBE FITTINGS

A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.

B. Ductile-Iron, Mechanical Joint Fittings: AWWA C153 pressure ratings shall be a minimum of **350 psi** for fittings 12 inch and smaller and at least 250 psi for fittings 14 inch and larger. Include cement-mortar lining according to C104 and seal coat according to AWWA C104.

1. Buried fittings below structures shall be mechanical joint and supplied with the proper adapter and/or transition gasket for use with PVC pipe. Buried fittings shall be rated for a working pressure of 350 psi.

C. Ductile-Iron, Flanged fittings shall be 125 pound fittings meeting ANSI/ASME B 16.42, or meeting ANSI/ASME B 16.1 for fittings not available in ductile iron.

D. Polyvinyl Chloride (PVC) Fittings for Schedule 40 and Schedule 80 PVC: Polyvinyl chloride fittings shall be made from clean, virgin, PVC compound conforming to ASTM D 1784 and shall conform to the following requirements:

1. Drain, Waste, and Vent: Fittings shall be Schedule 40 socket type conforming to ASTM D 2467.
2. Solvent Cement: Solvent cement for use on PVC pipe and fittings shall conform to ASTM F 493 ASTM D 2564, or ASTM D 2846 as appropriate for pipe used.

E. Service Line Fittings: Compression type conforming to ANSI B16.26 for copper tubing rated for a minimum **250 psi** working pressure. PVC fittings supplemented with restraint systems (as needed for 250 psi working pressure) for 2" PVC water lines. Stainless steel stiffeners required for all fittings, connections, and couplers with PE tubing.

F. Flexible Expansion Joints: Flexible expansion joints may be of either rubber or flexible metal tube construction.

1. Flexible rubber joints shall be flanged units fabricated from rubber reinforced with steel rings and synthetic fabric and formed with a single arch section to provide for lateral and longitudinal deflections. Units shall be rated for minimum 150 psi working pressure. Split steel retaining rings shall be utilized to protect the rubber flanges. Flanges shall be integrally attached and constructed of stainless steel. Retraining units (control rods) shall be provided with all flexible joints.

2. Flexible metal tube expansion joints shall have an internal flexible tube with braided metal exterior wrap and integral flange connections. Material shall be 304 stainless steel rated for minimum 150 psi working pressure.

2.3 JOINING MATERIALS

A. Ductile-Iron Piping: The following materials apply:

1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.
2. Mechanical Joints: AWWA C111 mechanical joint retainer glands, high-strength steel bolts and nuts, and rubber gaskets. Mechanical joints will be used within casings.

B. HDPE Tubing: The following materials apply:

1. All Joints: Stainless steel inserts for all fittings, connections and couplings. Inserts will be manufacturer recommended size and type.

2.4 VALVES

A. Non-rising Stem, Resilient-Seated Gate Valves: AWWA C515, ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze non-rising stem, and stem nut. Valve shall have O-ring seals and open counter-clockwise, ends shall be compatible with piping systems in which valves are installed. Valves shall be for at least 250 psi working pressure. Include interior coating according to AWWA C550, and mechanical-joint ends for buried installations and flanged in vaults and interior applications. Gate valves will be American Flow Control 2500 series, Mueller, Kennedy or approved equal gate valve with stainless steel stem.

B. PVC Ball Valves: Valves shall be manufactured of PVC Type 1 Grade 1 with EPDM O-ring seals, true union connections, and threaded end connectors. Valves shall be listed by NSF International Standard 61. PVC Ball Valves will only be installed within structures or vaults.

C. Swing Check Valves (Liquid): Liquid check valves shall be of the swing check type, bronze mounted with cast iron body conforming to ANSI/AWWA C 508. Valve shall be operated by an external lever and adjustable weight. Disc shall provide a positive seal in the closed position and pivot to provide an unobstructed flowway in the open position. Valve shall be Kennedy Figure 106 LW, Mueller A 2600-01, GA Figure 250D or approved equal.

D. Flexible Check Valves: Valves are to be all rubber flow operated check type with a slip-on screw clamp connection. The port area shall contour down to a duckbill which shall allow passage of flow in one direction while preventing reverse flow. The flange and flexible duckbill sleeve shall be one piece rubber construction with nylon reinforcement. Valves shall be rated for minimum back pressure up to 5 psi. Valves shall be Proco 700 series, Cla-Val DB series, or Tideflex TF-2 or 35 series.

E. Valve Boxes: Adjustable Cast-iron box of three piece type, consisting of lid, two piece sliding extension, and base. Lettering "WATER" shall be embossed on the valve box lid in letters not less than 1 inch high. Base shall be proper type and size for the valve with which it was used. Barrel approximately 5 inches (125 mm) in diameter or larger as required to properly access valve stem, and adjustable cast-iron extension of length required for depth of bury of valve.

F. Air Release Valve: The air release valve shall be of the float operated, simple lever or compound lever design, and capable of automatically releasing accumulated air from a fluid system while the system is pressurized and operating. The air release valve shall be a combination valve featuring both air release and air vacuum abilities unless otherwise specified. An adjustable designed orifice button shall be used to seal the valve discharge port with drip-tight shut-off. The orifice diameter must be sized for use within a given operating pressure range to insure maximum air venting capacity. The float shall be of all stainless steel construction and guaranteed to withstand the designed system surge pressure without failure. Valve may be one of the following:

1. The body and the cover shall be cast iron or the valve internal parts shall be stainless steel and the Viton Buna-N® for water tight shut-off, Cla-Val Series 36 or approved equal.
2. The body and cover shall be made of high-strength composite materials, A.R.I D-040 or approved equal.

The valve shall be sized as follows:

Pipe Diameter (inches)	Pipeline Pressure (psi)	Inlet Size (inches)
4	150	1
6	200	1
8	250	1

G. Tapping Sleeve and Tapping Valve: Complete assembly, including tapping sleeve, tapping valve, and bolts and nuts and will be manufactured by American Flow Control, Mueller, or approved equal. Use sleeve and valve compatible with tapping machine.
1. Tapping Sleeve: Grey cast iron (ASTM A126, Grade B) or ductile iron (ASTM A536, Grade 65-45-12), 2-piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical-joint ends with rubber O-ring gaskets for sealing the side flanges. Include sleeve matching size and type of pipe material being tapped and of outlet flange required for branch connection.

H. Tapping Saddle: Saddles will be double strap (PVC or DIP) or hinge type (for PVC only), Ford FC202 or approved equal. Tapping of DIP main will require approved equal saddle.

I. Hose Bibb: Assembly shall be anti-contamination wall faucet. Valve shall be furnished with approved vacuum breaker which complies with ANSI/ASSE 1011 and has 3/4 inch male hose threads. Valve shall be of brass construction with adjustable packing nut and deep stem guard, Teflon impregnated packing and standard "O" size washer and wheel handle. Inlet shall be 1/2 inch copper tube.

J. Pressure Reducing Valve: PRVs shall be CLA-Val 90-01 or approved equal.

2.5 WATER METERS

A. Residential Water Meters

1. Meters through 2” meter will be Mueller 420 Series Composite with Hot Rod AMR or approved equal.
   a. 2” water meters will be Omni T2 meter with Hot Road AMR.
2. Automated System-Meters will be provided with encoder register outputting and radio module compatible with Wythe County existing Hersey Hot Rod AMR system. Provide one lithium battery and provide mounting bracket for both pit and wall installations.
3. Meters will be 5/8” x ¾” unless otherwise noted on the plans.
4. Pressure reducing valves will be diaphragm type with adjustable outlet pressure from 25 to 75 psig. Valves will be Wilkins LU70, Watts or approved equal.

B. Meter Settings:

1. Corporation Stop - ¾” unless otherwise noted with Mueller inlet threads (AWWA C800). Outlet will have compression couplings for connection to copper pipe.
2. Meter Settings – Copper Setters will be dual check with key type inlet valve. As noted, tandem setters will be used for installation of pressure reducing valves. Setters will be **15”** in height with

integral compression grip joints on both inlet and outlet for use with copper service lines. Setter will have inlet ball valve & outlet cascading dual check valve.

a. Ford VBHH7x-15W-44-33-NL-G for standard setter 5/8 x ¾ to 1" or equal
b. Ford TVBHH7x-15W-44-33-NL-G for tandem setter 5/8 x ¾ to 1"or equal
c. Ford VBHH7x-15W-44-xx-NL-G for standard setter 1-1/2" to 2" with integral bypass pipe & valve built into setter, or equal,

3. Meter Box – 18" diameter circular HPDE meter box for single setter, 24" diameter HDPE meter box for tandem setter or in-line PRV, and 36" diameter HDPE meter box for 2" meters. All boxes will be 24" deep and supported by minimum 8 bricks. Boxes will be ribbed for strength.
4. Frame and cover – Cast iron frame and cover (Ford C32 or equal) with standard pentagon bolt and worm lock. Extension ring is required for meter boxes greater than 18" diameter.
5. Meter Setter Brace-PE or PVC of suitable length and diameter to brace the meter from twisting.

C. Mag Meter: Booster Station flow meter shall be magnetic type with remote mount transmitter. The magnetic flow meter shall be of the low frequency electromagnetic induction type and shall produce a DC pulsed signal directly proportional and linear to the liquid flow rate. Meter shall include an interior liner NSF rated for potable water service.

The meter shall be design for operation on 120 VAC +/- 10 percent, 60 Hz +/- 5 percent with a power consumption of less than 15 watts for sizes through 12 inch. The meter shall measure both forward and reverse flow. Complete zero stability shall be an inherent characteristic of the meter system to eliminate the need to adjust the system with a full pipe at zero flow.

The metering tubes shall be constructed of stainless steel. All magnetic flow meters shall be designed to mount directly in the pipe between ANSI Class 150 flanges. Meter shall have PE liner and be supplied with tungsten carbide electrodes in a zirconium holder. The meter housing shall be splash-proof and weather resistant design. The exterior of the meter shall be protected by an epoxy paint.

The electronics portion of the magnetic flow meter shall include both a magnet driver to power the magnet coils and a signal converter. The signal converter shall be remote mounted and shall be housed in a die cast aluminum case. The interconnecting cable shall be supplied with the meter. The converter shall include a separate customer connection section to isolate the electronics compartment and protect the electronics from the environment. A separate terminal strip for power connection shall be supplied. The electronics shall be of the solid state, feedback type and utilize integrated circuitry. The input span of the signal converter shall be continuously adjustable between 0-1 and 0-31 fps for both analog and frequency outputs and range adjustment shall be direct reading. The converter shall not be affected by quadrature noise nor shall it require zero adjustment or special tools for startup. Input and output signals shall be fully isolated. The converter shall include 4 to 20 mA DC flow rate output as well as totalized flow pulse relay output.

2.6 FIRE HYDRANTS

A. Fire hydrants shall be installed on 6 inches or larger lines only. Fire hydrant lead from the main will be DIP.

B. Hydrants will be traffic type with safety flange protection conforming to AWWA C502 latest edition and shall have not less than 6-inch diameter barrel, 5 1/4-inch minimum hydrant valve. Hydrant will be cast iron bodied with fully bronze mounted dry top capable of a working pressure of 250 psig. Hydrant shall have a 6-inch mechanical joint connection to the water main, two 2 1/2-inch hose outlets and one 4-1/2-inch pumper outlet and be so designed that if broken off, the hydrant will remain closed. Nipples will be bronze or non-corrosive metals with "National Standard" threads. Direction of opening shall be left (Counterclockwise) with 1 1/2-inch pentagon shape-operating nut, and nozzle thread shall be standard. The hydrant exterior above the ground line shall be shop painted with two coats per Owner designation. Hydrants shall be Kennedy K-81D or approved equal.

2.7 ANCHORAGES

A. Clamps, Straps, and Washers: ASTM A 506, steel.

B. Rods: ASTM A 575, steel.

C. Rod Couplings: ASTM A 197, malleable iron.

D. Bolts: ASTM A 307, steel.

E. Cast-Iron Washers: ASTM A 126, gray iron.

F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig (20.7 MPa).

1. Cement: ASTM C 150, Type I.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C33, crushed gravel.
4. Water: Potable.
5. Sizes and Locations: See Drawings

G. In lieu of concrete anchorages, Contractor may install Grip Rings on 12" and smaller diameter lines as manufactured by Romac Industries and Mega-lug restraints for larger pipe.

H. Contractor may utilize restrained joint pipe in lieu of or to supplement other anchorage systems. No additional payment will be made by the Owner for use of restrained joint pipe or alternative anchorage systems. Contractor will provide documentation from manufacturer of adequacy of restrained joint pipe or alternative anchorages.

I. Restrained joint pipe, restrained joints, grip rings, mega-lugs, etc. will utilize a **250 psig** pressure (unless otherwise noted on the Contract Documents or approved by the Engineer in reduced pressure areas) with a **factor of safety of 1.5 to 1** for design of joint restraints. Main-line valves will be treated as dead-ends regarding restraint design.
1. Joint restraint lengths may be reduced due to reduced static and pump pressures in limited locations as coordinated with the Owner and Engineer.
2. Joint restraint on the 4" and smaller pressurized mains may be reduced to utilize a **150 psig** pressure.

2.8 Vaults

1. General: Vaults shall be precast concrete using Portland cement design mix, 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
   a. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation. Unless otherwise shown on the plans, groundwater elevation shall be assumed at the top of the slab.
   b. Base Section: 8-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
   c. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
   d. Gaskets: ASTM C 443, rubber or asphaltic mastic.
   e. Steps: Fiberglass, individual steps or ladder. Include width that allows worker to place both feet on one step and is designed to prevent lateral slippage off step. Cast or anchor into base, riser, and top section sidewalls with steps at 12-inch intervals. Omit steps for vaults less than 60 inches deep.

f. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section. Connector will be Press-Boot manufactured by Press-Seal Gasket Corporation or approved equal.

g. The dimensions will be as shown on the plans

h. Pipe connections shall be as specified for manholes or pre-approved flexible watertight gasket

i. Base slab, base wall, and riser walls will be sized and reinforced to prevent flotation.

2. Flotation: Vaults shall be sized to prevent flotation due to groundwater. The shop drawings shall verify that the structures have been sized by the manufacturers to prevent flotation.

2.9 MISCELLANEOUS DEVICES

A. Floor Drains: Drains shall conform to ANSI/ASME A 112.21.1. Floor drains shall be coated cast iron with double drainage flange, weepholes, threaded outlet connection, integral bell trap, and adjustable polished nickel alloy round removable strainer. Strainer shall be 6 inches in diameter and shall be made with light duty grate in buildings except in traffic areas where medium duty shall be used.

B. Pressure Gauges: Pressure gauges shall be bronze Bourdon tube in cast aluminum case with male 1/4 inch IPT connection at bottom, at least 4 1/2 inch face diameter with a range adequate to measure all working pressures, installed with brass piston type pulsation dampener. Gauges on the suction side of pumps shall be a pressure and vacuum gauge with a range adequate to measure all working pressures. Each gauge shall be mounted with a bronze ball cock to allow removal or servicing and a piston type pressure snubber to protect the gauge from rapid changes in line pressure. Gauges for use in wastewater applications shall be isolated from direct contact with wastewater by means of a diaphragm type isolator.

C. Tapping Saddles inside buildings and vaults: Saddles shall be made of a malleable material and have flat stainless steel straps. Rubber gaskets shall be required for all pipe sizes and classes. Lead gaskets are prohibited. Saddles shall provide full support around the circumference of the pipe and have a bearing area of sufficient width along the axis of the pipe 1-1/2 inch minimum. Saddles shall not have lugs that will dig into the pipe when the saddle is tightened. The U-bolt type strap will not be allowed. Saddles shall be Ford FS 202, Mueller DE2S SERIES, Romac Style 202S or approved equal.

D. Pressure Tank: Pressure Tank shall be of the captive air diaphragm or bladder type designed for potable water application and meeting NSF 61 Standards. Tank shall have a minimum working pressure of 125 psi and 119 gallon capacity with an available drawdown of 35 gallons when operated at 30 to 50 psi. Diaphragm shall be constructed of butyl rubber. Tank shall be similar to Well-X-Trol model WX-405.

E. Flow Switch: Flow switch on booster station recirculation piping shall be heavy duty type with Nema 4 housing. Switch shall include free swinging vane which attracts a magnet within a lead-free brass or stainless steel switch body to activate a snap switch via a lever arm. Switch shall be rated for a minimum working pressure of 250 psi. and include a 1½" NPT connection suitable for insertion in pipes ranging from 1" to 20" diameter. Switch shall include a minimum of 5 removable vane layers which can be configured to adjust activation/deactivation flows.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 2 Section "Earthwork" for excavation, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Take all precautions necessary to insure that pipe, valves, fittings, and other accessories are not damaged in unloading, handling, and placing in trench. Examine each piece of material just prior to installation to determine that no damage has occurred. Remove any damaged material from the site and replace with undamaged material.

B. Exercise care to keep foreign material and dirt from entering pipe during storage, handling, and placing in trench. Close ends of in-place pipe at the end of any work period to preclude the entry of animals and foreign material.

C. Bed pipe as specified in Division 2 Section "Earthwork" or as shown on the drawings.

D. Do not lay pipe when trench bottom is muddy or frozen, or has standing water.

E. DIP pipe inside of buildings or vaults and exterior non-buried lines shall be with flanged joints.

F. Use only those tools specifically intended for cutting the size and material and type pipe involved. Make cut such as to prevent damage to pipe or lining and to leave a smooth end at right angles to the axis of the pipe.

G. Install copper tracing wire with all plastic piping including service lines to meters. All tracing wire will be wrapped around valves and exposed within meter boxes & air release vaults and at grade for all valve covers.

H. Potable Water-Service Piping: Use the following:

1. 3/4- to 1 1/2-Inch NPS: Copper tube, Type K; copper fittings; and soldered joints with manufacturer recommended fittings and couplings.
2. 3/4- to 2-Inch NPS: HDPE tube, per AWWA C901-08 with manufacturer recommended stainless steel stiffeners for all connections, fittings and couplings. Use tracer wire (factory installed integral to pipe or separate wire wrapped around tube) for all plastic service tubing.
3. 2-inch NPS: PVC IPS Pressure pipe per ASTM D2241 per rated to the working pressure of the system.

I. Combined Potable-Water and Fire-Protection Water-System: Use the following:

1. 4-inch NPS and larger diameter: PVC push-on-joint pipe and ductile-iron mechanical-joint fittings.
2. 4-inch NPS and larger diameter: Within casings and when specified in the contract documents, ductile iron mechanical joint pipe and mechanical joint fittings.
3. 4-inch NPS and larger diameter: Under VDOT roadway pavement, within concrete cradles, and when specified in the contract documents, ductile iron mechanical joint pipe or push-on joint pipe and mechanical joint fittings.

4. 4-inch NPS and larger diameter: Ductile-iron flanged pipe within pump station and vaults with flanged fittings.

J. Casing: Use the following:

1. Steel, butt-weld joint pipe for all water mains 4” diameter and larger
   a. Contractor may use larger diameter casings than shown on the plans at contractor’s discretion and at no additional cost to the Owner. If restrained joint pipe system requires larger diameter casings, contractor will install larger diameter casing at no additional cost to the Owner.
   b. Contractor may extend casings further than required in the Contract Documents at contractor’s discretion and at no additional cost to the Owner.
2. PE/HDPE: Joints will not be permitted. All PE/HDPE pipe will be single pipe free of joints.

3.3 VALVE APPLICATIONS

A. Install gate valves unless otherwise noted.

B. Install concrete donut around all valves within grass or gravel areas. Donut not required when asphalt or concrete pavement is flush with valve box frame and cover.

C. Install valves below grade with operator nut. Install valves within structures or vaults with handwheel, or lever operators.

D. A direct factory representative from manufacturer shall be provided by the contractor for start-up service, inspection and necessary adjustments for all Pressure Relief and control valves.

3.4 JOINT CONSTRUCTION

A. Ductile-Iron Piping, Gasketed Joints: According to AWWA C600.

1. Permissible deflection in push-on joint pipe shall not be greater than 2/3 of that listed in AWWA C600.

B. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

C. Copper Tubing, Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Steel casing - Steel pipe joints shall have butt weld connections. Welds for casing pipe will be continuous to prevent water seepage into the casing.

E. PE–Pipe joints are not permitted unless the length of the pipe exceeds the maximum manufactured length of pipe. Install couplers, fittings, and connections with stainless steel stiffeners for all joints.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless the Engineer approves deviations to layout.

B. Install piping at indicated depth. Where grades on the pressure line conflict with existing pipes or structures, lay pressure line to additional depth with a uniform vertical curve to provide proper clearance without the use of fittings. No additional payment to the contractor will be allowed for additional excavation. Provide allowance for expansion as directed by Engineer.
   1. Typical waterline cover will be 36” with the contractor minimizing highs and low points on the waterline. Only under extraordinary circumstances and with special permission of the Owner shall water lines be deeper than 60 inches, or less than 36-inches deep.

C. Install components with pressure rating equal to or greater than system operating pressure.

3.6 PIPING INSTALLATION

A. Water-Main Connection: Remove existing fittings and connect to existing water mains with size and in location as indicated on the Drawings.

B. Install ductile-iron piping according to AWWA C600.

C. At all dead end lines install a valve and cap. Restrain cap using rods and clamps as approved by the Engineer.

D. Bury piping with depth of cover over top at least 36 inches and no more than 42 inches unless otherwise coordinated and approved by Owner or Engineer.

E. Service piping will be a single piece of contiguous pipe from the service tap to the meter yoke. No intermediate joints or couplings will be permitted unless granted by the Owner/Engineer with written permission.
   1. All service connections to the water main will be tapped under pressure.

F. Contractor may install tee/reducer combination in lieu of saddle tap for dry connections to smaller diameter pipe.

G. Gravel Backfill Within Shoulders: Gravel backfill within shoulders will be paid for at the appropriate unit price. Coordinate all gravel backfill with Inspector or Engineer prior to utilizing gravel backfill for the following situations:
   1. Pipe centerline is closer than 36” to the edge of pavement of a VDOT roadway
   2. VDOT roadway subgrade shows signs of undermining the pavement
   3. Special circumstances agreed upon by the Inspector, Owner, and/or Engineer

3.7 ANCHORAGE INSTALLATION

A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

   1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.

B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

C. Provide manufacturer fabrication drawings sealed by a licensed engineer if restrained joint pipe is used in lieu of external anchorage. Main-line valves are to be treated as dead-ends regarding restrainted joint pipe calculations.

3.8 VALVE INSTALLATION

A. General Application: Install valves in accordance with manufacturer's recommendations, AWWA C600, or applicable standards. Use mechanical-joint-end valves for 3-inch and larger for underground installations.

B. Install in-line valves and fire hydrant shutoff valves within the right-of-way behind the ditchline, behind the guardrail, or beyond the top of slope and/or outside of the clear zone per VDOT requirements when possible. Contractor will coordinate all valve locations with the Inspector and VDOT prior to installation.
   1. Contractor will be permitted to roll the alignment in order to install valves in locations suitable to VDOT and the Owner. Contractor will coordinate all alignment shifts with the Owner/Inspector prior to installing pipe and valves.

3.9 FIRE HYDRANT INSTALLATION

A. General: install each fire hydrant with a separate gate valve in the supply pipe, anchor with restrained joints, mega-lugs, rodding back to mainline tee and/or thrust blocks, and support in upright, vertical position. Contractor will provide manufacturer's documentation regarding acceptability of restrained joints, mega-lugs, and/or rodding if used in lieu of concrete thrust blocks. Fire hydrants shall be installed on 6 inches or larger lines only.

B. Install fire hydrants within the right-of-way behind the ditchline, behind the guardrail, or beyond the top of slope and/or outside of the clear zone per VDOT requirements. Contractor will coordinate all hydrant locations with the Inspector and VDOT prior to installation.

C. All fire hydrant leads will be ductile iron pipe from the mainline tee to the hydrant base.

D. AWWA-Type Fire Hydrants: Comply with AWWA M17.

E. High Ground Water Location: Relocate fire hydrants when excavation reveals high ground water or plug the hydrant drain hole if unable to relocate. Notify the Engineer in writing when hydrant drain holes are plugged.

F. Coordination with local fire department: Notify local fire departments of work area, approximate work schedule, and all water mains & fire hydrants which may be impacted by utility work.
   1. Provide signage and/or provide cover to denote fire hydrants which are not usable by fire department. Coordinate signage and/or cover with local fire department.

3.10 VAULT INSTALLATION

A. Genera: Install vaults, complete with appurtenances and accessories indicated in accordance with details shown on the drawing.

B. Set tops a minimum 6" above finished surface in grassed areas.

C. Install precast concrete vault sections with gaskets according to ASTM C 891.

3.11 WATER METER INSTALLATION

A. General: Install all meter components including the meter.
   1. Notify Owner within 48 hours of installation of water meter.

B. Install meter setter bracing to extend to at least 2” outside of meter box to adequately brace meter setter from twisting.

C. Contractor will be responsible for coordination of the location and grade for water services with the Project Inspector. Contractor will determine required connection point and elevation to verify that service can be installed. Contractor will notify Engineer prior to laying water main if there is a conflict regarding service layout or location.

D. Install pressure reducing valves on all residential meters unless noted or otherwise instructed by Inspector. Prior to setting individual meters, Contractor will verify need for PRV with Engineer or Inspector.

E. Install stainless steel inserts within all fittings, couplings, and connections to main line and meters for HDPE tubing.

F. Contractor will be responsible for verifying meter setter is suitably aligned in order to easily install the meter with a gap of no more than ½” at the meter after gaskets are placed at the connection nuts. Contractor will be responsible for all remedial efforts (including full time inspection by the Owner) as may be required to correct defective alignments.

G. Extend service pigtail at least 36” outside of meter box on downstream side and cap. Do not crimp end of service pigtail.

H. Install bricks (minimum 8 unless otherwise specified in the plans) under water meter box

I. Backfill base of meter box with 21-A stone or other washed gravel. Do not cover setter joints with stone and joints will be visible from the box top.

3.12 FIELD QUALITY CONTROL

A. Notify Wythe County and the Engineer at least 48 hours in advance of the test date, and perform tests in presence of the Engineer.

B. Contractor is prohibited from making service taps prior to pressurized testing of the water main.

C. Wythe County will supply potable water for pipeline testing at no cost equal to two times the pipe volume. Contractor will provide an estimated volume of water required for flushing, testing, and disinfection. All water in excess of this volume will be purchased by the Contractor from the Owner.

D. After the line has been back-filled and at least seven days after the last concrete reaction anchor has been poured, subject the line or any valved section of the line to a hydrostatic pressure test in accordance with AWWA C600, except as modified herein. Fill the system with water at a velocity of approximately 1 ft. per second while necessary measures are taken to eliminate all air. After the system has been filled, raise the pressure by pump to 1.5 times the working pressure or up to the rated pressure of the pipe, whichever is less. Test pressures shall be:

1. Not be less than 1.25 times the working pressure at the highest point along the test section
2. Not exceed thrust restraint pressure
3. Not vary by more than +/- 5 psi
4. Not exceed twice the rated pressure of the valves or hydrants when test includes closed gate valves
5. Shall be at least 250 psig as measured at the high point on the section of line under tests.

Measure pressure at the low point on the system compensating for gage elevation. Maintain this pressure for two hours. If pressure cannot be maintained, determine cause, repair, and repeat the test until successful.

E. A leakage test shall be conducted concurrently with the pressure test in accordance with AWWA C600, except as modified herein. Leakage shall be determined with a calibrated test meter, furnished by the Contractor. Leakage is defined as the quantity of water required to maintain a pressure within 5 psi of the specified test pressure, after air has been expelled and the pipe filled with water. Leakage shall not exceed the volumes listed in AWWA C600. If leakage exceeds that specified, find and repair the leaks and repeat the test until successful.

F. All visible leaks shall be repaired regardless of the amount of leakage.

G. Prepare reports for testing activities.

3.13 CLEANING

A. Disinfect and test water lines in accordance with AWWA Standard C651 and the following:

B. All water lines shall be disinfected prior to being in operation.

C. Prior to disinfection all water lines shall be flushed unless the tablet method of disinfection is used. All valves and hydrants shall be operated during this operation. Flushing velocities should not be less than 2.5 ft./sec.

D. Methods of Chlorine Application

1. Continuous feed method - Potable water shall be introduced into the pipeline at a constant flow rate. Chlorine shall be added at a constant rate of this flow so that the chlorine concentration in the water in the pipe is at least 50 mg/L. The chlorinated water shall remain in the pipeline at least 24 hours, after which, the chlorine concentration in the water shall be at least 10 mg/L. All valves and appurtenances shall be operated while the chlorinated water remains in the pipeline.

2. The velocity of the potable water in the pipeline shall be less than 1 ft./sec. The water shall then remain in contact with the pipe for 24 hours. All valves and appurtenances shall be operated while the chlorinated water is in the pipeline.

E. Final Flushing- After the required retention period, the heavily chlorinated water shall be flushed from the lines using potable water.

F. Testing - After the lines have been flushed at a velocity of no less than 3 fps (in accordance with AWWA 651-14), the water lines shall be tested. Samples shall be collected at 1200 feet intervals throughout the length of pipeline.

1. All chlorine residual determinations shall be made using only those methods approved by the Virginia Department of Health.

2. Water samples for bacteriological analysis must be collected at 1200 feet intervals throughout the length of pipeline and analyzed by a certified laboratory using one of the two options below (in accordance with AWWA 651-14):
   a. Option A: Two samples taken at least 16 hours apart. A minimum of two samples at least 16 hours apart shall be collected from each sampling location.
   b. Option B: Two samples taken at least 15 minutes apart after the pipeline has been disinfected and allowed to sit for a 16 hour rest period.

   The results of these samples must indicate no coliform contamination before the pipeline can be utilized as part of the waterworks. If contamination is indicated, then the disinfection procedures must be repeated.

3. Water samples will be collected from both connection points (or the connection point and termination point) of the main line. Water samples will be collected from each water main branch larger than 2" as well.

G. Maintain a copy of AWWA Standard C-651 on Project site during all disinfecting operations. An additional copy will be available for review in the office of the Wythe County Utility Department.

H. Prepare reports for purging and disinfecting activities.

3.14 SEPARATION OF WATER AND SEWER LINES

A. Waterlines shall normally be separated horizontally from sanitary sewer lines, manholes, and septic system drainfields by a distance of 10 feet measured edge-to edge.

B. Under unusual conditions when local conditions prevent a horizontal separation of 10 feet from sewer lines and manholes, the water line may be laid closer provided that the invert of the water main is 18 inches above the top of the sewer; the sewer constructed of AWWA approved and tested water pipe; and all manholes are of water tight construction tested in place. The sewer pipe shall be pressure tested in place without leakage prior to backfilling.

C. Waterlines crossing sewers shall be laid to provide at least 18 inches vertical separation between that the invert of the water main and the top of the sewer pipe.

D. Under unusual conditions when local conditions prevent an 18-inch vertical separation, the sewer line passing over or under water mains shall be constructed of AWWA approved water pipe. The sewer pipe shall be pressure tested in place without leakage prior to backfilling. Water lines passing under sewers shall in addition have an 18" vertical separation between the bottom of the sewer and the top of the water line; adequate structural support for the sewer to protect both utilities; and the water pipe be centered on the crossing point so the joints are equidistant and as far away as possible from the sewer.

E. The Engineer will review all unusual sewer and waterline crossing conditions. The crossing conditions will be constructed such that the Engineer can approve the condition.

3.15 PIPE IDENTIFICATION

A. General:
   1. Potable Water Line Dark Blue

END OF SECTION 02510

SECTION 02741 - HOT-MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 REFERENCES

A. Virginia Department of Transportation (VDOT) publications:

1. Road and Bridge Specifications: latest edition.
2. Road and Bridge Standards: latest edition.

1.3 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt paving.
2. Pavement-marking paint.

B. Related Sections include the following:

1. Division 2 Section "Earthwork" for aggregate subbase course and aggregate pavement shoulders.

1.4 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt pavement according to the materials, placement procedure, workmanship, and other applicable requirements of the standard specifications of the VDOT Road and Bridge Specifications.

1.5 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: Certification, by VDOT, of approval of each job mix proposed for the Work.
2. Paint Mix and Colors, provide samples to Owner.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.

1. Firm shall be a registered and approved paving mix manufacturer with VDOT.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.8 PROJECT CONDITIONS

A. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations in accordance with VDOT specifications.

B. Coarse Aggregate: Use materials and gradations in accordance with VDOT Specification Sections 203 and 211.

C. Fine Aggregate: Use materials and gradations in accordance with VDOT Specification Sections 202 and 211. Material shall have a minimum sand equivalent of 30 when tested in accordance with the requirements of AASHTO T176.

D. Mineral Filler: Use materials and gradations in accordance with VDOT Specification Section 201.

2.2 ASPHALT MATERIALS

A. Asphalt Cement: Use materials in accordance with VDOT Specification Section 210.

B. Prime Coat: Asphalt emulsion prime conforming to VDOT Specification Section 210.

C. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Pavement-Marking Paint: Match existing type and color of paint.

2.4 MIXES

A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by VDOT and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: As indicated on the drawings.
3. Surface Course: As indicated on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Engineer in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Insure that prepared subgrade is ready to receive paving.

1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Prime Coat: Apply per requirements of VDOT Specification Section 210.

3.3 HOT-MIX ASPHALT PLACING

A. General: Apply asphalt per VDOT specifications.

B. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.
1. Place hot-mix asphalt base course in number of lifts and thickness indicated per VDOT specifications.
2. Revise below to higher temperature if thin lifts in cool weather are likely. See National Asphalt Pavement Association (NAPA) recommendations.
3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints per VDOT Specification Section 315.

3.5 COMPACTION

A. General: Compact pavement per VDOT Specification Section 315.

B. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

C. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.

D. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

E. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

F. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. General: Comply with tolerances per VDOT Specification Section 315.

3.7 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Engineer and Owner.

B. Allow paving to cure for 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint per VDOT Specification Section 704.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified independent testing agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.

B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D 3549.

D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by the Contractor's testing agency according to ASTM D 979 and at locations selected by the Engineer.

1. Reference laboratory density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 1559, and compacted according to job-mix specifications.
2. Reference maximum theoretical density will be determined by averaging results from 4 samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D 2041, and compacted according to job-mix specifications.
3. In-place density of compacted pavement will be determined by testing core samples according to ASTM D 1188 or ASTM D 2726.

a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, but in no case will fewer than 3 cores be taken.
b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D 2950 and correlated with ASTM D 1188 or ASTM D 2726.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 02741

SECTION 02930 - LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 REFERENCES

A. Virginia Department of Conservation and Recreation-Division of Soil and Water Conservation

1. Virginia Erosion and Sediment Control Handbook (VESCH): latest edition.

1.3 SUMMARY

A. This Section includes the following:

1. Fine grading
2. Seeding disturbed areas.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.6 COORDINATION AND SCHEDULING

A. Planting Season: Sow lawn seed during normal planting seasons for type of lawn work required. Correlate planting with specified maintenance periods to provide required maintenance from date of Substantial Completion. Work areas shall be re-seeded within 30 days after being disturbed. Temporary seeding shall be provided if seeding is required to stabilize disturbed areas outside of the normal planting season.

B. Weather Limitations: Proceed with planting only when existing and forecast weather conditions are suitable for work.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.

1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as prescribed by VESCH unless otherwise indicated on the drawings

2.2 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil, meeting requirements and amend when necessary. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

B. Respread or provide minimum 2” of topsoil in all disturbed easement areas. Respread or provide adequate topsoil for suitable vegetative stabilization within VDOT right-of-way.

2.3 SOIL AMENDMENTS

A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 sieve and a minimum 75 percent passing a No. 60 sieve.

B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in a 5-10-10 ratio.

C. Water: Suitable for watering lawns.

2.4 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, pavements, and other facilities caused by planting operations.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 PLANTING SOIL PREPARATION

A. Limit subgrade preparation to areas that will be planted in the immediate future.

B. Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter.

C. Spread topsoil over all areas to receive seeding at a minimum depth of 4”.

D. Spread planting soil mixture to depth required meeting thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.

1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.

E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches in any dimension, and other objects that may interfere with planting or maintenance operations.

F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.4 SEEDING NEW LAWNS

A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.

B. Sow seed at the rate shown on the drawings.

C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes less than 1:6 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre to form a continuous blanket 1-1/2 inches loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into topsoil by suitable mechanical equipment.

3.5 HYDROSEEDING NEW LAWNS

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

1. Mix slurry with nonasphaltic tackifier.
2. Apply slurry uniformly to all areas to be seeded in a 1-step process. Apply mulch at the minimum rate of 1500 lb. per acre dry weight but not less than the rate required obtaining specified seed-sowing rate.

3.6 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.

B. Protect newly planted areas from traffic. Erect fences, barricades and warning signs at the Contractor's expense as necessary to prevent disturbance. Maintain barricades throughout maintenance period until lawn is established.

3.7 PLANTING SOIL AMENDMENTS SCHEDULE

A. Lawns: Provide soil amendments in not less than the following quantities:

1. 2000 lbs. straw mulch/acre
2. 1000 lbs. 5-10-10 fertilizer/acre
3. 2 tons agricultural limestone/acre

3.8 SEED MIXTURES SCHEDULE

A. Use the seed mix schedule shown in the latest version of the Virginia Erosion and Sediment Control Handbook (VESCH), Site Specific Seeding mixture for Permanent Seeding for the following region:
1. Appalachian Area

B. Seed Mix Selection: Use the following Seed mix for the designated use.
1. Minimum Care Lawn: All areas within or adjacent to residential yards including shoulders and ditches.
2. General Slope: (3:1 or less): All remaining areas which are not adjacent to residential yards.
3. Low Maintenance Slope (Steeper than 3:1): All remaining areas which are not adjacent to residential yards.

END OF SECTION 02930

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. See Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture.

C. Shop Drawings: For steel reinforcement and formwork.

D. Material test reports.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F.
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, graded, 3/4-inch (19-mm) nominal maximum coarse-aggregate size.

1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

C. Plastic Vapor Retarder: ASTM E 1745, Class C **,** or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.5 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

G. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

H. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

2.7 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 5 inches (125 mm) 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch (38-mm) nominal maximum aggregate size.
5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

2.8 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.

1. Apply scratch finish to surfaces indicated to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch (3.2 mm).

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated and where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: The Contractor will employ the services of an independent testing laboratory as specified in Section 01400, QUALITY CONTROL SERVICES, to inspect reinforcement, to perform tests, and to submit test reports.

B. Inspection of Reinforcing Steel: Prior to the placement of any concrete in cast-in-place concrete work, inspect the placement of all reinforcing steel to ensure that it complies with the Contract Documents and Shop Drawings. Provide verbal telephone reports to the Architect at the completion of the inspection and follow up with written reports within 72 hours.

1. Inspect for correct bar or wire size and grade.
2. Verify bar bends, lengths, spacing, lap lengths, and splices are as indicated or required.
3. Check to ensure that all reinforcing will have the proper cover and that the required supports and spacers are in place and secure.
4. Ensure that all forms and surfaces on which or in which concrete is to be placed is clean and contains no debris.

C. Sampling Fresh Concrete: ASTM C 172

1. Slump: ASTM C 143; each time a set of compressive test specimens is made and when concrete consistency seems to have changed.
2. Air Content: ASTM C 173, volumetric method for light weight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; each time a set of compressive test specimens is made for air-entrained concrete.
3. Concrete Temperature: Each time a set of compressive test specimens is made.
4. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
    a. Cast and field cure one set of four standard cylinder specimens for each composite sample.

D. Compressive Strength Tests: ASTM C 39

1. One set of four cylinders for each 100 cu. yards, but not less than one set for each concrete class placed any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required. The samples shall be tested directly from the mixer.
2. In addition to specimens tested directly from the mixer, test cylinders for pumped concrete shall also be made from concrete sampled at the point of placements. These tests shall be separate and distinct from those made from the mixer, and shall be made from the same batch and cured and tested in the same manner as described for the samples taken from the mixer. One set of three cylinders for every 100 cubic yards, but not less than one set for each concrete class places any one day; two specimens tested at 28 days and one specimen retained in reserve for later testing if required. When concrete is being placed directly from the mixer into the forms without any intermediate conveyance, the additional cylinders will not be required.

E. Test results shall be reported to the Contractor in writing, with a copy to the Engineer, within 72 hours after testes are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placements, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 7-day tests and 28-days tests; slump, air content, and concrete temperature.

F. Non-destructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

G. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

H. Strength of concrete mix will be satisfactory if every average of any three consecutive compressive-strength test equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

I. Additional Tests: The testing service shall make additional test of in-place concrete when these results indicate specified concrete strength and other characteristics have not been attained in the structure, as directed by Architect. Testing service shall conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is to be verified.

END OF SECTION 03300

SECTION 04100 – CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Furnish all equipment, material and labor to provide concrete unit masonry where shown on the plans and as specified in this Section.

1.2 SUBMITTALS

A. General: Comply with the pertinent provisions of Section 01330 – Submittal Procedures.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For reinforcing steel. Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Samples of materials showing color and texture.

D. Material Certificates: For each type of product indicated. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

1. For masonry units include material test reports substantiating compliance with requirements.

E. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1.3 QUALITY ASSURANCE

A. General: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this Section.

B. Masonry Standards Joint Committee; American Concrete Institute (ACI), American Society of Civil Engineers (ASCE), The Masonry Society (TMS).

1. Masonry Standards Joint Committee Code, Specifications, and Commentaries.
   a. ACI 530-02 / ASCE 5-02 / TMS 402-02
   b. ACI 530.1-02 / ASCE 6-02 / TMS 602-02

C. Virginia Building Code: Latest edition.

D. Variation from Plumb: For vertical walls and arises, do not exceed 1/4" in 10' or 3/8" in a story height. For external corners, expansion joints and other conspicuous lines, do not vary more than 1/4" in 10'.

E. Variation from Level: For lines of exposed lintels, sills, parapets and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 3/4" in 40' or more.

F. Variation of Linear Building Line: For position shown in plan and related portion of walls and partitions, do not exceed 1/4" in any bay or 20' maximum, nor 3/4" in 40' or more.

G. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed -1/4" nor +1/2".

1.4 DELIVERY, STORAGE AND HANDLING

A. General: Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS (CMUS)

A. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" height (15-5/8" x 7-5/8" actual), unless otherwise indicated. Width of units will be as indicated on drawings.

B. CMUs shall comply with ASTM C90. Provide standard weight hollow load-bearing units unless otherwise indicated.

C. Aggregate weight shall conform to ASTM C 331 providing a dry net unit weight of not more than 105 lbs. per cubic foot unless otherwise indicated.

D. Curing:

1. Cure units by autoclave treatment at a minimum temperature of 350°F (l76°C), and a minimum pressure of 125 psi. Limit moisture absorption to twenty-five percent (25%) of saturation during delivery and until time of installation.
2. Cure units in a moisture controlled atmosphere or in an autoclave at normal pressure and temperature to comply with ASTM C 90, Type 1. Limit moisture absorption during delivery and until time of installation to the maximum percentage specified for Type 1 units for the average annual relative humidity as reported by the U. S. Weather Bureau Station nearest the project site.

E. Special Shapes: As required by building configuration.

2.2 MORTAR

A. ASTM C 270, Type S. One part portland cement to one half part hydrated lime and four parts sand aggregate by volume.

B. Portland Cement: ASTM C 150 and C91, Type III

C. Hydrated Lime: ASTM C207

D. Sand aggregate: ASTM C144

2.3 REINFORCEMENT

A. Reinforcing Bars: Deformed Steel, ASTM A 615, Grade 60

B. Continuous Wire Reinforcing: Provide welded wire units prefabricated in straight lengths of not less than 10', with matching corner and tee units. Fabricate from cold-drawn steel wire complying with ASTM A 82, with deformed continuous side rods and plain cross-rods, and a unit width of 1-1/2" to 2" less than thickness of wall or partition.

1. Provide units fabricated as follows:
   a. Truss Type: Fabricated with single pair of 3/16” continuous diagonal cross-rods spaced not more than 8" o.c.
   b. For exterior and interior, hot-dip galvanize after fabrication with 1.5 oz. zinc coating, ASTM A 153, Class B2.
   c. Individual Wire Ties for Masonry: Fabricate from 3/16" cold-drawn steel wire, ASTM A 82, unless otherwise indicated, of the length required for proper embedment. Maximum spacing shall be 16" o.c. vertical and 24" o.c. horizontally.
   d. For exterior walls, fabricate from steel wire with 1.5 oz. hot-dip zinc coating ASTM A 153, Class B2, or fabricate from steel wire with not less than 7-mil. copper coating, ASTM B 227, Grade 30 HS.

2.4 LINTELS

A. General: Unless otherwise noted, provide either concrete or masonry lintels complying with the requirements below.

B. Concrete Lintels: Precast units matching concrete masonry units and with reinforcing bars indicated or required to support loads indicated.

C. Masonry Lintels: Made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.

2.5 ANCHORS AND TIES

A. Provide straps, bars, bolts and rods fabricated from not less than 16 gage sheet metal or 3/8" diameter rod stock, unless otherwise indicated.

B. For devices which extend into exterior wythe, fabricate from steel with hot-dip galvanized coating, ASTM A 153, Class B1, B2, or B3.

2.6 ACCESSORIES

A. Flashing:

1. Provide concealed flashings, shown to be built into masonry.
2. Provide concealed flashings as follows: Virgin polyvinyl chloride with plasticizer and other modifiers, formed into uniform flexible sheet not less than 20 mils. thick and black in color, unless otherwise indicated.

B. Bond Breaker Strips: 15 pound asphalt roofing felt complying with ASTM D 226, or 15 pound coal-tar roofing felt complying with ASTM D 227.

C. Premolded Control Joint Strips: Solid rubber strips with a Shore A durometer hardness of 60 to 80, designed to fit standard sash block and maintain lateral stability in masonry wall, size and configuration as required at vertical control joints.

D. Plastic Weepholes: Unless otherwise indicated, proved 1/4" round X 4" long medium density polyethylene plastic tubes to form weepholes. Provide at 48" o.c. maximum horizontal spacing at bottom of wall or flashing, as required.

2.7 INSULATION

A. All CMU walls (including interior walls in the Alum & Blower Building) shall be insulated using the following:

1. Core Fill Insulation: Core Fill-500 by Tailored Chemical Products, Inc., Thermco Foam Insulation by Thermal Corporation of America or Tripolymer Foam Insulation by C.P. Chemical Co., Inc., or equal.
2. Core fill insulation to be free of formaldehyde.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Masonry units shall not be placed when air temperatures are below 40 degrees F. Masonry construction shall be protected from direct exposure to wind and sun when erected in ambient air temperature of 99 degrees F in the shade and with relative humidity less than 50 percent.

B. Cut masonry units with motor-driven saw designed to cut masonry with clean sharp, un-chipped edges. Butt units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.

C. Wet clay brick having ASTM C67 absorption rates greater than 0.025 oz. per square inch per minute. Do not wet concrete masonry units.

D. Frozen Materials and Work: Do not use frozen materials or materials mixed or coated with ice or frost. For masonry which is specified to be wetted, comply with the BIA recommendations. Do not build on frozen work. Remove and replace masonry work damaged by frost or freezing.

E. Do not lower the freezing point of mortar by use of admixtures or antifreeze agents. Do not use calcium chloride in mortar or grout.

F. Pattern Bond: Lay exposed masonry in running bond pattern. Bond and interlock each course of each wythe at corners, unless otherwise shown.

G. Avoid the use of less-than-half size units at corners, jambs, and wherever possible at other locations.

H. Lay-up walls plumb and true and with course level, accurately spaced and coordinated with other work.

I. Stopping and Resuming Work: Rack back one-half (1/2) masonry unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if specified to be wetted) and remove loose masonry units and mortar prior to laying fresh masonry.

J. Built-In Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

K. Intersecting Load-Bearing Walls: If carried up separately, block vertical joint with 8" maximum offsets and provide rigid steel anchors spaced not more than 4'-0" o.c. vertically, or omit blocking and provide rigid steel anchors at not more than 2'-0" o.c. vertically. Form anchors of galvanized steel not less than 1-1/2" X 1/4" X 2'-0" long with ends turned up not less than 2" or with cross-pins. If used with hollow masonry units, embed ends in mortar filled cores.

3.2 MORTAR BEDDING AND JOINTING

A. Batch Control: Measure and batch materials either by volume or weight, such that the required proportions for mortar can be accurately controlled and maintained. Measurement of sand exclusively by shovel will not be permitted.

B. Mix mortars with the minimum amount of water consistent with workability to provide minimum tensile bond strength within the capacity of the mortar.

C. Mix mortar ingredients for a minimum of five (5) minutes in a mechanical batch mixer. Use water clean and free of deleterious materials which would impair the work. Do not use mortar which has begun to set, or if more than one and a half (1-1/2) hours has elapsed since initial mixing.

D. Lay solid masonry units (where applicable) with completely filled bed, head and collar joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

E. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells; also bed webs in mortar in starting course on footings and foundation walls and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.

F. Joints: Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not otherwise indicated, lay walls with 3/8" joints for concrete masonry. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials. Tool exposed joints. Rake out mortar in preparation for application of caulking or silents where required.

G. Remove masonry units disturbed after laying; clean and relay in fresh mortar. Do not pound corners at jambs to fit stretcher units that have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

H. Collar Joints: Fill joints between wythes solidly with mortar by parging either the back of the facing, or the face of the backing, and shove units solidly into parging.

3.3 HORIZONTAL JOINT REINFORCING

A. Provide continuous horizontal joint reinforcing as shown and specified. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls and 1/2" at other locations. Lay reinforcement a minimum of 6" at ends of units. Do not bridge control and expansion joints with reinforcing, unless otherwise indicated. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions. Space continuous horizontal reinforcing as follows:

1. For single-wythe walls, space reinforcing at 8" o.c. vertically, unless otherwise indicated.
2. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcing placed in two (2) horizontal joints approximately 8" apart, both immediately above the lintel and below the sill. Extend reinforcing a minimum of 2'-0" beyond jambs of the openings, bridging control joints where provided.

B. Anchoring Masonry Work:

1. Provide anchoring devices of the type shown and specified. If not shown or specified, provide standard type for facing and back-up involved.
2. Anchorage of masonry to structural members where masonry abuts or faces such members shall comply with the following:

a. Provide an open space not less than 1" in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar or other rigid materials.
b. Anchor masonry to structural members with metal ties embedded in masonry joints and attached to structure. Provide anchors with flexible tie section, unless otherwise indicated.
c. Space anchors as shown, but not more than 24" o.c. vertically and 36" o.c. horizontally (where applicable).

C. Control and Expansion Joints: Provide vertical expansion, control and isolation joints in masonry where shown. Build-in related masonry accessories as the masonry work progresses.

D. Build-in joint fillers where shown.

3.4 FLASHING OF MASONRY WORK

A. Provide concealed flexible flashing in masonry work at, or above, all shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through wall flashing on bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar.

B. Extend flexible flashings the full lengths of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from a line 1/2" in from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior surface of inner wythe. If inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2".

C. Provide weep holes in the head joints of the same course of masonry bedded in the flashing mortar.

D. Interlock end joints of deformed metal flashings by overlapping deformations not less than 1-1/2" and seal lap with elastic sealant.

E. Install flashings in accordance with manufacturer's instructions.

F. Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

3.5 REPAIR, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, and completely fill with mortar. Point-up all joints at corners, openings and adjacent work, to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.

C. Clean exposed CMU masonry by dry brushing at the end of each day's work and after final pointing to remove mortar spots and droppings.

END OF SECTION 04100

SECTION 11215 - WATER BOOSTER PUMP SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

A. Work Included: Provide all materials, equipment and labor required for installation of the water pumps at the facility.

1.2 REFERENCES

1. General: The work shall comply with the most recent standards or tentative standards as published at the date of the contract and as listed in this specification using the abbreviation shown.

1.3 SUBMITTALS

1. General: Submittals for all pumps shall include pump characteristic curves showing capacity in gpm, head, efficiency and pumping horsepower. Information shall be submitted with the shop plans as well as contained in the O&M manual. A draft O&M Manual shall be submitted for review prior to or at time of equipment delivery.

1.4 QUALITY ASSURANCE

1. Spare Parts and Lubrication: Supplier shall provide the OWNER with an adequate supply of spare parts and lubricants to last the duration of the 1 year warranty period. Spare parts shall include all bearings, gaskets, etc. recommended by the equipment manufacturer. An adequate supply shall be defined as the quantity, type, and grade recommended by the equipment manufacturer. Any special lubricants that may be required during the equipment break-in period shall also be provided. Supplier shall also provide a spare pressure transducer for use on either the suction or discharge sides of the system.

2. Nameplates: Pumps and motors shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the equipment.

PART 2 PRODUCTS

2.1 VARIABLE SPEED PACKAGED PUMPING SYSTEM

A. Furnish and install a pre-fabricated and tested variable speed packaged pumping system to maintain constant water pressure delivery pressure. The system shall be provided with three pumps for complete redundancy of single pump design flow. System shall be provided with controls, skid space, and preinstalled valves to allow capacity expansion with the installation the three pumps and variable frequency drive. The system shall be designed to operate on 120/208 volt three phase incoming power supply.

B. The packaged pump system shall be a standard product of a single pump manufacturer. The entire pump system including pumps and pump logic controller, shall be designed and built by the same manufacturer.

C. The complete packaged water booster pump system shall be certified and listed by UL (Category QCZJ – Packaged Pumping Systems) for conformance to U.S. and Canadian Standards.

D. Service: Potable Water

Single Pump Design Points:	40 gpm @ 100 feet TDH (Maximum Full RPM Flow) 13 gpm @ 180 feet TDH (Minimum Full RPM Flow) 26 gpm @ 150 feet TDH (Additional Full RPM Condition)
Minimum Shutoff Head:	185 feet TDH
Minimum Motor Horsepower:	2 HP (Non-Overloading Along Full Curve)
NPSHR:	Less Than 15' Along Full Curve
Initial Set Points:	100 psi System Discharge Pressure 5 psi Max Disch. Pressure Drop (~50 psi Low Flow Cutout Resume)

F. System shall be Grundfos MPC-E (CRE 5-6), Goulds AquaForce, Fairbanks Nijhuis Intelliboost, or approved equal.

2.2 SEQUENCE OF OPERATION

A. General: The system controller shall operate equal capacity variable speed pumps to maintain a constant discharge pressure (system set-point). The system controller shall receive an analog signal [4-20mA] from the factory installed pressure transducer on the discharge manifold, indicating the actual system pressure. As flow demand increases the pump speed shall be increased to maintain the system set-point pressure. When the operating pump(s) reach 96% of full speed (adjustable), an additional pump will be started and will increase speed until the system set-point is achieved. When the system pressure is equal to the system set-point all pumps in operation shall reach equal operating speeds. As flow demand decreases the pump speed shall be reduced while system set-point pressure is maintained. When all pumps in operation are running at low speed the system controller shall switch off pumps when fewer pumps are able to maintain system demand.

The system controller shall be capable of switching pumps on and off to satisfy system demand without the use of flow switches, motor current monitors or temperature measuring devices.

All pumps in the system shall alternate automatically based on demand, time and fault. If flow demand is continuous (no flow shut-down does not occur), the system controller shall have the capability to alternate the pumps every 24 hours, every 48 hours or once per week. The interval and actual time of the pump change-over shall be field adjustable.

2.3 SYSTEM CONSTRUCTION

A. General: The suction and discharge manifolds shall be constructed of 316 stainless steel. Pump Isolation valves shall be provided on the suction and discharge of each pump. Isolation valve sizes 2 inch and smaller shall be nickel plated brass full port ball valves. The valve disk shall be of stainless steel. The valve seat material shall be EPDM and the body shall be cast iron, coated internally and externally with fusion-bonded epoxy.

A spring-loaded non-slam type check valve shall be installed on the discharge of each pump. The valve shall be a wafer style type fitted between two flanges. The head loss through the check valve shall not

exceed 2 psi at the pump design capacity. Check valves 2" and larger shall have a body material of stainless steel or epoxy coated iron (fusion bonded) with an EPDM or NBR resilient seat. Spring material shall be stainless steel. Disk shall be of stainless steel or leadless bronze.

Pressure transducers shall be factory installed on the suction and discharge manifold. Pressure transducers shall be made of 316 stainless steel. Transducer accuracy shall be +/- 1.0% full scale with hysteresis and repeatability of no greater than 0.1% full scale. The output signal shall be 4-20 mA with a supply voltage range of 9-32 VDC.

A factory installed liquid level sensor shall be installed on the suction manifold for dry-run (water shortage) protection.

A bourdon tube pressure gauge, 2.5 inch diameter, shall be placed on the suction and discharge manifolds. The gauge shall be liquid filled and have copper alloy internal parts in a stainless steel case. Gauge accuracy shall be 2/1/2 %. The gauge shall be capable of a pressure of 30% above its maximum span without requiring recalibration. Suction side gauge shall be compound vacuum/pressure type. Ranges shall be as shown on the plans.

The base frame shall be constructed of corrosion resistant 304 stainless steel. Rubber vibration dampers shall be fitted between each pumps and base frame to minimize vibration.

2.4 PUMPS

A. General: The pumps shall be of the in-line vertical multi-stage design and shall be ANSI/NSF 61 approved for drinking water.

B. Construction: The pump impellers shall be secured directly to the pump shaft by means of a splined shaft arrangement. The suction/discharge base shall have ANSI Class 250 flange or internal pipe thread (NPT). Materials of construction shall be as follows:

1)	Suction/discharge base, pump head, motor stool:	Cast iron (Class 30)
2)	Impellers, diffuser chambers, outer sleeve:	304 Stainless Steel
3)	Shaft	316 Stainless Steel
4)	Impeller wear rings:	304 Stainless Steel
5)	Shaft journals and chamber bearings:	Silicon Carbide
6)	O-rings:	EPDM

C. Seal: The shaft seal shall be a balanced o-ring cartridge type with the following features:

1)	Collar, Drivers, Spring:	316 Stainless Steel
2)	Shaft Sleeve, Gland Plate:	316 Stainless Steel
3)	Stationary Ring:	Silicon Carbide/ Graphite
4)	Rotating Ring:	Silicon Carbide/ Graphite
5)	O-rings:	EPDM

Shaft seal replacement shall be possible without removal of any pump components other than the coupling guard, shaft coupling and motor. The entire cartridge shaft seal shall be removable as a one piece

component. Pumps with motors equal to or larger than 15 hp (fifteen horsepower) shall have adequate space within the motor stool so that shaft seal replacement is possible without motor removal.

2.5 VARIABLE FREQUENCY DRIVES (PANEL MOUNT)

A. General: The VFD shall convert incoming fixed frequency single-phase 120/240 volt AC power into a variable frequency three phase power supply for controlling the speed of three-phase AC induction motors. VFDs shall be mounted within the system control panel. Each VFD shall be a six-pulse input design, and the input voltage rectifier shall employ a full wave diode bridge. The output waveform shall closely approximate a sine wave. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform. The VFD shall include a full-wave diode bridge rectifier and maintain a displacement power factor of near unity regardless of speed and load.

The VFD shall produce an output waveform capable of handling maximum motor cable distances of up to 1,000 ft. (unshielded) without tripping or derating. The VFD shall utilize an output voltage-vector switching algorithm, or equivalent, in both variable and constant torque modes. VFD shall automatically boost power factor at lower speeds.

The VFD shall be able to provide its full rated output current continuously at 110% of rated current for 60 seconds. Switching of the input power to the VFD shall be possible without interlocks or damage to the VFD at a minimum interval of 2 minutes. Switching of power on the output side between the VFD and the motor shall be possible with no limitation or damage to the VFD and shall require no additional interlocks.

The VFD shall have temperature controlled cooling fans for quiet operation, minimized internal losses, and greatly increased fan life. No side clearance shall be required for cooling of the units.

VFD shall provide full torque to the motor given input voltage fluctuations of up to +10% to -15% of the rated input voltage. The VFD shall provide internal DC link reactors to minimize power line harmonics and to provide near unity power factor. VFD's without a DC link reactor shall provide a 5% impedance line side reactor.

VFD to be provided with the following protective features:

1) VFD shall have input surge protection utilizing MOV's, spark gaps, and Zener diodes to withstand surges of 2.3 times line voltage for 1.3 msec.

2) VFD shall include circuitry to detect phase imbalance and phase loss on the input side of the VFD.

3) VFD shall include current sensors on all three-output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.

4) VFD shall auto-derate the output voltage and frequency to the motor in the presence of sustained ambient temperatures higher than the normal operating range, so as not to trip on an inverter temperature fault. The use of this feature shall be user-selectable and a warning will be exported during the event. Function shall reduce switching frequency before reducing motor speed.

5) VFD shall auto-derate the output frequency by limiting the output current before allowing the VFD to trip on overload. Speed can be reduced, but not stopped.

6) The VFD shall have the option of an integral RFI filter. VFD enclosures shall be made of metal to minimize RFI and provide immunity.

VFD to be provided with the following interface features:

1) VFD shall provide an alphanumeric backlit display keypad, which may be remotely mounted using standard 9-pin cable. VFD may be operated with keypad disconnected or removed entirely. Keypad

may be disconnected during normal operation without the need to stop the motor or disconnect power to the VFD.

2) VFD shall display all faults in plain text; VFD's, which can display only fault codes, are not acceptable.

3) All VFD's shall be of the same series, and shall utilize a common control card and LCP (keypad/display unit) throughout the rating range. The control cards and keypads shall be interchangeable through the entire range of drives used on the project.

4) VFD keypad shall be capable of storing drive parameter values in non-volatile RAM uploaded to it from the VFD, and shall be capable of downloading stored values to the VFD to facilitate programming of multiple drives in similar applications, or as a means of backing up the programmed parameters.

5) A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.

6) A start guide menu with factory preset typical parameters shall be provided on the VFD to facilitate commissioning.

7) VFD shall provide full galvanic isolation with suitable potential separation from the power sources (control, signal, and power circuitry within the drive) to ensure compliance with PELV requirements and to protect PLC's and other connected equipment from power surges and spikes.

8) All inputs and outputs shall be optically isolated. Isolation boards between the VFD and external control devices shall not be required.

9) There shall be three programmable digital inputs for interfacing with the systems external control and safety interlock circuitry. An additional digital input is preprogrammed for start/stop.

10) The VFD shall have two analog signal inputs. One dedicated for sensor input and one for external set point input.

11) One programmable analog output shall be provided for indication of a drive status.

12) The VFD shall provide two user programmable relays with selectable functions. Two form 'C' 230VAC/2A rated dry contact relay outputs shall be provided.

13) The VFD shall store in memory the last 5 faults with time stamp and recorded data.

14) The VFD shall be equipped with a standard RS-485 serial communications port for communication to the multi-pump controller. The bus communication protocol for the VFD shall be the same as the controller protocol.

VFD service conditions shall be as follows:

1) Ambient temperature operating range, -10 to 45ºC (14 to 113°F).

2) 0 to 95% relative humidity, non-condensing.

3) Elevation to 1000 meters (3,300 feet) without derating.

4) VFD's shall be rated for line voltage of 200 to 240VAC; with +10% to -15% variations. Line frequency variation of ± 2% shall be acceptable.

2.6 PUMP SYSTEM CONTROLLER

1. General: The pump system controller shall be a standard product developed and supported by the pump manufacturer and shall be housed in a pump control panel remotely mounted on the interior station wall as shown on the plans. The controller shall be microprocessor based capable of having software changes and updates via personal computer (notebook). The controller user interface shall have a VGA display with a minimum screen size of 3.5" x 4.5" for easy viewing of system status parameters and for field

programming. The display shall have a back light with contrast adjustment. Password protection of system settings shall be standard. The controller shall provide internal galvanic isolation to all digital and analog inputs as well as all fieldbus connections. The controller shall be pre-programmed with data representing the installed pump curves to allow the system to automatically adapt operation of the pumps to optimize energy efficiency and pump performance while ensuring that pumps operate at safe factory recommended duty conditions.

2. Display: The controller shall display the following as status readings from a single display on the controller (this display shall be the default):

    1) Current value of the control parameter, (typically discharge pressure)
    2) Most recent existing alarm (if any)
    3) System status with current operating mode
    4) Status of each pump with current operating mode and rotational speed as a percentage (%)

3. Inputs and Outputs: The controller shall have as a minimum the following hardware inputs and outputs:

    1) Three analog inputs (4-20mA or 0-10VDC)
    2) Three digital inputs
    3) Two digital outputs
    4) Ethernet connection
    5) Field Service connection to PC for advanced programming and data logging

    The controller shall be capable of receiving a remote analog set-point (4-20mA or 0-10 VDC) as well as a remote system on/off (digital) signal.

4. Programming: Pump system programming (field adjustable) shall include as a minimum the following:

    1) Water shortage protection (analog or digital)
    2) Transducer Settings (Suction and Discharge Analog supply/range)
    3) PI Controller (Proportional gain and Integral time) settings
    4) High system pressure indication and shut-down
    5) Low system pressure indication and shut-down
    6) Low suction pressure/level shutdown (via digital contact)
    7) Low suction pressure/level warning (via analog signal)
    8) Low suction pressure/level shutdown (via analog signal)

    The system controller shall be able to accept up to seven programmable set-points via a digital input, (additional input/output module may be required). The controller shall have advanced water shortage protection. When analog sensors (level or pressure) are used for water shortage protection, there shall be two indication levels. One level is for warning indication only (indication that the water level/pressure is getting lower than expected levels) and the other level is for complete system shut-down (water or level is so low that pump damage can occur). System restart after shut-down shall be manual or automatic (user selectable).

    The system pressure set-point shall be capable of being automatically adjusted by using an external set-point influence. The set-point influence function enables the user to adjust the control parameter (typically

pressure) by measuring an additional parameter. (Example: Lower the system pressure set-point based on a flow measurement to compensate for lower friction losses at lower flow rates).

The pump system controller shall store up to 24 warning and alarms in memory. The time, date and duration of each alarm shall be recorded. A potential-free relay shall be provided for alarm notification to the building management system. The controller shall display the following alarm conditions:

1) High System Pressure
2) Low system pressure
3) Low suction pressure (warning and/or alarm)
4) Individual pump failure
5) VFD trip/failure
6) Loss of sensor signal (4-20 mA)
7) Loss of remote set-point signal (4-20mA)
8) System power loss

5. Control Panel: The pump system controller shall be mounted in a UL NEMA Type 4 rated enclosure. The entire control panel shall be UL 508 listed as an assembly. The control panel shall include a main disconnect, circuit breakers for each pump and the control circuit and control relays for alarm functions. Panel shall include the following:

   1) Pump Run Lights
   2) Pump Alarm Lights
   3) System Fault Light
   4) Audible Alarm
   5) Surge Arrestor
   6) Emergency/Normal Operation Switches
   7) Service Disconnect Switches

6. Controller: The controller shall be capable of receiving a redundant sensor input to function as a backup to the primary sensor (typically discharge pressure). The controller shall have a pump "Test Run" feature such that pumps are switched on during periods of inactivity (system is switched to the "off" position but with electricity supply still connected). The inoperative pumps shall be switched on for a period of two to three (2-3) seconds every 24 hours, 48 hours or once per week (user selectable). The controller shall be capable of displaying instantaneous power consumption (Watts or kilowatts) and cumulative energy consumption (kilowatt-hours). The actual pump performance curves (5^{th} order polynomial) shall be loaded (software) into the pump system controller.

   The controller shall SCADA compatible with Ethernet interface and communication via Modbus or DF1 protocol. Supplier shall provide a full memory address list.

7. Dry Run Protection: System shall include a pressure transducer on the suction supply to detect loss of supply water pressure and halt the pumps. System shall indicate alarm status and be capable of automatically resuming normal operation when adequate supply water is restored.

2.7 LOW FLOW STOP FUNCTION

A. General: The system controller shall be capable of stopping pumps during periods of low-flow or zero-flow without wasting water or adding unwanted heat to the liquid. During low flow periods, the bladder tank capacity shall be utilized to supply the system with pump operation cycling to fill the tank and maintain minimum pressure setting.

When a low flow is detected, the system controller shall increase pump speed until the discharge pressure reaches the stop pressure (system set-point plus 50% of programmed on/off band). The pump shall remain off until the discharge pressure reaches the start pressure (system set-point minus 50% of programmed on/off band). Upon low flow shut-down a pump shall be restarted in one of the following two ways:

1) Low Flow Restart: If the drop in pressure is slow when the start pressure is reached (indicating the flow is still low), the pump shall start and the speed shall again be increased until the stop pressure is reached and the pump shall again be switched off.

2) Normal Flow Restart: If the drop in pressure is fast (indicating the flow is greater than 10% of pump nominal flow) the pump shall start and the speed shall be increased until the system pressure reaches the system set-point.

2.8 PRESSURE TANK

A. General: Pressure tank may be provided by either the Contractor or Booster Pump System Provider. Pressure Tank shall be of the captive air diaphragm or bladder type designed for potable water application and meeting NSF 61 Standards.. Tank shall have a minimum working pressure of 125 psi and 119 gallon capacity with an available drawdown of 25 gallons when operated at 30 to 50 psi. Diaphragm shall be constructed of butyl rubber.

PART 3 EXECUTION

3.1 INSTALLATION

1. General: All specified equipment shall be installed where indicated on the plans and in accordance with the manufacturer’s instructions.

3.2 MANUFACTURER'S RESPONSIBILITIES

1. Factory Testing: The entire pump station shall be factory performance tested as a complete unit prior to shipment. Job-site programming shall be entered into the controller prior to shipment. A verified performance test report shall be made available from the system manufacturer. The system shall undergo a hydrostatic test of 350 psig for a minimum of 15 minutes prior to shipment.

2. Field Service: The services of a factory trained field service technician shall be provided to inspect the completed installation, make all adjustment necessary to place the system in satisfactory operation and instruct the operating personnel in the proper care and operation of the equipment.

3. Manufacturer's Warranty: The manufacturer of the equipment shall warrant it to be of quality construction, free from defects in material and workmanship. The warranty period shall be a non-prorated period of 24 months from date of installation. Components failing to perform as specified by the ENGINEER, or as represented by the manufacturer, or proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to the OWNER.

END OF SECTION 11215

SECTION 15050 – BASIC MECHANICAL MATERIALS & METHODS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: The work in this section applies to all Division 15 Specifications. The CONTRACTOR shall furnish all labor, materials, supplies and equipment necessary for the complete and satisfactory construction of material described in this section and as shown on the plans.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Manufacturer’s Data: The following manufacturer's data shall be submitted to the Engineer:

1. Complete materials list of all items proposed to be furnished and installed under this Section.
2. Catalog cuts and other data required to demonstrate compliance with the specified requirements.
3. Manufacturer's recommended methods of installation.

C. The manufacturer's recommended methods of installation, when approved by the Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

1. Submit belt drive with the driven equipment. Submit selection data for specific drives when requested by the Owner.
2. Submit electric motor data with the driven equipment.
3. Equipment and materials identification.
4. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
5. Wall, floor, and ceiling plates.

D. Maintenance Data and Operating Instructions:

1. Maintenance and operating manuals for systems and equipment.
2. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment.

1.3 QUALITY ASSURANCE

A. Qualifications of Manufacturer: Products used in the work of this section shall be produced by manufacturer's regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Engineer.

B. Qualifications of Installers: Use sufficient journeymen plumbers and competent supervisors in execution of this portion of the work to ensure proper and adequate installation throughout. In the acceptance or rejection of installed plumbing, no allowance will be made for lack of skill on the part of workmen.

C. Certification: After completing the work of this section and as required by the locality, furnish the Owner and Engineer 3 copies of Plumbing Inspection Certificate from the local plumbing inspector..

D. Equipment Vibration Tolerance:

1. Equipment specifications require factory balancing of equipment to this tolerance.

E. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.
2. Equipment Service: Products shall be supported by a service organization which maintains an adequate inventory of repair parts and is located reasonably close to the site.
3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
5. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
6. Asbestos products or equipment or materials containing asbestos shall not be used.
7. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Owner prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: The Contractor shall comply with Section 01610 - Delivery, Storage, and Handling.

B. Protection: Use all means necessary to protect materials of this section before, during, and after installation and to protect installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 PIPES

A. General: Unless specifically stated otherwise, all pipe, fittings, and appurtenances shall be new, free from defects or contamination, and shall, whenever possible, be the standard product of a single manufacturer.

B. Material: Shall be as specified in Section 02510 – Water Distribution.

2.2 VALVES

A. General: Provide complete, in place, and free from leakage, all valves as shown on the plans, in accordance with this section and Section 02510 – Water Distribution. Valves shall be furnished complete with valve operators and accessories necessary for a complete assembly adequate for the specified purposes. Valve assemblies shall be installed, painted, tested and adjusted.

2.3 PIPE SUPPORTS

A. General: Material shall comply with Section 15250 - Pipe Supports.

2.4 DRIVE GUARDS

A. General: For machinery and equipment, provide guards as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears and other moving parts regardless of height above the floor. Drive guards may be excluded where motors and drives are inside factory fabricated air handling unit casings.

B. Materials: Sheet steel, cast iron, expanded metal or wire mesh rigidly secured so as to be removable without disassembling pipe, duct, or electrical connections to equipment.

C. Access for Speed Measurement: One inch diameter hole at each shaft center.

2.5 ELECTRIC MOTORS

A. Rating: Continuous duty at 100 percent capacity in an ambient temperature of 40 degrees centigrade; minimum horsepower as shown on plans; maximum horsepower in normal operation not to exceed nameplate rating without service factor.

B. Insulation Resistance: Not less than one half megohm between stator conductors and frame, to be determined at the time of final inspection.

2.6 EQUIPMENT AND MATERIALS IDENTIFICATION

A. General: Use symbols, nomenclature and equipment numbers specified, shown on the plans and in the maintenance manuals.

B. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 3/16 inch high of brass with black filled letters, or rigid black plastic with white letters permanently fastened to the equipment. Identify unit components such as coils, filters, fans, etc.

C. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 3/16 inch high riveted or bolted to the equipment.

D. Control Items: Label all temperature sensors, controllers and control dampers. Identify and label each item as they appear on the control diagrams.

2.7 EQUIPMENT SUPPORTS AND RESTRAINTS

A. For Attachment to Concrete Construction:

1. Concrete insert: Type 18, MSS SP 58.
2. Self drilling expansion shields and machine bolt expansion anchors permitted in concrete not less than four inches thick. Applied load shall not exceed one fourth the proof test load.

3. Power driven fasteners: Permitted in existing concrete or masonry not less than four inches thick when approved by the OWNER for each job condition. Use fasteners capable of supporting a 1000 pound test load, with the actual load not exceeding 50 pounds.

B. For Attachment to Steel Construction: MSS SP 58.
1. Welded attachment: Type 22.
2. Beam clamps: Types 20, 21, 28 or 29. Type 23 C clamp may be used for individual copper tubing up to 7/8 inch outside diameter.
3. For Attachment to Wood Construction: Wood screws or lag bolts.
4. Hanger Rods: Hot roller steel, ASTM A 36 or A 575 for allowable load listed in MSS SP 58. Types 13 or 15 turn buckles shall provide 1 1/2 inches minimum of adjustment and incorporate locknuts. All thread rods are acceptable.

2.8 TOOLS AND LUBRICANTS

A. General: Furnish, and turn over to the Owner, special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.

B. Grease Guns With Attachments For Applicable Fittings: One for each type of grease required for each motor or other equipment.

C. Tool Containers: Hardwood or metal, permanently identified for in tended service and mounted, or located, where directed by the Resident Engineer.

D. Lubricants: A minimum of one quart of oil, and one pound of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Coordinate location of inserts, hangers, ductwork and equipment. Locate inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.

1. Protection and Cleaning:
   a. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Owner. Damaged or defective items in the opinion of the Owner shall be replaced.
   b. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Tightly cover and protect fixtures and equipment against dirt, water chemical, or mechanical injury. At completion of all work thoroughly clean exposed materials and equipment.

B. Concrete and Grout: Use concrete and shrink compensating grout 3000 psi minimum.

C. Location: Install valves and other devices with due regard for ease in reading or operating and maintaining said devices. Servicing shall not require dismantling adjacent equipment or pipe work.

D. Process water piping shall be installed in accordance with Section 02080 - Utility Pipe and Materials. Pipe supports shall comply with section 15250 - Pipe Supports.

E. Non-potable water piping shall be installed as specified in Section 15400 - Plumbing, for potable water lines and conform to all local building codes and Section 02080 – Utility Pipe and Materials.

F. Process waste lines shall be installed as specified in Section 15400 – Plumbing for waste and vent piping and conform to all local building codes.

3.2 EQUIPMENT SUPPORTS

A. General:

1. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels.
2. Use of chain, wire or strap hangers; wood for blocking, stays and bracing; or, hangers suspended from piping above will not be permitted. Replace or thoroughly clean and red lead paint products that are rusty.
3. Use hanger rods that are straight and vertical.

3.3 MOTOR AND DRIVE ALIGNMENT

A. Direct-connect Drive: Securely mount motor in accurate alignment so that shafts are free from both angular and parallel misalignment when both motor and driven machine are operating at normal temperatures.

3.4 LUBRICATION

A. General: Field check and lubricate equipment requiring lubrication prior to initial operation.

3.5 STARTUP AND TEMPORARY OPERATION

A. General: Start up equipment as described in equipment specifications. Verify that vibration is within specified tolerance prior to extended operation.

3.6 OPERATING AND PERFORMANCE TESTS

A. Testing: Prior to the final inspection, perform tests as recommended by manufacturer and submit the test reports and records to the Owner.

B. Corrections: Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Owner.

C. Adjustments: When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

END OF SECTION 15050

SECTION 15250 – PIPE SUPPORTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: Provide all material, equipment, and labor required for installation of pipe supports. Contractor is responsible for providing all pipe supports as required to properly support piping, valves, and related equipment.

PART 2 - PRODUCTS

2.1 ADJUSTABLE PIPE SUPPORTS

A. General: Pipe support shall be designed to support pipe running close to the floor and provide vertical adjustment. U-Bolt shall be used to secure the pipe to the saddle.

B. Material: All pipe supports and hardware within wetwell shall be stainless steel. All other pipe support shall be made of steel with plain finish.

C. Spacing: Spacing of supports shall be maximum 10 feet apart and as required at fittings.

D. Threaded Base Stand: Support base stand shall have threaded end to provide vertical adjustments. Plate shall be secured to the floor by 4 typical concrete anchors. Height shall be as necessary.

E. Pipe Saddle Support with U-Bolt: Saddle support shall have threaded end to provide vertical adjustments.

F. Design Load: Pipe supports shall provide secure support of pipe loading. The following table represents the minimum design loading that shall be supported by pipe saddle support.

Pipe Size	Design Loading
4 inches	1,200 pounds
6 inches	2,100 pounds
8 inches	3,200 pounds

2.2 PIPE HANGERS

A. Material: Pipe hangers shall be made of steel with plain finish.

B. Design Load: Pipe hangers shall be capable of withstanding the design loading of a minimum of 190 pounds.

2.3 PROTECTIVE COATINGS

A. Pipe supports and hangers shall be coated as required in Section 09910 – Exterior Painting, and 09920 – Interior Painting.

PART 3 - EXECUTION

3.1 PIPE SUPPORTS INSTALLATION

A. Pipe supports shall be installed at locations designated on the Drawings and any other location where support is required to properly install piping as shown on the drawings.

B. All pipe supports shall be installed according to manufacturer's instructions.

END OF SECTION 15250

SECTION 15400 – PLUMBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included includes interior building and within 5’ of exterior of building: Plumbing system shall include all cold potable water distribution, non-potable water distribution, vents and wastes, floor drainage, and all plumbing items indicated on the plans or described in these specifications. The CONTRACTOR shall furnish all labor, materials, supplies and equipment necessary for the complete and satisfactory construction of the plumbing system shown on the plans.

1.2 SUBMITTALS

A. Comply with pertinent provisions of Section 01330 - Submittal Procedures.

B. Submit the following information:

1. Complete materials list of all items proposed to be furnished and installed under this Section.
2. Catalog cuts and other data required to demonstrate compliance with the specified requirements.
3. Manufacturer's recommended methods of installation.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with pertinent provisions of Section 01610 - Delivery, Storage, and Handling and with manufacturer’s recommendations.

1.4 QUALITY ASSURANCE

A. Qualifications of Manufacturer: Products used in the work of this section shall be produced by manufacturer's regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Engineer.

B. Qualifications of Installers: Use sufficient journeymen plumbers and competent supervisors in execution of this portion of the work to ensure proper and adequate installation throughout.

PART 2 - PRODUCTS

2.1 PIPES

A. Pipe shall conform to Section 02510 – Water Distribution unless noted within this section.

B. Schedule 40 CPVC: Schedule 40 Chlorinated Polyvinyl Chloride (CPVC) shall be used for building service water and chemical clean piping and shall conform to ASTM D 2846 with solvent weld joints.

C. Unless specifically stated otherwise, all pipe, fittings, and appurtenances shall be new, free from defects or contamination, and shall, whenever, possible, be the standard product of a single manufacturer.

2.2 VALVES

A. Valves shall conform to Section 02510 – Water Distribution unless noted within this section.

B. Sampling Taps: Sampling taps shall be plain end spigot facet, renewable seats, tee handles, polished chrome plated similar to American Standard 4221.024.

C. Corporation Stop: Shall be 3/4 inch unless otherwise indicated with inlet threads conforming to ANSI/AWWA C800, commonly known as the "Mueller" thread, and an outlet compatible with the service pipe and shall be Mueller #H-15000 for copper outlet or approved equal.

D. Valve Operators: Shall be either handwheel or wrench for nut operated valves as indicated on the plans. Minimum two wrenches shall be provided by the manufacturer of nut operated valves.

2.3 VACUUM BREAKERS

A. General: Shall have bronze body and internal trim, plain brass finish, full-size orifice and threaded ends. Vacuum breakers shall be suitable for 125 pounds of working pressure at 212 degrees F. Vacuum breaker shall meet ASSE No. 1011.

2.4 PIPE HANGERS AND SUPPORTS

A. General: Pipe supports shall be installed according to Section 15250 - Pipe Supports.

B. Horizontal Piping: Horizontal piping shall be supported such that forces are transmitted from the piping system to the hangers and sagging is eliminated. Hangers shall be pipe ring, split pipe ring, extension split pipe clamp or clevis type, with adjustable length hanger rods. Hanger rods shall be attached to trusses. Perforated pipe straps, thin strap or wire shall not be an acceptable means of supporting pipe.

C. Vertical Piping: Vertical piping shall be supported with riser clamps. Piping on walls shall be supported with one hole clamp, U-bolts or other means as approved by the Engineer.

D. Materials: Piping shall be supported with copper, brass, copper plated, or plastic covered malleable iron hangers and supports.

E. Hanger Spacing: PVC and steel pipe supports shall be as follows:
   1. 1/2 inch and smaller, not greater than 4 feet apart.
   2. 3/4 inch and larger, not greater than 6 feet apart.

F. Hangers shall be located at all points where pipes change direction.

2.5 CLEANOUTS

A. General: Cleanout shall be round coated cast iron access frame with heavy duty scoriated secured cover, coated cast iron ferrule, internal recessed plug, and spigot connection. Plug shall be brass and conform to ASTM A 74.

2.6 FLOOR DRAINS

A. Drains shall conform to ANSI/ASME A 112.21.1. Floor drains shall be coated cast iron with double drainage flange, weepholes, threaded outlet connection, integral bell trap, and adjustable polished nickel

alloy round removable strainer. Strainer shall be 6 inches in diameter and shall be made with light duty grate in buildings except in traffic areas where medium duty shall be used.

2.7 DEHUMIDIFIER

A. General: Dehumidifier shall have minimum 45 pint per day water removal capacity, digital display, adjustable humidistat, and thermoplastic or metal housing. Unit shall be plumbed to drain to exterior as shown on the plans. Dehumidifier shall be as manufactured by Dayton, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Code: Comply with all applicable State and local building codes.

B. General: Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PLUMBING SYSTEM LAYOUT

A. General: Lay out the plumbing system in careful coordination with the plans and other trades determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system. Follow the general layout shown on the plans in all cases except where other work may interfere. Lay out all pipe to fall within partition walls, or roof cavities, unless shown otherwise.

3.3 LOCATION OF PIPING

A. General: Arrange and install piping approximately as indicated, straight, plumb, and as direct as possible. Form right angles or parallel lines with building wall and floor. Keep pipe close to walls, partitions and ceilings. Offset only where necessary to follow walls. Pipes shall be sloped as necessary for proper functioning of the system, including drain down of water pipe. Install piping so as to leave parts of the system readily accessible for repairs and maintenance.

B. Parallel Pipes: Where several pipes are run together, they shall run parallel and shall be spaced at distances which will permit access for servicing, unless provisions for pitching the pipes dictate different elevations.

C. Interferences: Avoid interference with structure, and with work of other trades, preserving adequate headroom and clearing all doors and passageways to the approval of the Engineer.

3.4 INSTALLATION – GENERAL

A. General: Do not cut or reduce size of any load-carrying structural member without the prior approval of the Engineer. Install all pipes to clear all beams and obstructions in accordance with the following:

1. Install all piping promptly, capping or plugging all open ends.

2. Install all piping, with slopes as noted, and plumb, free from traps, and in a manner to conserve space for other work.
3. Cushion all traps and bearings to minimize transfer of sound. Provide complete isolation of all dissimilar materials. Firmly anchor all pipes into position.
4. Provide uniform pitch of at least 1/4 inch per foot for all horizontal waste piping within the building.

3.5 INSTALLATION OF PIPING

A. General:

1. Pipe shall be protected during handling against impact shocks and fee fall.
2. Piping shall be cut accurately to measurements established at the site and shall be emplaced without springing, forcing, excessive cutting or weakening of the building structure. Pipes shall be installed in a manner permitting proper drainage, venting, and free expansion and contraction. Changes in direction shall be made with factory manufactured fittings.
3. Reductions in pipe shall be made with reducing fittings only. Bushings are prohibited unless shown on the plans or approved by the Engineer.
4. Nipples shall be the same material and pressure rating as the remainder of the piping system. Use nipple of higher pressure rating when length of unthreaded part of nipple is less than 1-1/2 inches.
5. Unions or flanged spool pieces shall be used to facilitate piping installation, and shall be installed between valves and equipment to facilitate removal of equipment for repair.
6. Installation practices shall be in accordance with the best standards of the trade. All piping shall be reamed after cutting to remove burrs and rough edges. All piping shall be cleaned free of cuttings and oil prior to installation. All pipe lines shall be capped during construction to avoid the entry of foreign materials into the piping.
7. Installation of the piping system shall be such as to allow for thermal expansion and contraction while preventing undue stresses and strains on the systems and connected equipment. Contractor shall take proper care that lines will be installed so as to allow proper drainage, avoid trapping of air, and allow for normal expansion movements. Contractor shall be held liable to correct any defects in installation or proper performance of the piping systems under Contract.
8. Piping shall be installed parallel with or at right angles to building walls or piping and supported by approved methods.

B. Pipe Cleaning:

1. The Contractor shall make every effort to handle and place all material so that no foreign matter may enter either before, during, or after being installed. Any such matter which unavoidably gets into the pipe shall be carefully removed by the Contractor.
2. Clean pipe, pipe fittings, and valves before erection.
3. After threading any pipe, clean pipe ends carefully to remove cutting oil and particles. Any pipe which is stored shall have threading protected until installation commences.
4. Before making pipe joints, all surfaces of the portions of the pipe to be joined shall be clean and dry.

C. Below Grade Piping:

1. Pipe lines shall be laid to alignment and depth shown on the Contract Plans. A minimum depth of cover of 36 inches over the top of the pipe shall be provided, if no depth or grade is indicated on the Drawings.
2. Blocks shall not be used under any pipe except where absolutely necessary and only with the expressed approval of the Engineer.
3. Trenches shall be kept free of water and as dry as possible during bedding, laying and jointing. When work is not in progress, open ends of pipe and fittings shall be satisfactorily closed so that no trench water or other material will enter the pipe or fittings. No end of pipe trench shall remain open overnight.

4. As soon as possible after the joint is made, sufficient backfill material shall be placed along the pipe to prevent pipe movement off line or grade.

D. Joining of Pipes: Lubricants, primers, and adhesives shall be used as recommended by the pipe manufacturer. Pipe shall be installed in accordance with the manufacturer's recommendation.

E. Threaded Joints:

1. Screwed connections shall have full threads of true taper, accurate to gauge, and conforming to ANSI B 2.1.
2. Pipe shall be reamed and threaded. Remove cutting oil and make up joints with Teflon threaded tape or pipe dope on the male connection only.

F. Dissimilar Metals:

1. Wherever possible, connections between equipment, piping hangers of dissimilar metals shall be avoided.
2. Wherever such a connection or contact between dissimilar metals is to occur, insulate the two different materials using a best quality dielectric insulating material.

3.6 STERILIZATION OF PIPES

A. Chlorination:

1. After preliminary purging of the system, chlorinate the entire potable water system in accordance with the current procedures of the American Water Works Association (AWWA C 651) for flushing and disinfecting water mains, and in accordance with all other pertinent rules and regulations.
2. A minimum of two consecutive satisfactory samples taken from the outlet furthest from the building supply, shall be obtained and analyzed by a State certified laboratory with satisfactory results prior to potable use.
3. Chlorinate only when the building is unoccupied.
4. Upon completion of sterilizing, thoroughly flush the entire potable water system.

B. Certification: Deliver a "Certificate of Completion of Chlorination" to the Engineer.

3.7 TESTING

A. General: Furnish all test pumps, gages, equipment, and personnel required to demonstrate the integrity of the finished installation. Notify the Engineer and all pertinent approval authorities five days before the tests are to be performed. No piping shall be covered up or concealed until all testing is performed, leaks stopped and the system retested and approved. All tests shall be observed by the Owner’s representative.

B. Procedures:

1. Drain: Unless otherwise directed, plug all openings and fill with water to a height equal to the lowest vent. Allow to stand one hour or longer as required by regulation. Remake leaking joints as directed and then retest.
2. Water Lines: Test and make tight at 150 psi per procedures in Section 02080 - Utility Pipe and Materials. Retain for four hours; repair all leaking joints as directed; and then retest.
3. Valves: Test all valve bonnets for tightness. Test and operate all valves at least once from closed-to-open-to-closed positions while valve is under pressure. Test all automatic valves for proper operation at the settings indicated. Test pressure relief valves at least three times.
4. Other: Test all piping specialties for proper operation. Test all air vent points to ensure that air has been vented.

C. Record Data: Upon completion and approval of testing, submit in writing the following:

1. That all tests have been satisfactorily performed.
2. Dates the tests were performed.

END OF SECTION 15400

SECTION 16010 – ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 REFERENCES

1. General: The work shall comply with the most recent standards or tentative standards as published at the date of the contract and as listed in this specification.

1.2 SUBMITTALS

1. General: The following shall be submitted. Materials and equipment will be approved based on the manufacturer's published data.

2. Detail Plans: Detail plans shall be submitted for approval and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical data; catalog cuts; and any special installation instructions that may be required. Detail plans shall be submitted for all materials and equipment specified. Applicable schematic diagrams, equipment layout and anchorage shall be shown.

3. Test Reports: The label or listing of the Underwriters Laboratories, Inc. shall be submitted as evidence that the materials or equipment conform to the applicable standards of that agency.

4. Certificates of Compliance: For other than equipment and materials specified to conform to UL publications, a manufacturer's statement indicating complete compliance with the applicable Federal Specification, or standard of the ASTM, NEMA or other commercial standard, is acceptable.

1.3 QUALITY ASSURANCE

1. Standard Products: Materials and equipment shall be the standard catalog products of a UL listed manufacturer regularly engaged in the manufacture of the products that have been in satisfactory use for at least 2 years. All materials and equipment shall be in accordance with the ACSA Approved Products List included in section D of these Construction Standards

2. U.L. Listing: Equipment shall be constructed in a UL 508 and UL 913 listed controls manufacturing facility as applicable. The manufacturer shall provide certification of both ratings with submittals. The equipment shall bear the appropriate UL serialized label indicating the equipment supplied shall be constructed in accordance with the practices and requirements of UL.

3. Alternate Manufacturers: Alternate equipment must be approved by the Engineer. Any alternate equipment shall be noted as “alternate” when submittals are sent in for review.

4. Wiring: All wiring shall be minimum 600 volt UL type MTW or AWM and have a current carrying capacity of not less than 125% of the full load current. The conductors shall be in complete conformity with the National Electric Code, state, local and NEMA electrical standards. For ease of service and maintenance, all wiring shall be color coded. The wire color code shall be clearly indicated on all submittal and as-built drawings.

5. Bundled Wire: All control wiring shall be contained within wiring duct with covers as manufactured by Panduit or equal. Where dimensional constraints prevent the use of wiring duct, wires shall be bundled and tied not less than every three inches with nylon self-locking cable ties as manufactured by Panduit or equal. Every other cable tie shall be fastened to the enclosure door or inner device panel with a cable tie mounting plate with pressure tape. Where wiring crosses hinged areas such as when trained from the inner device panel to the enclosure door, spiral wrap shall be used.

1.4 DELIVERY, STORAGE AND HANDLING

1. General: Delivery, storage, and handling shall be the responsibility of the Contractor and at a minimum shall be conducted in accordance with the manufacturer's recommendations.

PART 2 PRODUCTS

2.1 ELECTRICAL IDENTIFICATION

1. Identification Nameplates: Major items of electrical equipment shall be permanently marked with an engraved plate and shall show an identification name, to identify the equipment by type of function as indicated.

2.2 LIGHTING

1. Fixtures: Interior and exterior fixtures shall be as indicated on the plans. All fixtures shall be rated high efficiency.

2.3 CONDUCTORS AND CABLES

1. General: All conductors used in the wiring system shall be soft drawn copper wire, having a conductivity of not less than 98 percent of that of pure copper, with 600 volt rating, unless otherwise noted. Wire shall be as manufactured by Capital, General Cable, Triangle or approved equal. Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid metallic conduit.

2. Conductor Types: The conductor types shall be as follows, unless otherwise noted:

   1) Service entrance shall be type THHN or XHHW, rated at 90 degrees C.

   2) Feeders and branch circuits shall be type THW or THWN, rated at 75 degrees C.

   3) Control circuits shall be type TFF, rated at 60 degrees C.

2.4 CONDUIT

1. Conduit: Rigid conduit shall be galvanized rigid steel conduit or Intermediate Metal Conduit (IMC) with a minimum size of 3/4 inch unless otherwise noted. Flexible metal conduit shall be Liquid-Tight type, approved for continuous grounding, and shall be used only where approved by NFPA 70 and local codes. Conduit, couplings, and connectors shall be products of a reputable manufacturer, as manufactured by Allied Tube and Conduit, Triangle Conduit and Cable, National Electric, or approved equal.

2.5 BOXES

1. Outlet Boxes: Outlet boxes shall be made of galvanized sheet steel unless otherwise noted or required by NFPA 70. Boxes shall be a minimum of 4 inches square, and shall be complete with the approved type of connectors and required accessories. Boxes shall be manufactured by Appleton, Raco, Steel City or approved equal. Outlet boxes for exposed work shall be handy boxes with handy box covers unless otherwise noted. Outlet boxes located on the exterior in damp or wet locations or as otherwise noted shall be threaded cast aluminum device boxes such as Crouse-Hinds Type "FS" or "FD". All box covers shall be watertight.

2. Receptacle Boxes: Wall receptacles shall be mounted approximately 48 inches above the finished floor (AFF) unless otherwise noted. All receptacle boxes shall be equipped with grounding lead which shall be connected to grounding terminal for the device. All box covers shall be watertight.

3. Switch Boxes: Wall switches shall be mounted approximately 54 inches AFF unless otherwise noted. Where two or more switches are located, the switches shall be mounted in a gang outlet box with gang cover. Switches with pilot lights, motor starting switches and other special switches that will not conveniently fit under gang wall plates may be individually mounted.

4. Pull Boxes: Pull boxes shall be installed at all necessary points, whether indicated on the plans or not, to prevent injury to the insulation or other damage that might result from pulling resistance or other reasons necessary for proper installation. Minimum box dimensions shall not be less than NFPA 70 requirements and shall be increased if necessary for practical reasons or where required to fit a job condition. Where boxes are used in connection with closed conduit, plain covers attached to the box with a suitable number of counter-sunk flat head machine screws shall be used. Pull boxes shall be constructed of galvanized sheet steel, minimum 12 gage.

2.6 RECEPTACLES

1. Heavy Duty Receptacles: Receptacles located outside or in wet locations shall be heavy duty, duplex, NEMA 5-15R, 15 amperes, 125 volts, with spring door gasketed covers similar to Crouse Hinds W1RD-l.

2. Interior Receptacles: Receptacles shall be specification grade, UL listed, NEMA 5-15R, brown duplex, 15 ampere, 125 volts AC, similar to Leviton Model 5262.

2.7 HEATING UNITS

1. Electric Unit Heaters: Unit heaters shall be heavy duty forced air electric heaters and shall be installed where shown on the plans. Heaters shall be wall mounted. Return and supply grille shall be constructed of 1/16" steel with maximum ¼" opening. All other parts shall be minimum 16 ga. steel zinc coated, both sides finished with high gloss colored baked enamel. Units shall be provided with a remote wall-mounted thermostat. Heaters shall be equipped with a "zero voltage reset" thermal overload, UL listed, and of the size and voltage as indicated on the plans. Heaters shall be as manufactured by Raywall, Dayton, or approved equal.

2.8 ELECTRICAL SURGE PROTECTION

1. Surge Suppressor: Main power service shall be protected by a Surge Protective Device (SPD) providing transient suppression and noise filtering with Nema 4 enclosure. Unit shall provide minimum 120 kA current capacity per phase. Unit shall be similar to Square D Surgelogic external brick panel SPD.

2. Surge protection shall be installed to protect electrical components in accordance with minimum International Society of Automation (ISA) standards.

   a) All field analog instruments shall be protected by surge suppression on the instrument.

   b) All analog signals coming from instrumentation to the main panel box shall be protected with surge suppression.

   c) All digital input/output signals and instrumentation shall be protected by inline fuses.

   d) Transient voltage surge suppression (TVSS) shall be installed at the main power feed and in the main control panel.

   e) Insulation and grounding of suppressors shall be in conformance with manufacturers recommendations.

PART 3 EXECUTION

3.1 INSTALLATION

1. General: Equipment specified in this section shall be installed in accordance with the manufacturer's recommendations and must meet all applicable requirements of NFPA 70 and NFPA 101, unless more stringent requirements are indicated herein or shown. The installations shall comply with all applicable laws and ordinances in effect at the building site, with applicable regulations of the National Electric Code and with regulations of the utility company furnishing power to the site. All systems shall be completely assembled, tested, adjusted, and demonstrated to be ready for operation prior to acceptance by the Owner.

2. Field Service: The manufacturer of controlled system shall provide the services of a factory trained service technician for a minimum of two eight-hour days of field service to inspect the installed equipment, supervise start-up of the equipment and train the OWNER’s personnel in the proper maintenance and operation of the equipment.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

1. Sizes: Branch-circuit conductors shall be not smaller than 12 AWG. Conductors for 120-volt branch circuits more than 100 feet long and conductors for 277-volt branch circuits more than 230 feet long, from panel to load center, shall be increased one size to prevent excessive voltage drop. Class 1 remote control and signal circuit conductors shall be not smaller than 14 AWG. Class 2 remote control and signal circuit conductors shall be not smaller than 16 AWG. Gages of all wiring shall be adequate to meet the requirements of NFPA 70.

2. Wiring Methods for Cable Systems: Cables shall be installed concealed behind ceiling or wall finish where practical. Cables shall be threaded through holes bored on the approximate centerline of wood members; notching of surfaces will not be permitted. Sleeves shall be provided through bond beams of masonry-block walls for threading cables through hollow spaces. Exposed cables shall be installed parallel or at right angles to walls or structural members. In rooms or areas not provided with ceiling or wall finish, cables and outlets shall be installed so that a room finish may be applied in the future without disturbing the cable or resetting the boxes. Exposed nonmetallic-sheathed cables less than 4 feet above floors shall be protected from mechanical injury by installation in conduit or tubing.

3. Aluminum Cables and Conductors: **Aluminum conductors shall only be permitted on service entrance**. Aluminum conductors shall have ampacity of not less than the copper conductors. Wire connectors of insulating material or solderless pressure connectors properly taped shall be utilized for all splices. Pressure connectors for aluminum conductors shall have tinned aluminum bodies. Aluminum contact surfaces of conductors and connectors shall be cleaned and covered with antioxidant compound prior to making the connections.

3.3 INSTALLATION OF RACEWAYS

1. Conduit Types: Only metal conduits will be permitted when required for shielding or other special purposes indicated, or when required by conformance to NFPA 70. Nonmetallic conduit and tubing may be used in damp, wet or corrosive locations, when permitted by NFPA 70 and the conduit or tubing system is provided with appropriate boxes, covers, clamps, screws or other appropriate type of fittings. Except as otherwise specified, Intermediate Metal Conduit (IMC) may be used as an option for rigid steel conduit in areas as permitted by NFPA 70.

2. Conduit Sizes: Conduit shall be of ample size to permit the ready insertion and withdrawal of conductors without abrasion. Conduit sizes shown are based on the use of copper conductors with insulation types as described in Part 2 Products.

3. Conduit Installation: All joints shall be cut square, reamed smooth and drawn up tight. All bends shall be free of dents or flattening. Conduit throughout the project shall be securely supported to the building structure in a neat and workmanlike manner. Conduits shall be continuous from outlets to cabinets, panels, junction or pull boxes, and shall enter and be secured at all such enclosures so that each system shall be electrically continuous throughout. Raceways shall be concealed within finished walls, ceilings, and floors unless otherwise permitted by Owner.

4. Exposed Raceways: Exposed raceways or conduit shall be installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings.

5. Changes in Direction of Runs: Changes in direction of runs shall be made with symmetrical bends or cast-metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-binding machine. Crushed or deformed raceways shall not be installed. Trapped raceways in damp and wet locations shall be avoided where possible. Care shall be taken to prevent the lodgment of plaster, dirt, or trash in raceways, boxes, fittings and equipment during the course of construction. Clogged raceways shall be entirely freed of obstructions or shall be replaced.

6. Underground and Below Slab-on-Grade Conduit: All electrical wiring below slab-on-grade shall be protected by a conduit system. No conduit system shall be installed horizontally within concrete slabs-on-grade. Conduit passing vertically through slabs-on-grade shall be rigid steel or IMC. Rigid steel or IMC conduits installed below slab-on-grade or in the earth shall be field-wrapped with 0.010-inch thick pipe-wrapping plastic tape applied with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating system.

7. Conduit in Slabs: Conduits shall be installed as close to the middle of concrete slabs as practical without disturbing the reinforcement. Outside diameter shall not exceed 1/3 of the slab thickness, and conduits shall be spaced not closer than 3 diameters on centers except at cabinet locations where the slab thickness shall be increased as necessary.

8. Conduit Stub-ups: Conduits stubbed up through concrete floors for connections to freestanding equipment shall be provided with a short elbow and an adjustable top or coupling threaded inside for plugs, set flush with the finished floor. Wiring shall be extended in rigid threaded conduit to the equipment, except that where required, flexible conduit may be used 6 inches above the floor. Screwdriver-operated threaded flush plugs shall be installed in conduits from which no equipment connections are made to suit the devices installed.

9. Supports: Metallic conduits and tubing shall be securely and rigidly fastened in place at intervals of not more than 10 feet and within 3 feet of boxes, cabinets, and fittings, with approved pipe straps, wall brackets, conduit clamps, conduit hangers, threaded C-clamps, or ceiling trapeze. C-clamps or beam clamps shall have strap or rod-type retainers. Rigid plastic conduits (if permitted as a wiring method) shall be supported as indicated above, except that they will be supported at intervals as indicated by NFPA 70. Loads and supports shall be coordinated with supporting structure to prevent damage or deformation to the structures, but no load shall be applied to joist bridging. Fastenings shall be by wood screws or screw-type nails to wood; by toggle bolts on hollow masonry units; by expansion bolts on concrete or brick; by machine screws, welded threaded studs, heat-treated or spring-steel-tension clamps on steel work. Nail-type nylon anchors or threaded studs driven in by a powder charge and or machine screws. Raceways or pipe straps shall not be welded to steel structures. Holes cut to a depth of more than 1-1/2 inches in reinforced concrete beams or to a depth of more than 3/4 inch in concrete joists shall avoid cutting the main reinforcing bars. Holes not used shall be filled. In partitions of light steel construction, sheet-metal screws may be used. Conduit shall not be supported using wire or nylon ties. Raceways shall be installed as a complete system and be independently supported from the structure. Supporting means will not be shared between electrical raceways and mechanical piping or ducts and shall not be fastened to hung ceiling supports. Conduits shall be fastened to all sheet-metal boxes and cabinets with two locknuts where required by NFPA 70, where insulating bushings are used, and where bushings cannot be brought into firm contact with the box; otherwise, a single locknut and bushing may be used. Bushings shall be installed on the ends

of all conduits and shall be of the insulating type where required by the NFPA 70. Threadless fittings for electrical metallic tubing shall be of a type approved for the conditions encountered. A pull wire shall be inserted in each empty raceway in which wiring is to be installed by others if the raceway is more than 50 feet in length and contains more than the equivalent of two 90 degree bends, or where the raceway is more than 150 feet in length. The pull wire shall be of No.14 AWG zinc-coated steel, or of plastic having not less than 200-pound tensile strength. At least 10 inches of slack shall be left at each end of the pull wire.

10. Communication Raceways: Communication raceways indicated shall be installed in accordance with the previous requirements for conduit and tubing and with the additional requirements that no length of run shall exceed 50 feet for 1/2 inch and 3/4 inch sizes, and 100 feet for 1 inch or larger sizes, and shall not contain more than two 90 degree bends or the equivalent. Additional pull or junction boxes shall be installed to comply with these limitations whether or not indicated. Inside radii of bends in conduits of 1 inch size or larger shall be not less than ten times the nominal diameter.

3.4 BOXES AND SUPPORTS

1. General: Boxes shall be provided in the wiring or raceway systems wherever required for pulling of wires, making connections, or mounting of devices or fixtures. Boxes for metallic raceways, 4 inches by 4 inches nominal size and smaller, shall be of the cast-metal hub type when located in normally wet locations, when flush and surface mounted on outside of exterior surfaces, or when located in hazardous areas. Large size boxes shall be NEMA 4 or as shown. Boxes in other locations shall be sheet steel except that aluminum boxes may be used with aluminum conduit, and nonmetallic boxes may be used with nonmetallic sheathed or metallic-armored cable system, when permitted by NFPA 70. Junction boxes shall not be permitted in wet wells.

2. Mounting: In partitions of light steel construction, bar hangers with 1 inch long studs, mounted between metal wall studs or metal stud “C" brackets snapped on and tab-locked to metal wall studs, shall be used to secure boxes to the building structure. When "C" brackets are used, additional box support shall be provided on the side of the box opposite the brackets. The edge of boxes for electrical devices shall be flush with the finished surfaces in gypsum, plasterboard installation. Boxes for mounting lighting fixtures shall be not less than 4 inches square except smaller boxes may be installed as required by fixture configuration, as approved. Boxes installed for concealed wiring shall be provided with suitable extension rings or plaster covers, as required. The bottom of boxes installed in masonry-block walls for concealed wiring shall be flush with the top of a block to minimize cutting of blocks, and boxes shall be located horizontally to avoid cutting webs of block. Indicated elevations are approximate. Unless otherwise indicated, boxes for wall switches shall be mounted 54 inches above finished floors. Cast-metal boxes installed in wet locations and boxes installed flush with the outside of exterior surfaces shall be gasketed. Separate boxes shall be provided for flush or recessed fixtures when required by the fixture terminal operating temperature, and fixtures shall be readily removable for access to the boxes unless ceiling access panels are provided. Boxes and supports shall be fastened to wood with wood screws or screw-type nails of equal holding strength, with bolts and metal expansion shields on concrete or brick, with toggle bolts on hollow masonry units, and with machine screws or welded studs on steel work. Threaded studs driven in by powder charge and provided with lockwashers and nuts, or nail-type nylon anchors may be used in lieu of expansion shields, or machine screws. In open overhead spaces, cast-metal boxes threaded to raceways need not be separately supported except where used for fixture support; cast-metal boxes having threadless connectors and sheet metal boxes shall be supported directly from the building structure or by bar hangers. Hangers shall not be fastened to or supported from joist bridging. Where bar hangers are used, the bar shall be attached to raceways on opposite sides of the box and the raceway shall be supported with an approved type fastener not more than 24 inches from the box. Penetration of more than 1 - 1/2 inches into reinforced-concrete beams or more than 3/4 inches into reinforced-concrete joists shall avoid cutting any main reinforcing steel.

3. Boxes for Use with Raceway Systems: Boxes for use with raceway systems shall be not less than 1-1/2 inches deep except where shallower boxes required by structural conditions are approved. Sheetmetal boxes for other than lighting fixtures shall be not less than 4 inches square except that 4 inches by 2 inches

boxes may be used where only one raceway enters the outlet. Minimum size boxes for telephone outlets shall be not smaller than 4-1/2 inches square and 3-1/2 inches deep.

4. Boxes for Use with Cable Systems: Boxes for use with cable systems shall be not less than 3 inches x 2 inches sectional boxes, 2 inches deep.

5. Pull Boxes: Pull boxes of not less than the minimum size required by NFPA 70 shall be constructed of aluminum or galvanized sheet steel, except where cast-metal boxes are required in locations specified above. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, the feeders shall be tagged to indicate clearly the electrical characteristics, circuit number, and panel designation.

3.5 DEVICE PLATES

1. General: One-piece type device plates shall be installed for all outlets and fittings. Screws shall be of metal with countersunk heads, in a color to match the finish of the plate.

2. Mounting: Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed with an alignment tolerance of 1/16 inch. The use of sectional-type device plates will not be permitted. Plates installed in wet locations shall be gasketed and provided with a hinged, gasketed cover, unless otherwise specified.

3.6 GROUNDING

1. General: Noncurrent-carrying metal parts of electrical equipment shall be effectively grounded by bonding to the ground bus provided in the service equipment or panelboard.

2. Ground Wire: A green ground wire shall be furnished regardless of the type of conduit.

END OF SECTION 16010

SECTION 16400- LOW-VOLTAGE DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

1. Work includes furnishing and installing switches, panelboards, surge suppressor and other devices for the distribution of electric power systems. Plans may be considered schematic only and do not show all appurtenances which may be necessary for a complete system and compliance with all codes.

1.2 SUBMITTALS

1. Materials and equipment will be approved based on the manufacturer's published data.

2. Detail drawings shall be submitted for approval and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical data; catalog cuts; and any special installation instructions that may be required. Detail drawings shall be submitted for all materials and equipment specified. Drawings shall show applicable schematic diagrams, equipment layout and anchorage.

3. The label or listing of the Underwrites Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing, the Contractor shall submit a statement from a nationally recognized, adequately equipped testing agency indicating that the items have been tested in accordance with required procedures and that the materials and equipment comply with all contract requirements. However, materials and equipment installed in hazardous locations must bear the UL label unless the Engineer specifically approves the data submitted from other testing agency in writing. For other than equipment and materials specified to conform to UL publications, a manufacturer's statement indicating complete compliance with applicable Federal Specification, or standard of the American Society for Testing and Materials, National Electrical Manufacturers Association or other commercial standard, is acceptable.

1.3 QUALITY ASSURANCE

1. Materials and equipment shall be installed in accordance with recommendations of the manufacturer and as shown.

2. The installation shall conform to the requirements of NFPA 70 and NFPA 101, unless more stringent requirements are indicated herein or shown.

1.4 DELIVERY, STORAGE, AND HANDLING

1. Delivery, storage, and handling shall be the responsibility of the Contractor and at a minimum shall be conducted in accordance with the manufacturer's recommendations.

PART 2 PRODUCT

2.1 SWITCHES

1. Disconnect Switches: Disconnect switches shall be general duty, fusible safety switches, voltage ratings as required, ampere ratings as required, similar to Square D. Disconnect switches for mounting outside or in wet areas shall have NEMA 4 enclosures.

2. Manual Generator Transfer Switches: Generator transfer switch shall be Double-Pole, Double-Throw non-fusible type with Nema 3R rating and minimum voltage ratings as required, and ampere ratings as indicated on the plans.

2.2 CIRCUIT BREAKERS

1. Circuit Breakers: Circuit breakers shall be plug-on, quick-make, quick-break, thermal-magnetic, trip indicating. All multi-pole breakers shall have common trips. Branch circuit breakers feeding convenience outlets shall have sensitive instantaneous trip settings of not more than 10 times the trip rating of the breaker, to prevent repeated arcing shorts. Single pole 15 and 20 ampere circuit breakers shall be UL listed as "Switching Breakers" at 120 Volts and shall carry the SWD marking.

2. Ground Fault Protection: UL Class A (5 milliampere sensitivity) ground fault circuit protection shall be provided on 120-Volt receptacle branch circuits as specified on the plans. This protection shall be an integral part of the branch circuit breaker, which also provides overload and short circuit protection for branch circuit wiring. Tripping of a branch circuit breaker containing ground fault circuit interruption shall not disturb feeder circuit to the panelboard. A single pole circuit breaker with integral ground fault circuit interruption shall require no more panelboard circuit space than a conventional single pole circuit breaker.

3. Lock-Out Devices: Circuit breakers to all motors or drives greater than 1 HP shall be equipped with devices suitable for pad lock attachment to lock breaker in the power off state.

2.3 CIRCUIT BREAKER PANEL

1. Panelboards: Panelboards shall be of adequate capacity for the number of circuits shown on the plans, and enclosed in a NEMA 4 steel cabinet enclosure or incorporated into the motor control center. Panelboards shall be Underwriters Laboratory (UL) listed and shall be similar to Square D type NQO.

2. Bussing: Panelboard bussing shall be such that any two adjacent single-pole breakers are connected to opposite polarities in such a manner that two-pole breakers can be installed in any location. All current carrying parts of the buss assembly shall be plated.

2.4 ELECTRICAL SURGE PROTECTION

1. Surge Suppressor: Main power service shall be protected by a Surge Protective Device (SPD) providing transient suppression and noise filtering with Nema 4 enclosure. Unit shall provide minimum 120 kA current capacity per phase. Unit shall be similar to Square D Surgelogic external brick panel SPD.

2. Surge protection shall be installed to protect electrical components in accordance with minimum International Society of Automation (ISA) standards.

    a) All field analog instruments shall be protected by surge suppression on the instrument.
    b) All analog signals coming from instrumentation to the main panel box shall be protected with surge suppression.
    c) All digital input/output signals and instrumentation shall be protected by inline fuses.
    d) Transient voltage surge suppression (TVSS) shall be installed at the main power feed and in the main control panel.
    e) Insulation and grounding of suppressors shall be in conformance with manufacturers recommendations.

PART 3 EXECUTION

3.1 INSTALLATION

1. Equipment specified in this section shall be installed in accordance with the manufacturer's recommendations at the locations as shown on the plans.

END OF SECTION 16400

SECTION 16800 - TELEMETRY AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included: This section covers work necessary for the design, documentation, assembly, installation, field testing, startup, training, and final documentation for project controls and additions to the County's Synchronous Control and Data Acquisition (SCADA) system, as described herein. Major components of this system shall include the specified software modifications, materials, equipment, and installation required to implement a integrate the new sites within the system any associated panel or field equipment modifications.

1.2 GENERAL REQUIREMENTS

A. Electrical: All wiring shall be in complete conformance with the National Electric Code, state, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required. For ease of servicing and maintenance, all wiring shall be color coded and uniquely numbered. The wire color code and number shall be clearly shown on the drawings, with each wire's color and number indicated.

1.3 QUALITY ASSURANCE

A. General: The Contractor shall be responsible for and shall provide for the design, supply, delivery, installation, certification, calibration and adjustment, software configuration, testing and startup, owner training, warranty and routine future field services, of a complete coordinated system which shall perform the specified functions.

B. Standard Products: In order to achieve standardization for appearance, operation, maintenance, spare parts and manufacturer's service, to the greatest extent practical, like items of equipment provided hereunder shall be the end products of the same manufacturer.

1.4 SUBMITTALS

A. Hardware Submittals: Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the Engineer for their review copies of submittal documents. Submittals shall include full details, shop drawings, catalog cuts, and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the Contractor shall submit the following materials:

1. Block diagram and operational description of the system showing all major components and their interconnections and interrelationships. Label each diagram and specify all external power and communications interfaces. Required documentation sets shall be furnished in bound hardcopy and final documentation shall also be provided in electronic format on CD.
2. Drawings of equipment to be supplied shall include, as a minimum: overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Wiring diagrams of equipment including field device connections shall be included and specific installation/wiring requirements identified.

3. Operational Description shall include the principal functions/capabilities of each personal computer (PC) and PLC as provided and configured /programmed. Included shall be a description of system communications.
4. Provide a detailed Bill of Materials along with descriptive literature identifying component name, manufacturer, model number, and quantity supplied.

B. SCADA Software Configuration: Software programmer shall coordinate and attend meeting with Owner and Engineer to develop conceptual layout of software screens and functionality.

C. Software Submittals: Provide initial graphic display and report format layouts. List and briefly describe all operator interface functions provided at the PC, including alarm annunciation and acknowledgment, status displays, control capabilities, report generation, event logging, charting, and trending, etc. System supplier shall obtain approval from Owner and Engineer of all draft PLC and PC screens prior to final programming.

D. Test Outlines and Procedures Submittals: Test descriptions shall be in sufficient detail to fully describe the specific tests to be conducted to demonstrate conformance with this specification.

E. Spares and Expendable Recommendations: The Contractor shall provide a list of recommended spares and expendable items. The list shall be exclusive of any spares furnished under this Contract. A total purchase cost for the recommended list shall be provided in addition to the unit cost for each item.

F. Scope of Engineer's Review: The Owner and the Engineer will review system technical information as submitted by the Contractor for software; operating system, database, control strategies and the graphical user interface, i.e. report and log formats, graphics, trends, alarming, etc. for compliance with these specifications. Review of the submittal does not relieve the Contractor from the responsibility of providing a fully functional telemetry and control system which complies with the project documents.

1.5 OPERATION AND MAINTENANCE MANUALS AND SOFTWARE

A. General: The Contractor shall provide complete hard-covered, ring bound, loose-leaf O&M manuals as well as one digital copy. In addition to "as-built" system drawings, the manuals shall include internal wiring diagrams and operating and maintenance literature for all components provided under this section.

The submitted literature shall be in sufficient detail to facilitate the operation, removal, installation, programming and configuration, adjustment, calibration, testing, and maintenance of each component and/or instrument.

Operation and Maintenance manuals shall include copies of all PLC programs written to accomplish the monitoring and control functions specified. Programs shall be updated after startup is complete, with the fully commented program(s) licensed to and provided to the Owner on compact disk (CD). Two (2) copies shall be provided.

All software and tools required for configuring and programming RTU's, PLC's, and SCADA software shall be provided and licensed to Owner. All custom programing shall be licensed to Owner for their use on existing facilities and base for future expansion of system.

The contents of the O&M manuals shall include the following sections:

1. System Hardware/Installation
2. System Software
3. Operation
4. Maintenance and Troubleshooting

PART 2 - PRODUCTS

2.1 GENERAL

A. General: The functions and features specified herewith are the minimum acceptable requirements for the implementing the controls at the Lookout Drive Booster Station and integrating them with the County's SCADA system. In some cases, the specifications may allow the accomplishing of certain functions by means of more than one hardware/firmware/software approach. Any approach that is proposed shall equal or exceed all functional, operational, convenience and maintenance aspects of the one described. Major equipment, component and software items are specified; however, the Contractor shall provide all appurtenant items necessary to achieve the required operation as hereinafter specified.

B. System Overview: The Wythe County SCADA system includes a master SCADA control station at the existing Fort Chiswell Wastewater Treatment Plant as well as remote telemetry units at sites including the existing Grayson Tank. The existing Grayson Tank RTU is located on an electrical rack at the tank and communicates via radio to a system hub. The SCADA system provides control of stations and control valves as well as monitoring, data logging, and trending of tank and meter sites.

C. New Functionality: Controls shall be provided for the Booster Station. Monitoring and remote control of this equipment shall also be provided through the master SCADA system. Monitoring of the booster station pump system shall also be provided. New RTU equipment may be provided in the booster station.

2.2 CENTRAL MONITORING AND CONTROL STATION

A. Existing System Overview: A PLC panel and SCADA computer is installed at the County's Fort Chiswell Wastewater Treatment Plant and serves as a central monitoring and control station./ Master Telemetry Unit (MTU). The SCADA PC operates Wonderware 2012 Development Studio with 3,000 tag capacity. The existing central monitoring station receives and transmits all inputs and outputs described at all remote sites. PC Software provides remote monitoring, data logging, and trending of meter flows, tank levels, and pump run times. SCADA software also includes reporting and trending within software as well as ability to export standard reports to Excel worksheets. The system is accessible via password protected internet access and provides automated alarm notification and acknowledgement via telephone and email communication. System shall provide automated backup of recorded data.

B. New SCADA PC Screens: The SCADA PC software shall include the following minimum new display screens and indicated features. Screens shall be standardized to the greatest extent possible to provide uniformity and facilitate future addition of sites.

1. Grayson Booster Station
    a. Pump Run Status (Each Pump)
    b. Pump Enabled Status (Each Pump)
    c. Pump Alarm Status (Each Pump)
    d. Discharge Pressure Setpoint
    e. Discharge Pressure
    f. Suction Pressure
    g. System Operation Mode (Auto/Manual)
    h. System Reset Required
    i. System Reset Request
    j. General Alarm

k. Discharge Flow Rate

C. Existing SCADA PC Screens: The SCADA PC software includes the following existing screens which will shall be updated to include the new additional remote sites.

1. Map Overview Screen
   a. Area wide overview with GIS or dynamic Google Maps (or similar) base mapping showing major roads and corporate boundaries. Base mapping shall include water system linework from County provided shape files which shall be updatable by Owner
   b. Tank Levels depicted graphically and numerically as water depth and/or percent full.
   c. Booster pump station status including Run, Fail, Idle condition
   d. Control valve status as Open or Closed Condition
   e. Selectable navigation to screen for any site providing full site details.
   f. Indication of signal failure to any site
2. Historical Data Screen
   a. Configurable graphical display of any individual or multiple selected monitored or calculated values
   b. Report Generation
3. Alarm Configuration Screen (may be provided in add-on software package)
   a. Configuration of alarms which initiate notification
   b. Configuration of notification email addresses and telephone numbers

2.3 STATION CONTROL PANELS

A. Control panels shall be installed at the booster station to monitor the booster pump system and provide control and monitoring of the recirculation and rechlorination equipment. Panel shall include a PLC and HMI. Panel shall monitor flow.

B. The proposed tank equipment shall be housed in a corrosion resistant welded NEMA Type 4 enclosure. Enclosures shall be fabricated from FRP or stainless steel. Units shall include a single gasketed front door. Full height hinges and door clamping hardware shall be included.

C. Inputs and Outputs: The RTU shall be capable of accepting all local analog inputs (AI), digital inputs (DI), analog outputs (AO), and digital outputs (DO) as listed below.

Description	Type	Source/ Output Location
Booster System Common Alarm	DI-3	Booster Station Control Panel
Mag Meter Pulse Flow Increment	DI-4	Mag Meter Transmitter
{Spare}	DI-5	
{Spare}	DI-6	
{Spare}	DI-7	
{Spare}	DI-8	
{Spare}	DO-3	
{Spare}	DO-4	
Booster Discharge Flow	AI-4	Mag Meter Transmitter
{Spare}	AO-1	

{Spare} AO-2

D. Booster System Monitoring: The RTU shall communicate to the Booster System Control Panel via Ethernet to provide monitoring or pump and system status, allow adjustment of system setpoints and allow remote system reset.

The SCADA system shall provide monitoring only of the following booster system status items:

1. Pump Run Status (Each of Three Pumps)
2. Pump Enabled Status (Each of Three Pumps)
3. Pump Alarm Status (Each of Three Pumps)
4. Discharge Pressure
5. Suction Pressure
6. System Reset Required
7. General Alarm

The SCADA system shall also provide monitoring and adjustment of the following:

1. Discharge Pressure Setpoint
2. System Operation Mode (Auto/Manual)
3. System Reset Request

Totalized and instantaneous flow measurements shall also be provided through the SCADA system.

2.4 COMPONENT SPECIFICATIONS

A. Control Panels: Control panel enclosures shall be NEMA Type 4. Unless otherwise specified, enclosures shall be fabricated from FRP or stainless steel. Units shall include a single gasketted front door. Full height hinges, locking hasp and door clamping hardware shall be included. All enclosures shall be UL listed.

Unless otherwise indicated, controls shall operate from a source of 120 volts, 1 phase, 60 Hz. All controls shall be protected from lightning or other transient voltages by a power arrestor. All power supplies required for operation shall be provided. Power supplies shall be sized to have a minimum of 40% spare capacity providing increased reliability and allowing for the addition of future equipment. Isolators shall be provided on all analog inputs for surge suppression. Enclosure shall have a heater for condensation protection.

All wiring shall be in complete conformance with the National Electric Code, state, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required. For ease of servicing and maintenance, all wiring shall be color coded and uniquely numbered. The wire color code and number shall be clearly shown on the drawings, with each wire's color and number indicated.

Relays shall be plug-in relays with contacts rated 5 amperes at 120 volts AC and clear polycarbonate covers. Relays shall be similar to square D RS14, Class 8501 general purpose relays with screw terminal sockets mounted in a NEMA 1 enclosure.

Surge protection shall be installed to protect electrical components in accordance with minimum International Society of Automation (ISA) standards. All analog signals coming from instrumentation to the control panel shall be protected with surge suppression. All digital input/output signals and instrumentation shall be protected by inline fuses. Transient voltage surge suppression (TVSS) shall be

installed in the control panel. Insulation and grounding of suppressors shall be in conformance with manufacturers recommendations.

B. PLC Control/Telemetry System: Each PLC panel shall have adequate memory and instruction sets required to make the unit perform all of the functions required by this specification. Units shall communicate with each other and with remote I/O panels via Modbus protocol.

All control signals, status signals, alarms, and process variable data shall be transmitted and received between the sites via the telemetry system. The system shall convert commands, alarms and variable analog data to digital blocks and transmit this information. The PLCs shall be capable of stand-alone control to maintain programmed logic.

Units shall be furnished completely configured and tested providing the specified communication, monitoring, display, input/output, annunciation, computational and other requirements for operation of the system. Any additional components required for operation, whether specifically referenced herein or not, shall be provided.

The PLC system shall be based on a scalable modular multi-use open architecture platform that can be efficiently applied to perform the necessary functions at each location. Each controller/telemetry unit shall be a modular hardware style PLC consisting of a CPU with adequate memory and instructions, power supply, local and remote input/output modules, communications ports, and all other components required to make the unit perform all of the functions required in this specification.

The PLC system shall support true system open architecture allowing full integration of other third party generic hardware/software devices. The architecture shall meet the requirements as herein defined and allow economical expansion of function and features based on new and evolving technologies.

1. Programmable Logic Controller (PLC): The PLC system shall be based on a robust, field proven, current technology hardware platform allowing utilization of the latest advances in technology and permitting the most open programming and communication architectures. The PLC system shall be modular and scalable to be efficiently applied at each of the specified sites within the system.

   The PLC system shall include a real time of day time clock w/battery backup for time stamping of data log records and scheduling of periodic time of day based events. Clock shall not require reset after a site power failure has occurred.

   The PLC shall store system parameters including, logic configuration, setpoints, time delays, alarm and event data, counters and totalizers, etc. in field programmable (FLASH) non-volatile memory. Sufficient non-volatile memory must be provided to protect at least 8,000 variables. The PLC shall also provide enough protected memory for time stamped data logging of up to 200,000 process values. This data shall be unaffected by power interruptions.

   The PLC shall have enough processing power and working (DRAM) memory to enable high level programs such as Internet Web Servers to operate efficiently without affecting other simultaneous multitasking operations.

   The PLC shall be furnished with a minimum of 6 communication ports with true multitasking and allow simultaneous support of all ports. Ports can be configured for local I/O, Operator Interface/display support, LAN/WAN, etc..

   The PLC processor shall meet the following as a minimum:

   a. CPU - True 32 Bit running at 50 MHz.
   b. 16 MB - 32 bit Dynamic RAM
   c. 8 MB FLASH
   d. 512 KB Static RAM

e. 1 (One) Ethernet 10/100 BaseT port (RJ45)

f. 1 (One) RS-232 Serial Communications (115 KB PS)

g. 1 (One) Local I/O port

h. 1 (One) Display Serial Communications Port

The PLC shall not require any specialized tools for removal of the unit. System components including PLC, power supplies, etc. shall be DIN rail mounted. Terminations shall be via plug in connectors facilitating quick field replacement.

PLC's and associated I/O modules shall meet national and international safety standards including UL, CSA, CE, DNV and Zone 2 Rated. In addition to the safety standards PLC system components shall also meet IEEE-472 (ANSI C37.90) surge withstand and IEC68-2-6 Vibration standards.

The PLC shall operate from a 10-30 VDC power source. A battery and charger as previously specified shall be supplied to power the master & remote unit during 120 Volt service power outage conditions.

The PLC's shall have an operational temperature range of -40OC to 70OC (-40OF to 158OF) under relative humidity conditions of 5 to 95% non-condensing. Storage temperature range up to 85OC (185OF)

2. Software: The PLC shall have a high performance open source software architecture that utilizes a true multitasking operating system running a combination of standard and specially designed for water and wastewater application software modules. The system provided shall utilize an integrated system approach providing a comprehensive common configuration tool for all components within the system including I/O, Processor, Communications, and Operator Interface Display. The architecture shall permit all system components to be configured, simulated, tested and downloaded from one terminal to all system components. The operating system shall be multitasking and allow a minimum of two separate programs to run simultaneously without affecting each other.

   To provide for and insure multiple source support, the PLC system shall utilize industry standard programming language certified by the PLC open committee for all five languages supported by the IEC 61131-3 standard including; Sequential Function Chart, Ladder Diagram, Structured Text, Instruction List, and Function Block Diagram. All five languages must be included. Any one or a combination of the aforementioned programming languages can be used to implement the system strategy. The programming software must be Windows™ based and be able to operate on Windows™ XP or Windows 7 operating systems.

   PLC's provided under this specification shall be capable of performing the necessary logic to control the system as previously defined. These capabilities shall include, but not be limited to the following:

   a. Discrete input/output

   b. Analog input

   c. Analog output

   d. Timers

   e. Pump Controller

   f. Pump Alternation

   g. Mathematical Function Blocks

   h. Stage Blocks

   i. Trending

   j. Latch/unlatch relays

   k. Counters

   l. Comparators

m. Ladder logic
n. Flow Totalization/Integration
o. Intrusion Detection
p. Time of Day Control w/Lockout
q. Ramp Blocks
r. Data Logging

Communications between a PLC and any computer shall be accomplished using standard off-the-shelf drivers allowing use of standard Windows DDE and or OPC software drivers. The PLC system configuration software shall allow the MTU tag name data base to be exported to the computer HMI software providing continuity between PLC and HMI tag names and making future changes/upgrades more efficient and less prone to database tag name error. Communications between the PLC any link computer shall be via high speed communications port (RS-232 up to 115 Kbps) or Ethernet 10/100 BaseT (10/100 Mbps) in conjunction with a modem over the previously specified telemetry medium.

Each PLC shall have memory protected built in historical archiving/data logging of system alarms & events and process variables. Data logger shall be able to log data based on time or an event. PLC shall have enough memory allocated to allow 200,000 time and date stamped discrete and/or analog values to be archived. The historical archive shall allow the oldest data to roll off the system as memory is used keeping the 200,000 most current data points available. Process point time stamping frequency shall be selectable within the configuration software. It shall be possible for the archived data to be exported in CSV format allowing use with standard spreadsheet and data base software applications.

Each PLC shall have built in web server capability allowing system information to be stored in a format that allows for easy access and viewing with standard Windows™ based browser. Each unit shall be furnished with built in O & M data associated with its specific site including; as a minimum, basic system information, panel layouts, wiring diagrams, material lists w/part numbers, and operational summary. This information shall be accessible locally or remotely.

3. I/O Systems: The PLC system shall have I/O resources to support a wide variety of applications without needing to depend upon alternate technologies to meet various system data requirements. Each PLC shall be supplied with the required I/O to meet the specified requirements and allow for a minimum of 100% spare capacity for future expansion. The PLC system shall be easily scaled from a standalone unit capable of supporting a minimum of 64 local, 64 remote I/O, and 64 Ethernet networked I/O points or one of 1284 RTU's with a total system data handling capability of 50,000 points.

   The PLC system shall support a wide variety of modular I/O with various configurations to permit the most efficient use of I/O hardware and panel space. I/O modules shall be available for local I/O (within control panel), remote I/O (RS-485 based distributed outside of the control panel) and Ethernet based I/O (Distributed I/O on high speed in plant network or wireless Ethernet). Each I/O module shall be DIN rail mounted, have compression wire type terminals capable of accepting 14 AWG wire, have wire identification markers and I/O wiring diagram. Each module shall include diagnostic LEDS indicating module operational and I/O status. Each I/O module shall be electrically isolated, meet IEEE-472 (ANSI C37.90) surge withstand certification, shall be removable under power and easily field replaced with a spare module requiring no software/hardware reconfiguration adjustments. Each module shall be safety keyed to insure proper installation. I/O modules shall permit installation and operation in hazardous locations as classified under UL, CSA Class 1, Div. 2, Groups A, B, C & D.

   a. Local I/O modules shall be connected to the PLC by a dedicated high speed serial communications port and shall allow local networking of I/O modules. Local I/O to PLC update time shall not exceed 150 mS.

b. Ethernet I/O modules shall be connected to the PLC by on board Ethernet 10/100 BaseT connection port. Ethernet I/O modules shall support multiple communications including TCP/IP and Modbus ASCII and RTU allowing connection to any device supporting these protocols over standard Ethernet backplane.

4. Display / HMI: PLC panels shall include an 6 inch, 256 color, 320x240 pixel touchscreen display with a NEMA 4 housing. Display shall be rated for operating temperatures between -32°F and 110°F with 500VAC voltage resistance, isolation resistance greater than 50M ohms at 500VDC, and be UL listed. Screen shall have a minimum brightness of 400 cd/m2 , 150:1 contrast, CCFL backlight with 40,000 hour minimum life span, and backlight screen saver. Touchscreen shall be of the analog resistive type with a minimum accuracy of 0.08 inches. Display shall support up to 999 user-definable full-size screens and or pop-up windows. Screen shall be able to display up to 6 pop-up windows simultaneously, which can be minimized to a task bar or moved by the operator. Touchable objects shall be custom-definable, displayed in 256 colors, supported in any size, and be capable of placement in any screen or pop-up window. Text shall support a minimum of 8 font sizes and displayed in 256 colors. Display shall also include native support for animations, function keys, bar graphs, meters, trends, and alarms.

C. Battery Back Up System: Included with each PLC and I/O station, and working in conjunction with the unit's DC power supply, shall be an intelligent battery backup system including battery health logic module, charger and sufficiently sized battery. Battery system shall provide full on-line protection, power conditioning, and a seamless switchover to battery upon detection of main DC power supply failure. Once main DC power is restored, the unit shall provide seamless switchback to normal DC power source and recharge the battery. Battery health logic module shall individually monitor main DC power supply, battery and converter voltages for low voltage conditions, and provide low voltage cutoff to protect battery from an unrecoverable depletion. An on board LED, or local Operator Interface (OI) if provided shall locally indicate detection of an alarm condition. In addition to local indication, all battery health and voltage information shall be transmitted to the Master PLC for centralized monitoring and alarm detection. The unit shall be capable of providing one-half hour of battery backed operation for all Master Station equipment.

Battery system shall be of sufficient capacity to provide a minimum of two (2) hours of backup in the event of a failure of the main power source. To avoid battery damage and erroneous data transmissions when operating on battery, should the battery voltage drop below 10.8 V, the PLC shall be inhibited from operation. Recovery shall be automatic upon restoration of normal power. The intelligent battery backup system shall be able to source 5 Amps allowing operation of mission critical components including; sensors, local alarm, and communication equipment during a power failure condition.

2.5 INSTRUMENTATION-NOT USED

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Equipment specified in this section shall be installed in accordance with the manufacturer's recommendations at the locations as shown on the plans.

B. Field Service: The Contractor shall provide experienced personnel to supervise, perform, and coordinate the installation, adjustment, testing, and startup of the system. The personnel shall be present on-site as required to effect a complete and operating system. All elements of the system shall be tested to demonstrate that the total system satisfies all of the requirements of the Contract Documents. The Contractor shall provide all special testing materials and equipment required. The Contractor shall

coordinate and schedule all of his testing and startup work with the Owner. As a minimum, the testing shall include both a factory test and a field test.

C. Training: The training program shall educate operators, maintenance, engineering, and management personnel with the required levels of system familiarity to provide a common working knowledge concerning all significant aspects of the system being supplied. The training program shall consist of two 8-hour days. At least two weeks prior to the requested start of the program, the proposed dates of training shall be submitted to the Owner and the Engineer for approval. The supplier shall provide all instructional course material, equipment and manuals to conduct the training program.

END OF SECTION 16800

APPENDIX A

EROSION CONTROL NARRATIVE
STORMWATER MANAGEMENT NARRATIVE

BARRETT MILL WATER IMPROVEMENTS
WYTHE COUNTY, VIRGINIA

EROSION CONTROL NARRATIVE
STORMWATER MANAGEMENT NARRATIVE

ADDITIONAL PLAN INFORMATION

- EROSION AND SEDIMENT CONTROL NARRATIVE
- STORMWATER MANAGEMENT NARRATIVE
- SWPP ADDITIONAL INFORMATION
- COUNTY E&S APPROVAL
- LINEAR WAIVER REQUEST
- LINEAR UTILITY SITE SKETCHES
- CGP REGISTRATION STATEMENT
- VRRM MAP & SPREADSHEET
- LETTER OF CREDIT AVAILABILITY
- FIRMette FLOOP MAP
- NCRS SOIL REPORT

Prepared for
Wythe County, Virginia

APRIL 2024

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EROSION AND SEDIMENT CONTROL NARRATIVE

PROJECT DESCRIPTION

The purpose of this plan is to construct water line extensions and a water booster station along Grayson Turnpike (Route 21) and Barrett Mill Road south of Wytheville, Virginia. The water booster station will disturb ~4,750 square feet and add 1,010 square feet of impervious area. The installation of 37,500 LF underground utilities will be a linear disturbance that does not significantly alter the predevelopment runoff characteristics of the area.

EXISTING SITE CONDITIONS

The construction area runs along existing roadways for the bulk of the project. The disturbed areas drain into roadside ditches and ultimately into Reed Creek.

ADJACENT PROPERTY

The adjacent areas of the construction site are mostly roadways, rural residential development, and undeveloped pastures. At one point the waterline parallels Big Survey Wildlife Management Area

OFF-SITE AREAS

Any off-site area disturbed by the contractor will have to be protected with any required erosion control measures. There are no off-site areas planned at this time.

SOILS

The soils of the pump station are Matneflat gravelly sandy loam.

The soils of this project area are primarily of the Hagerstown-Rock, Frederick, and Marbie-Wyrick complex.

CRITICAL EROSION AREAS

The critical erosion areas will be those disturbed areas along the steep roadside ditches, and the two areas where the waterline leaves the roadside to allow a looping connection. The areas off the road will be covered in slope matting. When feasible, check dams will be installed within roadside ditches.

EROSION AND SEDIMENT CONTROL MEASURES

The purpose of the control measures will be to prevent sediment deposition off the roadside ditches. Unless otherwise indicated, all vegetative and structural erosion and sediment control practices shall be constructed and maintained according to minimum standards and specifications of the handbook. The minimum standards of the VESCR shall be adhered to unless otherwise waived or approved by a variance.

COMPLY WITH MINIMUM STANDARD 16 (MS-16) FROM VESCR

MS 16- Underground utility lines shall be installed in accordance with the following standards in addition to other applicable criteria:

a. No more than 500 linear feet of trench may be opened at one time.
b. Excavated material shall be placed on the uphill side of trenches.
c. Effluent from dewatering operations shall be filtered or passed through an approved sediment trapping device, or both, and discharged in a manner that does not adversely affect flowing streams or off-site property.
d. Material used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization.
e. Restabilization shall be accomplished in accordance with these regulations.
f. Applicable safety regulations shall be complied with.

STRUCTURAL PRACTICES

1. Construction Entrance – 3.02: Install construction entrance at any marshal locations as required by the plans and Wythe County Erosion Control department
2. Silt Fence Barrier– 3.05: Install silt fence downstream of disturbed areas if not in compliance with MS-16 or as required due to poor stabilization of surface.

3. Storm Drain Inlet Protection – 3.07: Install inlet protection over storm grate and curb inlets as shown on the plan.
4. Culvert Inlet Protection – 3.08: Install inlet protection at culverts as shown on the plan.
5. Rip rap – 3.19: Install rip rap for slope stabilization as shown on plans.
6. Check Dam – 3.20: Install rock check dams along drainage ditches as shown on the plan.
7. Erosion Control Matting (Treatment 1/VDOT EC 2)– 3.36: Install matting in disturbed areas to ensure permanent vegetative stabilization. Install within ditches when flow line of the ditch is disturbed by construction.

VEGETATIVE PRACTICES

1. Topsoiling – 3.30: Topsoil shall be stripped from all the trench area and respread after backfill of the trench. Approval of the inspector will be required for the location of any stockpiles.
2. Temporary and Permanent Seeding – 3.31 & 3.32: Permanent or temporary seeding shall be applied to any denuded areas left dormant within 15 days of disturbance. Seed mix shall depend upon the recommendations of the VESC Handbook and the time of year.
3. Mulching – 3.35: Mulch shall be applied as required to all areas with grass seeding or landscape plantings.
4. Soil Stabilization Blankets and Matting– 3.36: Install matting as shown on steep slopes and to revegetate stream banks as labeled on the plans.

MANAGEMENT STRATEGIES

1. Construction will be sequenced so that grading operations can begin and end as quickly as possible.
2. Runoff from disturbed areas not stabilized per MS-16 will be directed into sediment traps, check dams, or through silt fence.
3. Temporary seeding or other stabilization will follow immediately after backfill of trench.
4. The job superintendent will be responsible for the installation and maintenance of all erosion and sediment control practices.
5. After achieving adequate stabilization, the select temporary E & S controls will be cleaned up and removed. The inspector will determine when measures may be removed.

CONSTRUCTION SCHEDULE

1. Install all temporary measures as practical.
2. Excavate trench, install pipe, and backfill trench.
3. Stabilize trench in accordance with MS-16.
4. Prepare stream crossings in accordance with USC.
5. Final grading and permanent stabilization.
6. All temporary E & S controls will remain in place until specified by the Engineer.

PERMANENT STABILIZATION

All areas disturbed by construction and not paved will be stabilized with permanent seeding as soon as final grading of each area is complete. Seeding mix will consist of seeds as required by standard 3.32. Mulch per standard 3.35 and Matting per standard 3.36 will be used to protect permanent seeding areas.

MAINTENANCE

All erosion and sediment control measures will be checked weekly and after each significant rainfall. The following areas will be checked in particular.

1. Stabilized areas will be checked weekly to ensure that the surface coating (grass seed, stone, asphalt) is sufficient to minimize erosion runoff.
2. The silt fence barrier will be checked regularly for undermining or deterioration of the fabric. Sediment shall be removed when the level of sediment deposition reaches half way to the top of the barrier.
3. The seeded areas will be checked regularly to ensure that a good stand of grass is maintained. Areas should be fertilized and re-seeded as necessary.

STORMWATER MANAGEMENT NARRATIVE
The linear portion of this plan meets the requirements of GM15-2003 criteria and a SWM plan waiver and declination to permit is requested.

The booster station disturbs less than 5,000 square feet of area and adds approximately 1,000 sqft of impervious area. Due to the small disturbed area of less than 10,000 feet and relatively low post development curve numbers of approximately 40 the exact runoff is difficult to model but is negligible with peak flows less than 0.01 cfs and total runoff of approximately 15 cu ft.

Per 9VAC25-875-600.D., the drainage has been evaluated and it is the sealing engineer's professional opinion that the negligible increased volume of sheet flow will not "cause or contribute to erosion, sedimentation, or flooding of down gradient properties or resources." See supporting calculations for more details.

Stormwater Quality compliance will be met through nutrient credit purchasing. See the VRRM Compliance sketch and spreadsheet included in this report.

SWPP ADDITIONAL INFORMATION
CONTRACTOR WILL COMPLY WITH ALL THE PROVISIONS OF THE VSMP AND/OR SWPP PERMIT INCLUDING INSPECTION, MAINTENANCE, AND REPORTING REQUIREMENTS.

Possible additional pollution sources:
Vehicle fueling
Oil seals on pumps
Concrete curing compounds

Construction and Waste materials to be stored on-site
Pipe -no discharge associated
Bedding and base stone-protected with silt fence
Contractor may not discharge or waste materials into water bodies.
Structural erosion control methods and practices have been selected based on availability to the contractor, cost of construction & maintenance, and practical use in this particular application.

Contractors will comply with the following GM15-2003 Requirements for the waterline work:

Contractor will comply with the following requirements:

- The project is managed so that less than one (1) acre of land disturbance occurs on a daily basis;
- The disturbed land where work has been completed is adequately stabilized on a daily basis;
- The environment is protected from erosion and sedimentation damage associated with the land-disturbing activity
- The construction activity operator designs, installs, implements, and maintains pollution prevention measures to:
    - Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters;
    - Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, and other materials present on-site to precipitation and to stormwater;
    - Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures;
    - Prohibit the discharge of wastewater from the washout of concrete;
    - Prohibit the discharge of wastewater from the washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials; and
    - Prohibit the discharge of fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.
- **The project does not significantly alter the predevelopment runoff characteristics of the land surface after the completion of construction and final stabilization.**

APPENDIX B

VDOT LUP DOCUMENTS

August 1, 2016

Land Use Permit - LUP-UT
Utility installations

The installation of utilities on state maintained highway right-of-way is authorized under Sections **24VAC30-151-300** General Provisions Governing Utilities through 24VAC30-151-400 of the Land Use Permit Regulations
http://law.lis.virginia.gov/admincode/title24/agency30/chapter151/

Land Use Permit Required by Law

The General Rules and Regulations of the Commonwealth Transportation Board provide that no work of any nature shall be performed on any real property under the ownership, control, or jurisdiction of VDOT until written permission has been obtained from VDOT. Written permission is granted for the installation of private entrances on state maintained highway right-of-way through the issuance of a land use permit.

By issuing a permit, VDOT is giving permission only for whatever rights it has in the right-of-way; the permittee is responsible for obtaining permission from others who may also have an interest in the property.

The permittee will be civilly liable to the Commonwealth for expenses and damages incurred by VDOT as a result of violation of any of the rules and regulations of this chapter. Violators shall be guilty of a misdemeanor and, upon conviction, shall be punished as provided for in §**33.2-210** of the Code of Virginia.

Application Requirements

Application for a land use permit authorizing the installation of utilities on non-limited or limited access state maintained highways shall be made through the local district permit office where the activity is to take place.

The proposed installation shall accompany plan/sketches showing distances from edge of pavement, existing and proposed right-of-way line, depths below existing and proposed grades, depths below ditch line or underground drainage structures, or other features shall be shown. Any existing utilities within close proximity of the permittee's work shall be shown. Location of poles, guys, pedestals, relief valves, vent pipes, etc. shall be shown. Height of wires or cables above the crown of the roadway shall be shown.

Please note the company has to be registered with the State Corporation Commission and with Miss Utility.

Application, forms and general information regarding VDOT land use permitting for the installation of utility on state maintained highways right-of-way are included below.

24VAC30-151-710. Fees.

A. Single use permit. A nonrefundable application fee shall be charged to offset the cost of reviewing and processing the permit application and inspecting the project work, in accordance with the requirements below:

1. The application fee for a single permit is $100.
2. Additive costs shall be applied as indicated below.

Activity	Fee
Storm Sewer	$10 per 100 linear feet
Box Culvert or Bridge	$5 per linear foot of attachment
Drop Inlet	$10 per inlet
Pole Attachment	$10 per structure
Span Guy	$10 per crossing
Additive Guy and Anchor	$10 per guy and anchor
Underground Utility - Parallel	$10 per 100 linear feet

Activity	Fee
Overhead or Underground Crossing	$10 per crossing
Excavation Charge (including Test Bores and Emergency Opening)	$10 per opening

Surety Requirement

The permittee and/or their agent shall provide surety to guarantee the satisfactory performance of the activity authorized under the auspices of the land use permit issued for the initial installation. The surety shall be based on the estimated cost of work to be performed within the right-of-way and the amount shall be determined by the district administrator's designee. The surety may be in the form of a check, cash, irrevocable letter of credit, Corporate Surety, Resolution or bond. This surety will be refunded or released upon satisfactory completion of the initial installation and inspection by VDOT.

Cash Surety Refund

Applicants owing the Internal Revenue Service or the Commonwealth of Virginia may not receive a refund of the cash guarantee provided for the issuance of a VDOT land use permit unless the amount owed is less than the amount of cash guarantee provided. Applicants providing cash guarantee for the issuance of a VDOT land use permit must provide an executed copy of the Commonwealth of Virginia's Substitute Form W-9 to receive a refund of the cash guarantee provided for the issuance of a VDOT land use permit

Contact Information

A list of counties with their corresponding VDOT district offices and contact information may be obtained at the following VDOT web site: **http://www.virginiadot.org/about/districts.asp**

Land Use Permit Application (LUP-A)

APPLICATION is hereby made for permit as shown on the accompanying plan or sketch and as described below. Said activity(s) will be done under and in accordance with the rules and regulations of the Commonwealth Transportation Board of Virginia, in so far as said rules are applicable thereto and any agreement between the parties herein before referred to. Where applicable agreements may be attached and made a part of the permit assembly including any cost responsibilities covering work under permit. Applicant agrees to maintain work in a manner as approved upon its completion. Applicant also hereby agrees and is bound and held responsible to the owner for any and all damages to any other installations already in place as a result of work covered by resulting permit. Applicants to whom permits are issued shall at all times indemnify and save harmless the Commonwealth Transportation Board members of the Board, the Commonwealth and all Commonwealth employees, agents, and offices, from responsibility, damage, or liability arising from the exercise of the privileges granted in such permit to the extent allowed by law. In consideration of the issuance of a permit the applicant agrees to waive for itself, successors in interest or assigns any entitlements it may otherwise have or have hereafter under the Uniform Relocation and Assistant Act of 1972 as amended in event the Department or its successor, chooses to exercise its acknowledged right to demand or cause the removal of any or all fixtures, personality of whatever kind or description that may hereafter be located, should this application be approved.

Applicant information:

Driver's License or Tax ID No. _____ Contact Name _____

Owner Name _____ E-mail Address _____

Address _____ Telephone Number _____

City _____State _____Zip Code_____ Emergency Telephone Number _____

Fax Number _____

Agent information:

Driver's License or Tax ID No. _____ Contact Name _____

Owner Name _____ E-mail Address _____

Address _____ Telephone Number _____

City _____State _____Zip Code_____ Emergency Telephone Number _____

Fax Number _____

Permit Term Requested _____ Fees Enclosed $ _____ Check Number _____ Money Order _____

Estimated cost of work to be performed on VDOT Right of Way $_____

Surety Information:

Surety Posted by: ☐ Owner ☐ Agent ☐ County Resolution ☐ Waived

If cash/check surety is posted, please complete Commonwealth of Virginia's Substitute Form W-9.

Bonding Company Name _____ Bond # _____

Irrevocable Letter of Credit - Bank Name _____ Irrevocable Letter of Credit # _____

Surety paid by Check - Check Number _____

Amount of Surety $ _____ Obligation Amount $_____

Request permission to perform the following activity(s): _____

_____

_____

_____as per attached plans.

Location: ☐ County ☐ Town ☐ City of _____ Route No. _____ Street Name _____

Between Route No. _____ Street Name _____ and Route No._____ Street Name _____

Latitude _____ Longitude_____ Tax Map Number _____ Applicant Job No._____

Applicant shall provide proof of registration as an operator with the appropriate notification center in accordance as defined in §2.2-1151.1 of the Code of Virginia & must provide a notarized affidavit, stating that the utility owner has notified the commercial and residential developer, owner of commercial or multifamily real estate, or local government entities with a property interest in any parcel of land located adjacent to the property over which the land use is being requested, that application for the permit has been made.

☐ IF APPLICABLE, I AGREE TO PAY THE FULL SALARY AND EXPENSES OF A STATE ASSIGNED INSPECTOR IN CONJUNCTION WITH ACTIVITIES AUTHORIZED UNDER THE AUSPICES OF A VDOT LAND USE PERMIT.

By signing below, I acknowledge that I am fully cognizant of all the LUP-SPG requirements associated with the issuance of a VDOT Land Use Permit.

Signature of Applicant: _____ Title _____ Date _____

Signature of Agent: _____ Title _____ Date _____

All applicable items on this form must be completed to avoid delay in processing the issuance of a VDOT Land Use Permit.
Prepayment required with remittance payable to Virginia Department of Transportation.

VDOT USE ONLY

Receipt is hereby acknowledged for: CHECK No.: _____ MONEY ORDER No.: _____

In the Amount of $ _____ for PERMIT FEE $ _____ CASH SURETY $ _____

Authorized VDOT Signature: _____ Date: _____

*Agent mean: Applicant contractor's or a person or business authorized to act on another's behalf.

Land Use Permit
LUP-SPG
Special Provisions General
Permittee Agreement for Land Use Permit Issuance

Any of the following provisions that may apply, shall apply:

General Requirements

1) Permittee acceptance and use of a Virginia Department of Transportation (VDOT) land use permit is prima facie evidence that the permittee has read and is fully cognizant of all required permit provisions, applicable traffic control plans and associated construction standards to be employed. All applicants to whom permits are issued shall at all times indemnify and save harmless the Commonwealth Transportation Board, members of the Board, the Commonwealth, and all Commonwealth employees, agents, and officers, from responsibility, damage, or liability arising from the exercise of the privileges granted in such permit to the extent allowed by law including any sums ordered to be paid or expended by VDOT by any governmental entity as a fine, penalty or damages for any violation of any applicable environmental law, or to remediate any hazardous or other material, including illicit discharge into VDOT maintained storm sewer systems.

2) The permittee assumes full responsibility for any and all (downstream flooding, erosion, siltation, etc.) damages that may occur as a result of the work performed under this permit. Furthermore, the Department will in no way be responsible for any damage to the facility being placed as a result of future maintenance or construction activities performed by the Department.

3) The permittee agrees to move, remove, alter, or change any installation that interferes with the ultimate construction of the highway in alignment or grade at no cost to the Department unless otherwise stipulated and agreed to by the Department.

4) The permittee shall immediately correct any situation that may arise as a result of these activities that the district administrator's designee deems hazardous to the traveling public.

5) Any and all highway signs, right-of-way markers, etc., disturbed as a result of work performed under the auspices of a land use permit shall be accurately reset by the permittee immediately following the work in the vicinity of the disturbed facility. The services of a certified land surveyor with experience in route surveying may be required.

6) It shall be the permittee's responsibility to obtain any and all necessary permits that may be required by any other government agencies, i.e., U.S. Army Corp. of Engineers, Department of Environmental Quality, Department of Conservation and Recreation, etc.

7) A copy of the VDOT land use permit shall be maintained at the work site and made readily available for inspection when requested by authorized VDOT personnel.

8) The permittee shall notify the local district permit office at least 48 hours prior to commencement of any work requiring inspection and/or testing as stipulated in VDOT's Road and Bridge Standards (current edition) and VDOT's Road and Bridge Specifications (current edition). Failure to carry out this requirement may result in permit revocation.

9) The permittee or their agent must contact the VDOT Customer Service Center at 1-800-367-7623 a minimum of 48 hours prior to initiating any planned excavation within 1,000 feet of a signalized intersection and/or near VDOT ITS infrastructure. Excavation activities may proceed only after the VDOT regional utility location agent has notified the permittee that the utility marking has been completed. Additional information can be found at:
http://www.virginiadot.org/business/resources/IIM/TE-383_Request_for_Marking_VDOT_Utility_Location.pdf

Alternately, within all localities in the Northern Virginia Construction District, including the Counties of Arlington, Fairfax, Loudoun & Prince William, the Cities of Alexandria, Fairfax, Falls Church, Manassas and Manassas Park, and the Towns of Clifton, Dumfries, Hamilton, Haymarket, Herndon, Hillsboro, Leesburg, Lovettsville, Middleburg, Occoquan, Purcellville, Quantico, Round Hill and Vienna, and on Interstate 95 in the counties of Stafford, Spotsylvania and Caroline, the permittee may request VDOT regional utility marking at: **http://www.vdotutilitymarking.virginia.gov**

Failure to carry out this requirement may result in permit revocation.

10) The permittee shall to notify "Miss Utility" (or each operator of an underground utility where no notification center exists) of any planned excavation within state maintained right-of-way. This notification must be provided at least 48 hours (excluding weekends and holidays) in advance of commencing with any planned excavation within state maintained right-of-way. Failure to carry out this requirement may result in permit revocation.

11) It is the duty of the district administrator's designee to keep all roads maintained in a safe and travelable condition at all times. Therefore, any permit may be denied, revoked or suspended when in the opinion of the district administrator's designee, the safety, use or maintenance of the highway so requires.

12) The permittee shall at all times give strict attention to the safety and rights of the traveling public, their employees and themselves. VDOT reserves the right to stop work at any time due to safety problems and/or non-compliance with the terms of the permit. The Department may, at its discretion, complete any of the work covered in the permit or restore the right-of-way to the department's standards and invoice the permittee for the actual cost of such work. The permittee may be required to move, alter, change or remove from state maintained right-of-way, in a satisfactory manner, any installation made under this permit.

13) All work authorized under the auspices of a VDOT land use permit shall be subject to VDOT's direction and be in accordance with VDOT's Road and Bridge Standards (current edition) and VDOT's Road and Bridge Specifications (current edition).

14) Design changes, specified material changes and/or field changes from the approved plans shall be submitted to the appropriate district administrator's designee for review and approval prior to proceeding with the proposed changes. This submittal shall include written justification, supplemental documentation and/or engineering calculations that support the requested changes.

15) The permittee shall meet or exceed the existing pavement design and typical section when constructing pavement widening adjacent to an existing state maintained roadway. The proposed pavement design and typical section shall be approved by the district administrator's designee prior to commencing with any work within state maintained right-of-way. All pavement widening shall be in accordance with VDOT's Road and Bridge Standard 303.02.

16) Within the limits of a VDOT construction project it is the responsibility of the permit applicant to obtain the contractor's consent in writing prior to permit issuance. Information regarding current and/or planned VDOT construction and maintenance activities can be obtained at: **http://www.virginiaroads.org/**.

Insurance Requirements (excluding County, Town or City)

The permittee or their agent shall secure and maintain insurance to protect against liability for personal injury and property damage that may arise from the activities performed under the authority of a land use permit and from the operation of the permitted activity up to one million dollars ($ 1,000,000) each occurrence to protect the Board members and the Department's agents or employees; seventy-five thousand dollars ($75,000) each occurrence to protect the Board, the Department, or the Commonwealth in event of suit. Insurance must be obtained prior to start of the permitted work and shall remain valid through the permit completion date. VDOT staff may require a valid certificate or letter of insurance from the issuing insurance agent or agency prior to issuing the land use permit.

Traffic Control and Safety

1) The permittee shall at all times give strict attention to the safety and rights of the traveling public, their employees, and contractors. Any permit may be revoked or suspended when in the opinion of the district administrator's designee, the safety, use or maintenance of the highway so requires.

2) In accordance with the Virginia Department of Transportation (VDOT) Road and Bridge Specification, Special Provision 105.14, all activities performed under the auspices of a VDOT Land Use Permit involving the installation, maintenance and removal of work zone traffic control devices must have an individual on-site who, at a minimum, is accredited by VDOT in Basic Work Zone Traffic Control. The accredited person must have their VDOT Work Zone Traffic Control accreditation card in their possession while on-site.

3) The individual accredited in Basic Work Zone Traffic Control is responsible for the placement, maintenance and removal of work zone traffic control devices within the project limits in compliance with the permit requirements and conditions, the approved plans and specifications, the Virginia Work Area Protection Manual, and the Manual of Uniform Traffic Control Devices.

4) A person accredited by VDOT in Intermediate Work Zone Traffic Control must be on-site to provide supervision for adjustment to the approved layout of any standard Typical Traffic Control (TTC) layouts outlined in the Virginia Work Area Protection Manual.

5) All traffic control plans shall be prepared by a person verified by VDOT in Advanced Work Zone Traffic Control.

6) Individuals responsible for implementation of work zone traffic control measures shall provide evidence of their accreditation upon request from VDOT personnel.

7) The permittee shall be exempt from the requirements of Virginia Department of Transportation (VDOT) Road and Bridge Specification, Special Provision 105.14 if the authorized activity is not within the roadway (as defined in 24VAC30-151) of a state maintained highway.

8) Non-compliance with the requirements outlined in VDOT Road and Bridge Specification, Special Provision 105.14 may result in a stop work order and / or permit revocation.

9) All activities that require the disruption (stoppage) of traffic shall utilize VDOT certified flaggers. Flag persons shall be provided in sufficient number and locations as necessary for control and protection of vehicular and pedestrian traffic in accordance with the Virginia Work Area Protection Manual. All flaggers must have their certification card in their possession when performing flagging operations within state maintained right-of-way. Any flag person found not in possession of his/her certification card shall be removed from the flagging site and the district administrator's designee will suspend all permitted activities.

10) Any VDOT certified flag person found to be performing their duties improperly shall have their certification revoked.

11) All signs shall be in accordance with the current edition of the Manual of Uniform Traffic Control Devices (MUTCD).

12) The permittee shall immediately correct any situation that may arise as a result of these activities that the district administrator's designee deems hazardous to the traveling public.

13) During authorized activities, the permittee shall furnish all necessary signs, flag persons and other devices to provide for the protection of traffic and workers in accordance with the Virginia Work Area Protection Manual or as directed by the district administrator's designee.

14) Traffic shall not be blocked or detoured without permission, documented in writing or electronic communication, being granted by the district administrator's designee.

15) All lane or shoulder closures on highways in the Northern Virginia construction district classified as arterial or collector routes must be authorized, documented in writing or by electronic communication by the VDOT Transportation Operations Center (NRO/TOC).

16) The permittee shall notify the following appropriate VDOT Transportation Operations Center (TOC) 30 minutes prior to the installation of a lane closure or shoulder closure on non-limited access primary routes and within 30 minutes of removing the lane or shoulder closure:

- Eastern Region (757) 424-9920: All localities within the Hampton Roads construction district excluding Greenville County and Sussex County
- Northern Virginia (703) 877-3401: All localities within the NOVA construction district including Spotsylvania County and Stafford County
- Central Region (804) 796-4520: All localities within the Richmond construction district including Greenville County and Sussex County. All localities within the Fredericksburg district excluding Spotsylvania County and Stafford County
- SW Region (540) 375-0170: All localities within the Salem, Bristol, and Lynchburg construction districts
- NW Region (540) 332-9500: All localities within the Staunton and Culpeper construction districts

VIRGINIA WORK ZONE TRAFFIC CONTROL TRAINING OPTIONS

The following three options are available to receive Work Zone Traffic Control (WZTC) training based on an individual's job duties and responsibilities as required by the FHWA Final Rule on Work Zone Safety and Mobility and the Virginia Department of Transportation:

OPTION 1 – Have someone trained to become a qualified instructor in your company who can then instruct others , utilizing training material provided by VDOT. The following qualifications must be met in order to teach the VDOT Basic, Intermediate, or Advanced WZTC training courses:

- **Basic** – Be flagger certified either by VDOT or by the American Traffic Safety Services Association (ATSSA); possess two years of practical experience in Highway Design, Construction, Maintenance, or Traffic Operations; possess two years of documented experience in conducting training courses; and successfully complete the VDOT WZTC Intermediate or Advanced course or complete the ATSSA Virginia Intermediate/Traffic Control Supervisor (TCS) course.

- **Intermediate** - Be flagger certified either by VDOT or by ATSSA; possess two years of practical experience in Highway Design, Construction, Maintenance, or Traffic Operations; possess two years of documented experience in conducting training courses; complete and possess the ATSSA Virginia Intermediate/TCS certification.

- **Advanced** - Be flagger certified either by VDOT or by ATSSA; possess two years of practical experience in Highway Design, Construction, Maintenance, or Traffic Operations; possess two years of documented experience in conducting training courses; complete and possess the ATSSA Virginia Advanced Traffic Control Design Specialist (TCDS) certification or ATSSA Virginia Intermediate TCS certification.

To become an approved instructor, an application must be completed listing the above qualifications and sent to the chairman of VDOT's WZST committee at the following location:
http://www.virginiadot.org/business/resources/wztc/wztc_inst_app_form.pdf

Once a person has become an approved instructor, training material can be obtained from VDOT using the order form obtained from the following location (requires an approved instructor identification number):
http://www.virginiadot.org/business/resources/wztc/WZTC_order_form.pdf

OPTION 2 – Obtain the services of an approved instructor from VDOT's Approved WZTC Instructor List to teach the course or courses you need for your employees.

The Approved WZTC Instructor's List can be obtained at the following location:
http://www.virginiadot.org/business/resources/wztc/Approved_WZTC_Instructors.pdf

A list of Approved Providers of training can be obtained at the following location:
http://www.virginiadot.org/business/resources/wztc/wztc_training_sponsors.pdf

OPTION 3 – Send personnel to classes conducted by approved sources such as ATSSA Virginia or the Virginia Local Technical Assistance Program (LTAP).

Courses by ATSSA Virginia can be found at the following location:
http://atssa.com/cs/course_information/courses_by_state?state=56

Courses by the Virginia LTAP can be found at the following location:
http://ltap.cts.virginia.edu/2%20Page%20Calendar%20June%20-%20Sept%2009.pdf

Basic WZTC courses by the Virginia Rural Water Association can be found at the following location:
http://www.vrwa.org/ (See Training Schedule)

Training by the Virginia Transportation Construction Alliance (VTCA) can be found at the following location: **http://vtca.org/**

Visit the following site for additional information regarding Virginia's Work Zone Traffic Control training program:
http://www.virginiadot.org/business/trafficeng-WZS.asp

Authorized Hours and Days of Work

Normal hours for work under the authority of a VDOT land use permit are from 9:00 a.m. to 3:30 p.m. for all highways classified as arterial or collector. All highways classified as local roads will have unrestricted work hours and days.

The district administrator's designee may establish alternate time restrictions in normal working hours for single use permits.

The central office permit manager may establish alternate time restrictions in normal working hours for district-wide permits.

The classifications for all state maintained highways can be found at the following link:
http://www.virginiadot.org/projects/fxn_class/maps.asp

Emergency Repair

In the event of an emergency situation that requires immediate action to protect persons or property, work may proceed within the right-of-way without authorization from the district administrator's designee; however, the utility owner must contact the VDOT Emergency Operations Center as soon as reasonably possible but no later than 48 hours after the end of the emergency situation.

The utility owner must apply for a separate land use permit from the local district permit office for any emergency work performed on state maintained right-of-way when the following actions are proposed:

- Stopping or impeding highway travel in excess of 15 minutes, or,
- Accessing facilities within limited access right-of-way, or,
- Cutting the highway pavement or shoulders.

The district administrator's designee shall determine the applicable permit fee for emergency repair permits.

Holiday Restrictions

Permitted non-emergency work will not be allowed on arterial and collector highway classifications from noon on the preceding weekday through the following state observed holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. If the observed holiday falls on a Monday, the permit will not be valid from noon on the preceding Friday through noon on Tuesday.

Excavation

All excavation within state maintained rights-of-way shall comply with OSHA Technical Manual, Chapter 2, Title Excavation: Hazard Recognition in Trenching and Shoring. A professional engineer shall certify all shoring and/or trench boxes.

No excavated material is to be placed or tracked on the pavement without written permission from the District Administrator's designee. When so authorized, the pavement shall be satisfactorily cleaned by a VDOT approved method. No cleated (track-mounted) equipment is to be used on the pavement without properly protecting the pavement from damage.

Inspection and Restoration

1) Inspection and testing of all backfill and pavement sections shall be performed in accordance with all applicable sections of VDOT's Road and Bridge Specifications (current edition).

2) If during or before construction it is deemed necessary for the local district permit office to assign an inspector to the project, the permittee shall pay the Department an additional inspection fee in an amount that will cover the salary, expense allowance, and mileage allowance for the inspection(s) assigned by the Department for handling work covered by this permit. Said inspection fee shall be paid promptly each month on invoices rendered by the Department.

3) It shall be the decision of the district administrator's designee whether to assign an inspector to monitor the placement of all backfill and pavement restoration activities.

4) The absence of a VDOT inspector does not in any way relieve the permittee of their responsibility to perform the work in accordance with the approved plans, provisions of the attached permit, VDOT's Road and Bridge Standards (current edition) and VDOT's Road and Bridge Specifications (current edition).

5) The permittee shall be responsible for any settlement of all backfill or pavement restoration necessitated by authorized excavation activities for a period of two (2) years after the completion date of permit, and for the continuing maintenance of the facilities placed within the highway right-of-way. A one (1) year restoration warranty period may be considered, provided the permittee adheres to the following criteria:

- The permittee retains the services of a professional engineer (or certified technician under the direction of the professional engineer) to observe the placement of all backfill and pavement restoration.
- The professional engineer (or certified technician under the direction of the professional engineer) performs any required inspection and testing in accordance with all applicable sections of VDOT's Road and Bridge Specifications.
- The professional engineer submits all testing reports for review and approval, and provides written certification that all restoration procedures have been completed in accordance with all applicable sections of VDOT's Road and Bridge Specifications prior to completion of the work authorized by the permit.

6) Whenever existing pavement is permitted to be cut, not over one-half of the roadway width shall be disturbed at one time and the first open cut trench section shall be satisfactorily restored to allow for the passage of traffic prior to the second half of the roadway surface can be disturbed.

7) All crossing of existing pavement shall be bored, pushed or jacked an appropriate distance from the edge-of-pavement so as not to impede the normal flow of traffic or damage the existing pavement section. Existing pavement shall not be cut unless approved by the district administrator's designee and then only if justifiable circumstances prevail or proof is shown that a thorough attempt has been made to push, bore or jack.

8) Authorized daily trench excavation within pavement sections shall not exceed 500 feet in length.

9) Pavement restoration shall be in accordance with the attached VDOT LUP-OC Pavement Open Cut Special Provisions.

10) Where the pavement is disturbed or deemed weakened in its entirety or such portions as deemed desirable by the Department, the pavement shall be restored or replaced in a manner that is satisfactory to the district administrator's designee.

Environmental

1) In accordance with the Virginia Department of Transportation (VDOT) Road and Bridge Specification §**107.16**, all contractors performing regulated land disturbing activities within VDOT right-of-way must have at least one (1) employee that has successfully completed the VDOT Erosion & Sediment Control Contractor Certification training. This person shall be on site during all land disturbance activities and will be responsible for insuring compliance with all applicable local, state and federal erosion and sediment control regulations during land disturbance activities. This person must have their certification card with them while on the project site. The land use permit will be suspended if proof of certification cannot be provided. Regulated land disturbing activities are defined as those activities that disturb 2,500 square feet or greater in Tidewater, Virginia or 10,000 square feet or greater in all other areas of the State. The Department will require evidence of this certification with any land use permit application that involves utility and/or commercial right of way improvement. Improper installation, maintenance and removal of erosion and sediment control devices may result in revocation of VDOT Erosion & Sediment Control Contractor Certification.

2) The permittee is responsible for pursuing and obtaining any and all environmental permits which may be required to pursue the proposed activity prior to any work beginning within state maintained right-of-way.

3) In the event hazardous materials or underground storage tanks are encountered within state maintained right-of-way during authorized activities, the permittee shall suspend all work immediately then notify the local district permit office and other responsible parties, i.e., the local fire department, emergency services, Department of Environmental Quality, etc. The permittee is responsible for coordination and completion of all required remediation necessary to complete the permitted activities within the state maintained right-of-way. The permittee shall provide evidence of such compliance to the local district permit office prior to recommencement of permitted activities.

4) In the event cultural resources, archaeological, paleontological, and/or rare minerals are encountered within the right of way during authorized activities, the permittee shall suspend all work immediately then notify the local district permit office and the proper state authority charged with the responsibility for investigation and evaluation of such finds. The permittee will meet all necessary requirements for resolving any conflicts prior to continuing with the proposed activities within the state maintained right-of-way, and shall provide evidence of such compliance to the local district permit office.

5) Roadway drainage shall not be blocked or diverted. The shoulders, ditches, roadside, drainage facilities and pavement shall be kept in an operable condition satisfactory to the Department. Necessary precautions shall be taken by the permittee to insure against siltation of adjacent properties, streams, etc., in accordance with VDOT's current standards or as prescribed by the Department's Environmental Manual and the district administrator's designee.

Entrances

1. Plans for the proposed installation of entrance(s) to state maintained highway right-of-way shall be designed in accordance with the current edition of VDOT's Road and Bridge Standards, VDOT's Road and Bridge Specifications and per VDOT *Road Design Manual*, Appendix F located at **http://www.extranet.vdot.state.va.us/locdes/Electronic_Pubs/2005%20RDM/AppendF.pdf.**

2. VDOT's authority to regulate highway entrances is provided in §, §**33.2-240**, and §**33.2-241** of the Code of Virginia and its authority to make regulations concerning the use of highways generally is provided in §**33.2-210** of the Code of Virginia. Regulations regarding entrances are set forth in VDOT's regulations promulgated pursuant to §**33.2-245** of the Code of Virginia.

3. The permittee shall be responsible for the design and installation of a private entrance under the auspices of a VDOT land use permit however the permittee may request that VDOT forces install the private entrance at the permittee's expense.

4. Street connections, private entrances, and construction entrances shall be kept in satisfactory condition during all activities authorized under the auspices of a VDOT land use permit. Entrances shall not be blocked. Ample provisions must be made to provide safe ingress and egress to adjacent properties at all times. Entrances that are disturbed shall be restored to the satisfaction of the property owner and the district administrator's designee.

Utilities

1) Prior to any excavation, the permittee shall comply with the terms of **Title 56, Chapter 10.3** of the Underground Utility Damage Prevention Act and §**56-265.14** through §**56-265.20** of the Code of Virginia. This permit does not grant permission to grade on or near property of others, or, adjust or disturb in anyway existing utility poles or underground facilities within the permitted area. Permission to do so must be obtained from the impacted utility company and any expense involved shall be borne by the permittee. Any conflicts with existing utility facilities must be resolved between the permittee and the utility owner(s) involved.

2) All underground utility installations within limited access right-of-way shall have a minimum of 36 inches of cover. All underground utilities within non-limited access right-of-way will require a minimum of 36 inches of cover, except underground cables that provide telecommunications service shall be at a minimum of 30 inches of cover.

3) Where feasible, all aboveground installations (such as fire hydrants, telephone pedestals, markers, etc.) shall be located adjacent to the outside edge of the right-of-way line and in accordance with minimum clear zone requirements. All manhole covers, valve box, etc., shall be installed two inches below existing ground line and shall conform to existing contours.

4) No poles, guys, anchors, etc., are to be placed on state maintained right-of-way unless authorized under the auspices of a VDOT land use permit. At no time will any such facilities be allowed between the ditch line and the traveled roadway.

5) All overhead installations crossing non-limited access highways shall provide a minimum of 18 feet of vertical clearance or at a minimum height as established by the National Electric Safety Code, whichever is greater. All overhead utility installations within limited access right-of-way shall maintain a minimum of 21 feet of vertical clearance. The vertical clearance for all new overhead parallel installations within non-limited access rights-of-way shall be in compliance with standards as specified in the National Electric Safety Code.

Final Inspection and Completion of Permit

Upon completion of the work covered by this permit all disturbed areas outside of the roadway prism shall be restored to their original condition as found prior to starting such work.

Completion of this permit is contingent upon the permittee's completion of the authorized work in accordance with the approved plan and compliance with all governing bodies involved in the total completion of work on state maintained right-of-way.

Upon completion of the work under permit, the permittee shall provide notification, documented in writing or electronic communication, to the district administrator's designee requesting final inspection. This request shall include the permit number, county name, route number and name of the party or parties to whom the permit was issued.

The district administrator's designee shall promptly schedule an inspection of the work covered under the permit and advise the permittee of any necessary corrections.

Permit Revocation

At the discretion of the district administrator's designee, a land use permit may be revoked upon written finding that the permittee was not in compliance with all requirements contained herein and/or violated the terms of the permit, or any state and local laws and ordinances regulating activities within the right-of-way.

The district administrator's designee shall promptly schedule an inspection of the work covered under the permit and advise the permittee of any necessary corrections

Permittee Notice

The preceding provisions are intentionally condensed in format and should not be loosely interpreted by the permittee without consultation with the central office permit manager and affirmation from the **Land Use Permit Regulations**.

LAND USE PERMIT
LUP-OC
Open-Cut Pavement Restoration Requirements

Any of the following provisions that may apply, shall apply:

1. The permittee shall be responsible for the restoration of pavement on state maintained highways in accordance with all applicable sections of the VDOT Road and Bridge Specifications, VDOT Road and Bridge Standards and this document.

2. Whenever existing pavement is permitted to be cut, not over one-half of the roadway width shall be disturbed at one time and the first open cut trench section shall be satisfactorily restored to allow for the passage of traffic prior to the second half of the roadway surface can be disturbed.

3. All trench backfill material shall be Select Material Type I having a minimum CBR of 30 and free from any wood, decaying material, asphalt, concrete, ice, frost, large clods, stone or debris.

4. Trench backfill material shall be compacted to a minimum of 95% of the theoretical maximum density at optimum moisture content, as determine by VDOT testing procedures (VTM1), using mechanical tamping throughout the depth of the trench in 6-inch lifts to ensure that the adequate support is provided for the aggregate sub-base layer is adequately supported.

5. For roadways with a bituminous concrete asphalt pavement section the compacted trench backfill shall be capped with 10 inches (10”) of Type I, Size 21-A or 21-B aggregate compacted to 100% of the theoretical maximum density at optimum moisture content covering the entire trench width and a minimum six inch (6”) bench on each side of the excavated trench or as determined by the district administrator’s designee.

6. A bituminous concrete asphalt base course (BM-25) having a minimum thickness of six inches (6”), or matching the existing base course thickness, shall be placed over the benched aggregate sub-base to the bottom elevation of the existing asphalt concrete surface course.

7. All sides of the excavated trench shall be saw-cut trimmed to neat straight lines and a tack coat of RC-250 liquid asphalt applied at a rate of 0.1 gallon per square yard (or as determined by the district administrator’s designee) prior to placing the bituminous concrete asphalt base course (BM-25.0) and/or replacement of the bituminous concrete asphalt surface course (SM-9.5A or SM-9.5D).

8. The existing pavement surface course adjacent to the excavated trench shall be milled and repaved with bituminous concrete asphalt (SM-9.5A or SM-9.5D) having of a minimum thickness of 1-1/2 inches (1.5”). This operation shall cover the entire trench width and extend 12 inches (12”) beyond the edge of the trench on longitudinal open cuts and 25 feet (25’) beyond the trench centerline on perpendicular open cuts, or as determined by the district administrator’s designee.

9. Open cuts in surface treated roadway sections with an aggregate base course shall be replaced with the same layer(s) as roadway sections with a bituminous concrete asphalt pavement structure except the sub-base layer (Type I, Size 21-A or 21-B) may be reduced to six inches (6”) and the bituminous concrete asphalt base layer (BM-25.0) may be reduced to four inches (4”) while maintaining the required six inch (6”) bench on both sides of the excavated trench. The surface course restoration material and thickness shall match the existing surface.

10. Replacement of all bituminous concrete asphalt and surface treated courses shall be rolled with equipment having a manufacturer’s rating of ten (10) tons until the aggregate is keyed into the bitumen. Where rolling is not possible, a mechanical tamper shall be utilized.

11. Full depth aggregate stone may be placed in the trench daily up to maximum length of 500 feet, at which time either temporary or permanent pavement restoration procedures must be implemented.

12. Should the application of the bituminous concrete asphalt surface course be delayed due to adverse weather conditions, the contractor shall provide and maintain a temporary pavement section that is acceptable to the district administrator's designee until such time as the appropriate permanent pavement restoration can be achieved.

13. The permittee shall be responsible for any settlement in the backfill or pavement for a period of two (2) years after the completion date of permit and for the continuing maintenance of the facilities placed within the highway right-of-way.

14. A one-year restoration warranty period may be considered, provided the permittee adheres to the following criteria:

    - The permittee retains the services of a professional engineer (or certified technician under the direction of the professional engineer) to observe the placement of all fill embankments, pavement, and storm sewer and utility trench backfill.
    - The professional engineer (or certified technician under the direction of the professional engineer) performs any required inspection and testing in accordance with all applicable sections of VDOT's Road and Bridge Specifications.
    - The professional engineer submits all testing reports for review and approval, and provides written certification that all restoration procedures have been completed in accordance with all applicable sections of VDOT's Road and Bridge Specifications prior to completion of the work authorized by the permit.

15. The district administrator's designee may request and review the backfill compaction test results and/or authorize an inspector to monitor the trench backfill and compaction operations.

16. The use of steel plates to provide a temporary riding surface will not be allowed between November 1 and April 1. The use of steel plates between April 2 and October 31 shall be in accordance with VDOT standards and specifications.

17. Traffic shall be maintained at all times in accordance with the Virginia Work Area Protection Manual and a VDOT approved Maintenance of Traffic (MOT) plan.

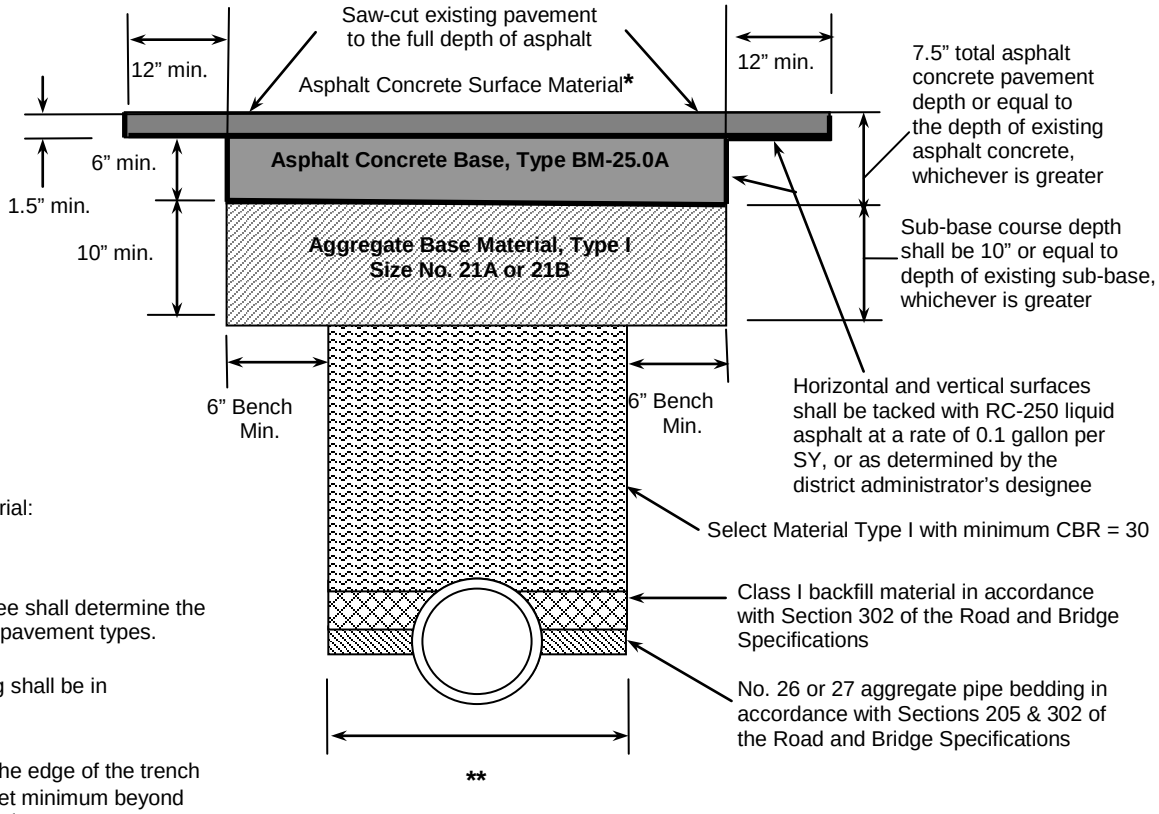
18. The permittee shall notify the district administrator's designee a minimum of 72 hours prior to initiating any pavement open cutting operations.

19. The trench to be backfilled shall be made as dry as practicable at the time of backfilling by pumping, bailing, draining, or other approved dewatering method.

20. All asphalt pavement restoration activities shall be in accordance with the Asphalt Pavement Restoration Detail for Open Cut Utility Installations contained herein.

LAND USE PERMIT
LUP-OC
Open-Cut Pavement Restoration Requirements

Asphalt Pavement Restoration Detail for Open Cut Utility Installations



NOTES:

* Asphalt Concrete Surface Material:
SM-9.5A for ADT < 10,000
SM-9.5D for ADT > 10,000

The district administrator's designee shall determine the restoration requirements for other pavement types.

** Trench width and pipe bedding shall be in accordance with VDOT Std. PB-1

*** 12 inches minimum beyond the edge of the trench on longitudinal open cuts, or 25 feet minimum beyond the trench centerline on perpendicular open cuts, or as determined by the district administrator's designee.

Date: August 27, 2014

LAND USE PERMIT
LUP-LC
Bank Irrevocable Letter of Credit

[Bank Letterhead]

LETTER OF CREDIT BANK AGREEMENT

Date: _____ APPLICANT NAME: _____
Issuing Bank: _____ Tax ID number or Driver's license Number: _____
Address: _____ Telephone Number: _____
City: _____ State_____ Zip Code_____ Address: _____
Amount: _____ City: _____ State _____ Zip Code _____
Expiration Date: _____

VIRGINIA DEPARTMENT OF TRANSPORTATION
Address: _____
City: _____ State _____ Zip Code _____

We hereby issue Irrevocable Letter of Credit number _____ in favor of the Virginia Department of Transportation (the Department) for the account of _____ in an amount not to exceed _____U.S. Dollars ($_____) available by sight draft on the above stated issuing bank accompanied by the documents specified below:

A certified statement signed by the Department's Permit Manager or their representative stating that_____ has not satisfactorily completed work pursuant to the permit issued to the permittee or his agent to perform the work as described on the face of the land use permit in the **County of** _____, Virginia.

A certified statement signed by the Department's Permit Manager or their representative stating that: "**This draw is for the explicit purpose of providing for completion or restoration of the right of way to the terms of the Land Use Permit Regulations and pursuant to the agreement of the permittee or their Agent to perform the work covered by permit to the satisfaction of the Department."** All drafts must bear the clause "Drawn under _____ Irrevocable Letter of Credit No. _____ dated _____ , 20_____." We hereby engage with drawers, endorsers and bona fide holders that all drafts drawn in compliance with the terms of this credit shall be duly honored upon presentation and delivery of this document. This Irrevocable Letter of Credit shall remain in full force and effect for a period of two (2) years from the date hereof and shall automatically renew itself from year to year for three (3) years, one (1) year periods thereafter unless and until the above issuing bank shall give ninety (90) days prior written notice to the department by CERTIFIED MAIL, RETURN RECEIPT REQUESTED, of its intent to terminate same at the expiration of said ninety-day period. During said ninety (90) days notice period, this Irrevocable Letter of Credit shall remain in full force and effect.

During the last thirty (30) days while this Irrevocable Letter of Credit is in force and effect after notice of termination has been given, the Department may draw up to the full amount of this Irrevocable Letter of Credit when accompanied by a document stating that _____ has failed to provide an acceptable substitute Irrevocable Letter of Credit or deposit in an escrow account, and further stating that **"The draw will be held by the Department for the sole purpose of providing for the completion or restoration of the right of way for work covered by the land use permit issued to _____ until such work is completed or restored to the Department's satisfaction**. **This Irrevocable Letter of Credit shall be terminated upon the Department's Permit Manager or their appointed representative giving written release stating that the terms of the permit have been completed and accepted by the Department."** Requests for the termination of this Irrevocable Letter of Credit should be addressed to the local Department office that issued the land use permit.

Except as otherwise expressly stated herein, this credit is subject to the Uniforms Customs & Practices for Documentary Credit (2007 Revision), International Chambers of Commerce Publication No. 600.

Attest: _____

_____
(Seal)

_____
Authorized Signature

_____
Type or Print Name

_____
Title

Land Use Permit Regulations
LUP-SB Surety Bond

BE KNOWN THAT WE as Principal, and_____, a corporation duly incorporated under the Laws of the State of _____, as Surety, are held and firmly bound unto the Commonwealth of Virginia in the full and just sum of _____ U.S. Dollars ($ _____), to be paid to the Commonwealth of Virginia to the payment whereof we hereby bind ourselves and our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents, sealed and dated this _____ day of _____ (month), 20_____ (year).

WHEREAS, The said Principal hereunder has been or will be granted permit(s) authorizing one or more of the following activities;(A) to move house property upon public highways of Virginia (B) to cut surface of the highways of Virginia, or to tunnel under such highways; (C) to install and/or erect and maintain telephone, electric power lines, water, sewer, gas or other utilities on, under or over such highways, bridges or tunnels;(D) to install an entrance or tie-in into a public roadway and/or grading upon the Right -of-way; or (E) for the following purposes: Explain below exact purpose(s) for which surety coverage is being obtained:

_____

_____

Work to be performed in the county, city or town of: _____

THEREFORE, The conditions of this obligation are such that if the said Principal shall in all respects comply with the terms and conditions of said permit(s), and fully meet and perform obligations thereunder in accordance with requirements for permits as set forth in the Land Use Permit Manual in effect at time of permit issuance, and shall satisfactorily complete the work permitted, and shall indemnify and save harmless the Commonwealth of Virginia against and from all loss, cost, expense damage or injury to highways and bridges and to persons and property lawfully on such highways, growing out of the granting of such permit(s) to said Principal, then this obligation be void, otherwise to be and remain in full force and virtue.

NOW, THEREFORE, It is expressly understood that this Bond may be canceled by the Surety at the expiration of sixty (60) days from the date which the Surety shall have lodged with the Commonwealth Transportation Commissioner or his designees written notice to so cancel. This provision, however, shall not operate to relieve, release or discharge the Surety from any liability already accrued, or which shall accrue, on permits issued before the expiration of the sixty-day period. **Bonds securing performance on specified active permit(s) may be canceled only upon satisfactory completion of permit(s), as determined by the Department Engineer**.

NOTE: Continuous Bond cannot be canceled unless facilities covered by the permit have been removed from the Right -of-way, or the principal has arranged for replacement surety protection. **ALL permit work covered under section (C) above shall be covered by a bond at all times.**

Said principal and surety, being properly authorized, have caused these presents to be executed and their seals affixed the day and year first above written.

Surety name _____
Bond number _____
Address_____
City _____ State _____ ZIP _____
Contact person _____
Telephone number _____
Attorney-in-Fact Name _____
Signature _____

Principal name _____
TAX ID # or DMV ID # _____
Address _____
City _____ State _____ ZIP _____
Contact person _____
Telephone number _____
Signature _____

POWER OF ATTORNEY AUTHORIZATION TO BE ATTACHED
Acknowledgement of Principal
Attorney-In-Fact
(Seal)
STATE OF _____ COUNTY / TOWN / CITY OF _____
I, the undersigned, a Notary Public in and for the County / Town / City aforesaid, in the State aforesaid, do certify that, _____whose name as Principal is signed to the foregoing writing bearing date this_____ day of _____ (month), 20_____ (year), personally appeared before me and acknowledged the same.
Given under my hand this day of _____ (month), 20____ (year)
My Commission expires: _____

_____
Notary Public
Affidavit and Acknowledgement of Surety
STATE OF _____ COUNTY/TOWN/CITY OF _____
I, the undersigned, a Notary Public in and for the County/Town/City aforesaid, in the State aforesaid do certify that, . (Name of Attorney in Fact) personally appeared before me and made oath that he is . (Title) of the (Name of Surety), that he is duly authorized to execute the foregoing bond by virtue of a certain power of attorney of said company; that said power of attorney has not been revoked; that the said company has complied with all the requirements of law regulating the admission of such companies to transact business in the State of Virginia; that the said company holds the certificate of the Commissioner of Insurance authorizing it to do business in the State of Virginia; that it has a paid-up cash capital of not less than $250,000; that the paid-up capital plus the surplus and undivided profits of said company is $; that the penalty of the foregoing bond is not in excess of ten percentum of said sum; that the said company is not by said bond incurring in the aggregate, on behalf or on account of the principal names in said bond, a liability for an amount lager than one-tenth of its paid-up capital, plus its surplus and undivided profits; that the said company is solvent and fully able to meet promptly all its obligations, and the said (Attorney in fact name) thereupon, in the name and on behalf of the said company, acknowledged the foregoing writing as its act and deed.
Given under my hand this _____ day of _____ (month), 20____ (year)
My Commission expires: _____

_____
Notary Public
Original to be filed with the Virginia Department of Transportation
Request for Land Use Permit Surety Bond Cancellation may be addressed to:
Virginia Department of Transportation

_____
_____

LAND USE PERMIT
RESOLUTION
August 26, 2014

[County, City or Town Letterhead]

"RESOLUTION"

WHEREAS, it becomes necessary from time to time for the *[County, City or Town]* of *[County, City or Town Name]* to obtain land use permits from the Virginia Department of Transportation to install, construct, maintain and operate certain public works and public utilities projects along, across over and upon highway systems of the Commonwealth of Virginia; and,

WHEREAS, expense, damage or injury may be sustained by the Commonwealth of Virginia growing out of granting to the *[County, City or Town]* of *[County, City or Town Name* by the Virginia Department of Transportation of said permits for the work aforesaid;

NOW, THEREFORE, BE IT RESOLVED by the *[County, City or Town] [Board of Supervisors, City or Town Council]* this *[Date]* day of *[Month]*, *[Year]*:

Section 1: That in accordance with the provisions of Section 24VAC30-151-720 of the Land Use Permit Regulations of the Virginia Department of Transportation, the *[County, City or Town]* of *[County, City or Town Name]* does hereby grant assurances to the Virginia Department of Transportation (VDOT) that it shall in all respects comply with all of the conditions of the permit or permits that have been, or will be, granted to the *[County, City or Town]* of *[County, City or Town Name]* and that said jurisdiction does hereby certify that it will carry liability insurance for personal injury and property damage that may arise from the work performed under permit and/or from the operation of the permitted activity as follows: up to one-million dollars ($1,000,000) each occurrence to protect the Commonwealth Transportation Board members and the Virginia Department of Transportation's agents or employees; seventy-five thousand dollars ($75,000) each occurrence to protect the Commonwealth Transportation Board, the Virginia Department of transportation or the Commonwealth of Virginia in the event of suit.

Section 2: That the County Administrator, City or Town Mayor, or their designee, be, and hereby is authorized to execute on behalf of the *[County, City or Town]* of *[County, City or Town Name]* all land use permits and related documents of the Virginia Department of Transportation.

Section 3: That this resolution shall be a continuing resolution and shall not be revoked unless and until sixty (60) days written notice of any proposed revocation be submitted to the Virginia Department of Transportation.

Section 4: That the *[County, City or Town]* of *[County, City or Town Name]* shall, if requested by the Virginia Department of Transportation, provide a letter that commits to using the surety provided by its contractor or to have the contractor execute a dual obligation rider that adds the Virginia Department of Transportation as an additional obligee to the surety bond provided to the locality, with either of these options guaranteeing the work performed within state maintained right-of-way under the terms of the land use permit for that purpose.

BE IT STILL FURTHER RESOLVED that the County Administrator, City or Town Mayor, or their designee, be, and hereby is authorized and directed to procure insurance required by Section 1 herein.

The foregoing Resolution was adopted by the [County Board of Supervisors, City or Town Council] at its regular meeting held on [Day, Month, Year] in [County, City or Town Name], Virginia.

[Authorized Signature]
[Printed Name & Title]
[County, City or Town Name]

LAND USE PERMIT
LUP-CSB
Corporate Surety Bond

[Company Letterhead]

CORPORATE SURETY BOND

KNOW ALL MEN BY THESE PRESENTS THAT_____ a public service corporation duly incorporated under the laws of the Commonwealth of Virginia, is held and firmly bound unto the Commonwealth of Virginia in the full and just sum of $_____, current money of the United States, to be paid to the said Commonwealth of Virginia, to the payment whereof _____ binds itself and its heirs, executors, administrators, and assigns, jointly and severally, firmly by these presents, sealed and dated this _____ day of_____ , _____.

WHEREAS, _____ has been or will be granted permits authorizing the following activities: (a) to cut the surface of the highways of the Commonwealth, or to tunnel under such highways, (b) to install and/or erect and maintain gas pipelines and appurtenant facilities on, under or over such highways, bridges, or tunnels.

NOW, THERFORE, The conditions of this obligation are such that, if _____ shall in all respects comply with the conditions of the permit or permits granted or to be granted and the requirements for permits, as set forth in the "Land Use Permit Regulations" in effect at time of issuing permit, and shall indemnify and save harmless the Commonwealth of Virginia against and from all loss, cost, expense, damage, or injury to highways and bridges and to persons and property lawfully on such highways, growing out of the granting of such permits to , _____ then this obligation to be void, otherwise to be and remain in full force and virtue.

This Surety Bond cannot be cancelled unless facilities covered by the permit have been removed from the right of way, or _____has arranged substitute surety protection.

IN WITNESS WHEREOF, _____ being properly authorized has caused these presents to be executed and its seal affixed the day and year first above written.

BY: _____

NAME: _____

TITLE: _____

Form **W-9**

Commonwealth of Virginia
Substitute W-9 Form

Revised July 2014

Request for Taxpayer Identification Number and Certification

Section 1 - Taxpayer Identification

☐ **Social Security Number (SSN)**

☐ **Employer Identification Number (EIN)**

— — — — — — — — — —

Please select the appropriate Taxpayer Identification Number (EIN or SSN) type and enter your 9 digit ID number . The EIN or SSN provided must match the name given on the "Legal Name" line to avoid backup withholding. If you do not have a Tax ID number, please reference "Specific Instructions - Section 1." If the account is in more than one name, provide the name of the individual who is recognized with the IRS as the responsible party.

Dunn & Bradstreet Universal Numbering System (DUNS) (see instructions)

— — — — — — — — — —

Legal Name:

Business Name:

Entity Type		**Entity Classification**		**Exemptions (see instructions)**
☐ Individual	☐ Corporation	☐ Professional Services	☐ Medical Services	Exempt payee code (if any):
☐ Sole Proprietorship	☐ S-Corporation	☐ Political Subdivision	☐ Legal Services	(from backup withholding)
☐ Partnership	☐ C-Corporation	☐ Real Estate Agent	☐ Joint Venture	_____
☐ Trust	☐ Disregarded Entity	☐ VA Local Government	☐ Tax Exempt Organization	Exemption from FATCA reporting code (if any):
☐ Estate	☐ Limited Liability Company	☐ Federal Government	☐ OTH Government	
☐ Government	☐ Partnership	☐ VA State Agency	☐ Other	_____
☐ Non-Profit	☐ Corporation			

Contact Information

Legal Address:	Name:	
	Email Address:	
City: State : Zip Code:	Business Phone:	
Remittance Address:	Fax Number:	
	Mobile Phone:	
City: State : Zip Code:	Alternate Phone:	

Section 2 - Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined later in general instructions), and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions: You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See instructions titled Certification

Printed Name:		
Authorized U.S. Signature:		Date:

LAND USE PERMIT
LUP-SPG
Special Provisions – General

VDOT Land Use Permit Required by Law

The General Rules and Regulations of the Commonwealth Transportation Board provide that no work of any nature shall be performed on any real property under the ownership, control, or jurisdiction of VDOT until written permission has been obtained from VDOT. Written permission is granted for the above-referenced activity through the issuance of a land use permit.

By issuing a permit, VDOT is giving permission only for whatever rights it has in the right-of-way; the permittee is responsible for obtaining permission from others who may also have an interest in the property.

The permittee will be civilly liable to the Commonwealth for expenses and damages incurred by VDOT as a result of violation of any of the rules and regulations of this chapter. Violators shall be guilty of a misdemeanor and, upon conviction, shall be punished as provided for in §33.2-210 of the Code of Virginia.

Application Requirements

Application shall be made for VDOT land use permits through the local district permit office where the activity is to take place.

Application forms and general information regarding VDOT land use permitting can be obtained by contacting the central office permit manager or at the following VDOT web site: http://www.virginiadot.org/business/bu-landUsePermits.asp

The applicant shall provide a notarized affidavit indicating compliance with the registration and notification requirements outlined in § 2.2-1151.1 of the Code of Virginia.

Permit Fees

The land use permit application shall include a check in an amount determined by the district administrator's designee based on the schedule found in 24VAC30-151-710 of the Land Use Permit Regulations.

Surety Requirement

A performance surety in the amount determined by the district administrator's designee is required to restore the right-of-way in the event of damage or default. This surety may be in the form of cash, check or surety bond LUP-SB, or LUP-LC irrevocable letter of credit.

Cash Surety Refund

Applicants owing the Internal Revenue Service or the Commonwealth of Virginia may not receive a refund of the cash guarantee provided for the issuance of a VDOT land use permit unless the amount owed is less than the amount of cash guarantee provided. Applicants providing cash guarantee for the issuance of a VDOT land use permit must provide an executed copy of the Commonwealth of Virginia's Substitute Form W-9 to receive a refund of the cash guarantee provided for the issuance of a VDOT land use permit.

Insurance Requirements (excluding County, Town or City)

The permittee or their agent shall secure and maintain insurance to protect against liability for personal injury and property damage that may arise from the activities performed under the authority of a land use permit and from the operation of the permitted activity up to one million dollars ($ 1,000,000) each occurrence to protect the Board members and the Department's agents or employees; seventy-five thousand dollars ($75,000) each occurrence to protect the Board, the Department, or the Commonwealth in event of suit. Insurance must be obtained prior to start of the permitted work and shall remain valid through the permit completion date. VDOT staff may require a valid certificate or letter of insurance from the issuing insurance agent or agency prior to issuing the land use permit.

Any of the following provisions that may apply, shall apply:

General Requirements

1) Permittee acceptance and use of a Virginia Department of Transportation (VDOT) land use permit is prima facie evidence that the permittee has read and is fully cognizant of all required permit provisions, applicable traffic control plans and associated construction standards to be employed. All applicants to whom permits are issued shall at all times indemnify and save harmless the

Commonwealth Transportation Board, members of the Board, the Commonwealth, and all Commonwealth employees, agents, and officers, from responsibility, damage, or liability arising from the exercise of the privileges granted in such permit to the extent allowed by law including any sums ordered to be paid or expended by VDOT by any governmental entity as a fine, penalty or damages for any violation of any applicable environmental law, or to remediate any hazardous or other material, including illicit discharge into VDOT maintained storm sewer systems.

2) The permittee assumes full responsibility for any and all (downstream flooding, erosion, siltation, etc.) damages that may occur as a result of the work performed under this permit. Furthermore, the Department will in no way be responsible for any damage to the facility being placed as a result of future maintenance or construction activities performed by the Department.

3) The permittee agrees to move, remove, alter, or change any installation that interferes with the ultimate construction of the highway in alignment or grade at no cost to the Department unless otherwise stipulated and agreed to by the Department.

4) The permittee shall immediately correct any situation that may arise as a result of these activities that the district administrator's designee deems hazardous to the traveling public.

5) Any and all highway signs, right-of-way markers, etc., disturbed as a result of work performed under the auspices of a land use permit shall be accurately reset by the permittee immediately following the work in the vicinity of the disturbed facility. The services of a certified land surveyor with experience in route surveying may be required.

6) It shall be the permittee's responsibility to obtain any and all necessary permits that may be required by any other government agencies, i.e., U.S. Army Corp. of Engineers, Department of Environmental Quality, Department of Conservation and Recreation, etc.

7) A copy of the VDOT land use permit shall be maintained at the work site and made readily available for inspection when requested by authorized VDOT personnel. District administrator's designee may request the permittee to install on site a project information sign to help the public and VDOT personnel identify activities in the right of way (see LUP-IS).

8) The permittee shall notify the local district permit office at least 48 hours prior to commencement of any work requiring inspection and/or testing as stipulated in VDOT's Road and Bridge Standards (current edition) and VDOT's Road and Bridge Specifications (current edition). Failure to carry out this requirement may result in permit revocation.

9) The permittee or their agent must contact the VDOT Customer Service Center at 1-800-367-7623 a minimum of 48 hours prior to initiating any planned excavation within 1,000 feet of a signalized intersection and/or near VDOT ITS infrastructure. Excavation activities may proceed only after the VDOT regional utility location agent has notified the permittee that the utility marking has been completed. Additional information can be found at: http://www.virginiadot.org/business/resources/IIM/TE-383_Request_for_Marking_VDOT_Utility_Location.pdf

   Alternately, within all localities in the Northern Virginia Construction District, including the Counties of Arlington, Fairfax, Loudoun & Prince William, the Cities of Alexandria, Fairfax, Falls Church, Manassas and Manassas Park, and the Towns of Clifton, Dumfries, Hamilton, Haymarket, Herndon, Hillsboro, Leesburg, Lovettsville, Middleburg, Occoquan, Purcellville, Quantico, Round Hill and Vienna, and on Interstate 95 in the counties of Stafford, Spotsylvania and Caroline, the permittee may request VDOT regional utility marking at: http://www.vdotutilitymarking.virginia.gov

10) The permittee shall to notify "Miss Utility" (or each operator of an underground utility where no notification center exists) of any planned excavation within state maintained right-of-way. This notification must be provided at least 48 hours (excluding weekends and holidays) in advance of commencing with any planned excavation within state maintained right-of-way. Failure to carry out this requirement may result in permit revocation.

11) It is the duty of the district administrator's designee to keep all roads maintained in a safe and travelable condition at all times. Therefore, any permit may be denied, revoked or suspended when in the opinion of the district administrator's designee, the safety, use or maintenance of the highway so requires.

12) The permittee shall at all times give strict attention to the safety and rights of the traveling public, their employees and themselves. VDOT reserves the right to stop work at anytime due to safety problems and/or non-compliance with the terms of the permit. The Department may, at its discretion, complete any of the work covered in the permit or restore the right-of-way to the department's standards and invoice the permittee for the actual cost of such work. The permittee may be required to move, alter, change or remove from state maintained right-of-way, in a satisfactory manner, any installation made under this permit.

13) All work authorized under the auspices of a VDOT land use permit shall be subject to VDOT's direction and be in accordance with VDOT's Road and Bridge Standards (current edition) and VDOT's Road and Bridge Specifications (current edition).

14) Design changes, specified material changes and/or field changes from the approved plans shall be submitted to the appropriate district administrator's designee for review and approval prior to proceeding with the proposed changes. This submittal shall include written justification, supplemental documentation and/or engineering calculations that support the requested changes.

15) The permittee shall meet or exceed the existing pavement design and typical section when constructing pavement widening adjacent to an existing state maintained roadway. The proposed pavement design and typical section shall be approved by the district administrator's designee prior to commencing with any work within state maintained right-of-way. All pavement widening shall be in accordance with VDOT's Road and Bridge Standard 303.02.

16) Within the limits of a VDOT construction project it is the responsibility of the permit applicant to obtain the contractor's consent in writing prior to permit issuance. Information regarding current and/or planned VDOT construction and maintenance activities can be obtained at: http://www.virginiaroads.org/.

Traffic Control and Safety

1) The permittee shall at all times give strict attention to the safety and rights of the traveling public, their employees, and contractors. Any permit may be revoked or suspended when in the opinion of the district administrator's designee, the safety, use or maintenance of the highway so requires.

2) In accordance with the Virginia Department of Transportation (VDOT) Road and Bridge Specification, Special Provision 105.14, all activities performed under the auspices of a VDOT Land Use Permit involving the installation, maintenance and removal of work zone traffic control devices must have an individual on-site who, at a minimum, is accredited by VDOT in Basic Work Zone Traffic Control. The accredited person must have their VDOT Work Zone Traffic Control accreditation card in their possession while on-site.

3) The individual accredited in Basic Work Zone Traffic Control is responsible for the placement, maintenance and removal of work zone traffic control devices within the project limits in compliance with the permit requirements and conditions, the approved plans and specifications, the Virginia Work Area Protection Manual, and the Manual of Uniform Traffic Control Devices.

4) A person accredited by VDOT in Intermediate Work Zone Traffic Control must be on-site to provide supervision for adjustment to the approved layout of any standard Typical Traffic Control (TTC) layouts outlined in the Virginia Work Area Protection Manual.

5) All traffic control plans shall be prepared by a person verified by VDOT in Advanced Work Zone Traffic Control.

6) Individuals responsible for implementation of work zone traffic control measures shall provide evidence of their accreditation upon request from VDOT personnel.

7) The permittee shall be exempt from the requirements of Virginia Department of Transportation (VDOT) Road and Bridge Specification, Special Provision 105.14 if the authorized activity is not within the roadway (as defined in 24VAC30-151) of a state maintained highway.
8) Non-compliance with the requirements outlined in VDOT Road and Bridge Specification, Special Provision 105.14 may result in a stop work order and / or permit revocation.

9) All activities that require the disruption (stoppage) of traffic shall utilize VDOT certified flaggers. Flag persons shall be provided in sufficient number and locations as necessary for control and protection of vehicular and pedestrian traffic in accordance with the Virginia Work Area Protection Manual. All flaggers must have their certification card in their possession when performing flagging operations within state maintained right-of-way. Any flag person found not in possession of his/her certification card shall be removed from the flagging site and the district administrator's designee will suspend all permitted activities.

10) Any VDOT certified flag person found to be performing their duties improperly shall have their certification revoked.

11) All signs shall be in accordance with the current edition of the Manual of Uniform Traffic Control Devices (MUTCD).

12) The permittee shall immediately correct any situation that may arise as a result of these activities that the district administrator's designee deems hazardous to the traveling public.

13) During authorized activities, the permittee shall furnish all necessary signs, flag persons and other devices to provide for the protection of traffic and workers in accordance with the Virginia Work Area Protection Manual or as directed by the district administrator's designee.

14) Traffic shall not be blocked or detoured without permission, documented in writing or electronic communication, being granted by the district administrator's designee.

15) All lane or shoulder closures on highways in the Northern Virginia construction district classified as arterial or collector routes must be authorized, documented in writing or by electronic communication by the VDOT Transportation Operations Center (NRO/TOC).

16) If directed by the district, requests for the implementation of temporary lane closures must be entered into the VDOT Lane Closure Advisory Management System (LCAMS) and VaTraffic a minimum of one (1) week prior to the planned execution of lane closure activities on state maintained highways. The permittee or their contractor(s) may enter their requests directly or provide written requests to the VDOT Regional Operations Center as follows:

- Lane closure requests in all the counties listed below are within the Northern Region and shall be sent to: nrolaneclosurerequests@vdot.virginia.gov.

  Counties: Arlington, Fairfax, Loudoun, Prince William, Spotsylvania, and Stafford

- Lane closure requests in all the counties listed below are within the Northwest Region and shall be sent to: StauntonTrafficManagementCenter@vdot.virginia.gov.

  Counties: Albemarle, Alleghany, Augusta, Bath, Clarke, Culpeper, Fauquier, Fluvanna, Frederick, Greene, Highland, Louisa, Madison, Orange Page, Rappahannock, Rockbridge, Rockingham, Shenandoah and Warren

- Lane closure requests in all the counties listed below are within the Southwest Region and shall be sent to: SalemSmartTrafficCenter@VDOT.Virginia.gov.

  Counties: Amherst, Appomattox, Bedford, Bland, Botetourt, Buchanan, Buckingham, Campbell, Carroll, Charlotte, Craig, Cumberland, Dickenson, Floyd, Franklin, Giles, Grayson, Halifax, Henry, Lee, Montgomery, Nelson, Patrick, Pittsylvania Prince Edward, Pulaski, Roanoke, Russell, Scott, Smyth, Tazewell, Washington, Wise, and Wythe.

- Lane closure requests in all the counties listed below are within the Eastern Region and shall be sent to: HamptonRoadsTOCControllers@VDOT.Virginia.gov.

  Counties: Accomack, Greensville, Isle of Wight, James City, Northampton, Southampton, Surry, Sussex and York

- Lane closure requests in all the counties listed below are within the Central Region and shall be sent to: RichmondDist.SmartTraffic@vdot.virginia.gov

  Counties: Amelia, Brunswick, Caroline, Charles City, Chesterfield, Dinwiddie, Essex, Gloucester, Goochland, Hanover, Henrico, King and Queen, King George, King William, Lancaster, Lunenburg, Mathews, Mecklenburg, Middlesex, New Kent, Northumberland, Nottoway, Powhatan, Prince George, Richmond, and Westmoreland

  Written requests for implementation of temporary lane closures must be submitted to the appropriate VDOT Regional Operations Center by close of business on the preceding Wednesday for the upcoming week's planned lane closures. All requests being directly input into LCAMS and VaTraffic must be entered no later than 2:00 pm on the preceding Thursday for the upcoming week's lane closure activities. Any conflicts with other roadway work must be resolved by close of business on Thursday the week prior to the scheduled lane closure activities with documented resolution sent to the VDOT point of contact provided by the regional traffic operation center LCAMS Administrator. Any requests received after these time limitations will not be approved and the proposed work within VDOT right of way requiring lane closures must be rescheduled.

  Lane closure requestors wanting direct access to LCAMS and VaTraffic must complete ITD-35E & ITD-36E forms and return to Ms. Carlene McWhirt at Carlene.McWhirt@VDOT.Virginia.gov. Online training is available for LCAMS and VaTraffic and VDOT can accommodate any additional training needs. Please contact Ms. McWhirt at (571) 350-2078 to schedule training.

VIRGINIA WORK ZONE TRAFFIC CONTROL TRAINING OPTIONS

The following three options are available to receive Work Zone Traffic Control (WZTC) training based on an individual's job duties and responsibilities as required by the FHWA Final Rule on Work Zone Safety and Mobility and the Virginia Department of Transportation:

OPTION 1 – Have someone trained to become a qualified instructor in your company who can then instruct others , utilizing training material provided by VDOT. The following qualifications must be met in order to teach the VDOT Basic, Intermediate, or Advanced WZTC training courses:

- Basic – Be flagger certified either by VDOT or by the American Traffic Safety Services Association (ATSSA); possess two years of practical experience in Highway Design, Construction, Maintenance, or Traffic Operations; possess two years of

documented experience in conducting training courses; and successfully complete the VDOT WZTC Intermediate or Advanced course or complete the ATSSA Virginia Intermediate/Traffic Control Supervisor (TCS) course.

- Intermediate - Be flagger certified either by VDOT or by ATSSA; possess two years of practical experience in Highway Design, Construction, Maintenance, or Traffic Operations; possess two years of documented experience in conducting training courses; complete and possess the ATSSA Virginia Intermediate/TCS certification.

- Advanced - Be flagger certified either by VDOT or by ATSSA; possess two years of practical experience in Highway Design, Construction, Maintenance, or Traffic Operations; possess two years of documented experience in conducting training courses; complete and possess the ATSSA Virginia Advanced Traffic Control Design Specialist (TCDS) certification or ATSSA Virginia Intermediate TCS certification.

To become an approved instructor, an application must be completed listing the above qualifications and sent to the chairman of VDOT's WZST committee at the following location:
http://www.virginiadot.org/business/resources/wztc/wztc_inst_app_form.pdf

Once a person has become an approved instructor, training material can be obtained from VDOT using the order form obtained from the following location (requires an approved instructor identification number):
http://www.virginiadot.org/business/resources/wztc/WZTC_order_form.pdf

OPTION 2 – Obtain the services of an approved instructor from VDOT's Approved WZTC Instructor List to teach the course or courses you need for your employees.

The Approved WZTC Instructor's List can be obtained at the following location:
http://www.virginiadot.org/business/resources/wztc/Approved_WZTC_Instructors.pdf

A list of Approved Providers of training can be obtained at the following location:
http://www.virginiadot.org/business/resources/wztc/wztc_training_sponsors.pdf

OPTION 3 – Send personnel to classes conducted by approved sources such as ATSSA Virginia or the Virginia Local Technical Assistance Program (LTAP).

Courses by ATSSA Virginia can be found at the following location:
http://atssa.com/cs/course_information/courses_by_state?state=56

Courses by the Virginia LTAP can be found at the following location:
http://ltap.cts.virginia.edu/2%20Page%20Calendar%20June%20-%20Sept%2009.pdf

Basic WZTC courses by the Virginia Rural Water Association can be found at the following location:
http://www.vrwa.org/ (See Training Schedule)

Training by the Virginia Transportation Construction Alliance (VTCA) can be found at the following location: http://vtca.org/

Visit the following site for additional information regarding Virginia's Work Zone Traffic Control training program:
http://www.virginiadot.org/business/trafficeng-WZS.asp

Authorized Hours and Days of Work

Normal hours for work under the authority of a VDOT land use permit are from 9:00 a.m. to 3:30 p.m. Monday through Friday for all highways classified as arterial or collector. All highways classified as local roads will have unrestricted work hours and days.
The district administrator's designee may establish alternate time restrictions in normal working hours for single use permits.

The central office permit manager may establish alternate time restrictions in normal working hours for district-wide permits.

The classifications for all state maintained highways can be found at the following link:
http://www.virginiadot.org/projects/fxn_class/maps.asp

Emergency Repair

In the event of an emergency situation that requires immediate action to protect persons or property, work may proceed within the right-of-way without authorization from the district administrator's designee; however, the utility owner must contact the VDOT Emergency Operations Center as soon as reasonably possible but no later than 48 hours after the end of the emergency situation.

The utility owner must apply for a separate land use permit from the local district permit office for any emergency work performed on state maintained right-of-way when the following actions are proposed:

- Stopping or impeding highway travel in excess of 15 minutes, or,
- Accessing facilities within limited access right-of-way, or,
- Cutting the highway pavement or shoulders.

The district administrator's designee shall determine the applicable permit fee for emergency repair permits.

Holiday Restrictions

Permitted non-emergency work will not be allowed on arterial and collector highway classifications from noon on the preceding weekday through the following state observed holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. If the observed holiday falls on a Monday, the permit will not be valid from noon on the preceding Friday through noon on Tuesday.

Excavation

All excavation within state maintained rights-of-way shall comply with OSHA Technical Manual, Chapter 2, Title Excavation: Hazard Recognition in Trenching and Shoring. A professional engineer shall certify all shoring and/or trench boxes.

No excavated material is to be placed or tracked on the pavement without written permission from the District Administrator's designee. When so authorized, the pavement shall be satisfactorily cleaned by a VDOT approved method. No cleated (track-mounted) equipment is to be used on the pavement without properly protecting the pavement from damage.

Trenchless Construction

Site specific geotechnical sub-surface investigation reports, compiled in accordance with the provisions of VDOT Materials Division Manual of Instructions, shall be submitted to the district administrator's designee if the following trenchless installation(s) are proposed:

- The proposed pipe diameter is 24-inches or greater, and;
- The proposed pipe cover is less than 3 times the pipe diameter, and;
- The AADT of roadway is greater than 25,000, or;
- The proposed pipe diameter is 60-inches or greater, or;
- Any situation where there is a significant risk identified.

Inspection and Restoration

1) Inspection and testing of all backfill and pavement sections shall be performed in accordance with all applicable sections of VDOT's Road and Bridge Specifications (current edition).

2) If during or before construction it is deemed necessary for the local district permit office to assign an inspector to the project, the permittee shall pay the Department an additional inspection fee in an amount that will cover the salary, expense allowance, and mileage allowance for the inspection(s) assigned by the Department for handling work covered by this permit. Said inspection fee shall be paid promptly each month on invoices rendered by the Department.

3) It shall be the decision of the district administrator's designee whether to assign an inspector to monitor the placement of all backfill and pavement restoration activities.

4) The absence of a VDOT inspector does not in any way relieve the permittee of their responsibility to perform the work in accordance with the approved plans, provisions of the attached permit, VDOT's Road and Bridge Standards (current edition) and VDOT's Road and Bridge Specifications (current edition).

5) The permittee shall be responsible for any settlement of all backfill or pavement restoration necessitated by authorized excavation activities for a period of two (2) years after the completion date of permit, and for the continuing maintenance of the facilities placed

within the highway right-of-way. A one (1) year restoration warranty period may be considered, provided the permittee adheres to the following criteria:

- The permittee retains the services of a professional engineer (or certified technician under the direction of the professional engineer) to observe the placement of all backfill and pavement restoration.
- The professional engineer (or certified technician under the direction of the professional engineer) performs any required inspection and testing in accordance with all applicable sections of VDOT's Road and Bridge Specifications.
- The professional engineer submits all testing reports for review and approval, and provides written certification that all restoration procedures have been completed in accordance with all applicable sections of VDOT's Road and Bridge Specifications prior to completion of the work authorized by the permit.

6) Whenever existing pavement is permitted to be cut, not over one-half of the roadway width shall be disturbed at one time and the first open cut trench section shall be satisfactorily restored to allow for the passage of traffic prior to the second half of the roadway surface can be disturbed.

7) All crossing of existing pavement shall be bored, pushed or jacked an appropriate distance from the edge-of-pavement so as not to impede the normal flow of traffic or damage the existing pavement section. Existing pavement shall not be cut unless approved by the district administrator's designee and then only if justifiable circumstances prevail or proof is shown that a thorough attempt has been made to push, bore or jack.

8) Authorized daily trench excavation within pavement sections shall not exceed 500 feet in length.

9) Pavement restoration shall be in accordance with the VDOT LUP-OC Pavement Open Cut Special Provisions. This document can also be found at: http://www.virginiadot.org/business/bu-landUsePermits.asp

10) Where the pavement is disturbed or deemed weakened in its entirety or such portions as deemed desirable by the Department, the pavement shall be restored or replaced in a manner that is satisfactory to the district administrator's designee.

Environmental

1) In accordance with the Virginia Department of Transportation (VDOT) Road and Bridge Specification §107.16, all contractors performing regulated land disturbing activities within VDOT right-of-way must have at least one (1) employee that has successfully completed the VDOT Erosion & Sediment Control Contractor Certification training. This person shall be on site during all land disturbance activities and will be responsible for insuring compliance with all applicable local, state and federal erosion and sediment control regulations during land disturbance activities. This person must have their certification card with them while on the project site. The land use permit will be suspended if proof of certification cannot be provided. Regulated land disturbing activities are defined as those activities that disturb 2,500 square feet or greater in Tidewater, Virginia or 10,000 square feet or greater in all other areas of the State. The Department will require evidence of this certification with any land use permit application that involves utility and/or commercial right of way improvement. Improper installation, maintenance and removal of erosion and sediment control devices may result in revocation of VDOT Erosion & Sediment Control Contractor Certification.

2) The permittee is responsible for pursuing and obtaining any and all environmental permits which may be required to pursue the proposed activity prior to any work beginning within state maintained right-of-way.

3) In the event hazardous materials or underground storage tanks are encountered within state maintained right-of-way during authorized activities, the permittee shall suspend all work immediately then notify the local district permit office and other responsible parties, i.e., the local fire department, emergency services, Department of Environmental Quality, etc. The permittee is responsible for coordination and completion of all required remediation necessary to complete the permitted activities within the state maintained right-of-way. The permittee shall provide evidence of such compliance to the local district permit office prior to recommencement of permitted activities.

4) In the event cultural resources, archaeological, paleontological, and/or rare minerals are encountered within the right of way during authorized activities, the permittee shall suspend all work immediately then notify the local district permit office and the proper state authority charged with the responsibility for investigation and evaluation of such finds. The permittee will meet all necessary requirements for resolving any conflicts prior to continuing with the proposed activities within the state maintained right-of-way, and shall provide evidence of such compliance to the local district permit office.

5) Roadway drainage shall not be blocked or diverted. The shoulders, ditches, roadside, drainage facilities and pavement shall be kept in an operable condition satisfactory to the Department. Necessary precautions shall be taken by the permittee to insure against siltation of adjacent properties, streams, etc., in accordance with VDOT's current standards or as prescribed by the Department's Environmental Manual and the district administrator's designee.

Entrances

1) VDOT's authority to regulate highway entrances is provided in §, §33.2-240, and §33.2-241 of the Code of Virginia and its authority to make regulations concerning the use of highways generally is provided in §33.2-210 of the Code of Virginia. Regulations regarding entrances are set forth in VDOT's regulations promulgated pursuant to §33.2-245 of the Code of Virginia.

2) The permittee shall be responsible for the design and installation of a private entrance under the auspices of a VDOT land use permit however the permittee may request that VDOT forces install the private entrance at the permittee's expense.

3) Street connections, private entrances, and construction entrances shall be kept in satisfactory condition during all activities authorized under the auspices of a VDOT land use permit. Entrances shall not be blocked. Ample provisions must be made to provide safe ingress and egress to adjacent properties at all times. Entrances that are disturbed shall be restored to the satisfaction of the property owner and the district administrator's designee.

Utilities

1) Prior to any excavation, the permittee shall comply with the terms of Title 56, Chapter 10.3 of the Underground Utility Damage Prevention Act and §56-265.14 through §56-265.20 of the Code of Virginia. This permit does not grant permission to grade on or near property of others, or, adjust or disturb in anyway existing utility poles or underground facilities within the permitted area. Permission to do so must be obtained from the impacted utility company and any expense involved shall be borne by the permittee. Any conflicts with existing utility facilities must be resolved between the permittee and the utility owner(s) involved.

2) All underground utility installations within limited access right-of-way shall have a minimum of 36 inches of cover. All underground utilities within non-limited access right-of-way will require a minimum of 36 inches of cover, except underground cables that provide telecommunications service shall be at a minimum of 30 inches of cover.

3) Where feasible, all aboveground installations (such as fire hydrants, telephone pedestals, markers, etc.) shall be located adjacent to the outside edge of the right-of-way line and in accordance with minimum clear zone requirements. All manhole covers, valve box, etc., shall be installed two inches below existing ground line and shall conform to existing contours.

4) No poles, guys, anchors, etc., are to be placed on state maintained right-of-way unless authorized under the auspices of a VDOT land use permit. At no time will any such facilities be allowed between the ditch line and the traveled roadway.

5) All overhead installations crossing non-limited access highways shall provide a minimum of 18 feet of vertical clearance or at a minimum height as established by the National Electric Safety Code, whichever is greater. All overhead utility installations within limited access right-of-way shall maintain a minimum of 21 feet of vertical clearance. The vertical clearance for all new overhead parallel installations within non-limited access rights-of-way shall be in compliance with standards as specified in the National Electric Safety Code.

Final Inspection and Completion of Permit

Upon completion of the work covered by this permit all disturbed areas outside of the roadway prism shall be restored to their original condition as found prior to starting such work.

Completion of this permit is contingent upon the permittee's completion of the authorized work in accordance with the approved plan and compliance with all governing bodies involved in the total completion of work on state maintained right-of-way.

Upon completion of the work under permit, the permittee shall provide notification, documented in writing or electronic communication, to the district administrator's designee requesting final inspection. This request shall include the permit number, county name, route number and name of the party or parties to whom the permit was issued.

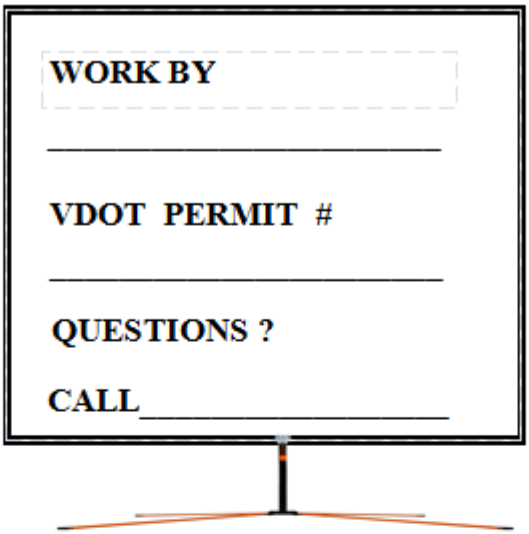
The district administrator's designee shall promptly schedule an inspection of the work covered under the permit and advise the permittee of any necessary corrections.

Permit Revocation

At the discretion of the district administrator's designee, a land use permit may be revoked upon written finding that the permittee was not in compliance with all requirements contained herein and/or violated the terms of the permit, or any state and local laws and ordinances regulating activities within the right-of-way. In addition VDOT may apply additional penalties in accordance with §33.2-1221.

Permittee Notice

The preceding provisions are intentionally condensed in format and should not be loosely interpreted by the permittee without consultation with the central office permit manager and affirmation from the Land Use Permit Regulations.



1. Sign must not be oriented facing traffic approaching from any direction
2. Sign must be non-reflective
3. Sign must use Times New Roman font and should not use MUTCD sign fonts (or Clearview)
4. Sign must not show any logos
5. Sign must not contain the contractor's name (unless the contractor is the permittee)
6. Sign must be installed outside clear zone within 50' of work area
7. Sign must remain on site until final restoration of right of way
8. For multiple work locations within subdivisions, at least one sign may be installed at the main work area
9. Sign must be at least 36"X36" and made of water-resistant material and firmly secured
10. Sign must be blue with white 3" lettering
11. Sign shall not be installed on existing VDOT sign posts and should not impede pedestrian mobility

LAND USE PERMIT
LUP-ESCCC
Erosion & Sediment Control Contractor Certification

March 10, 2016

In accordance with the Virginia Department of Transportation (VDOT) Road and Bridge Specification 107.14 (a), Special Provision 107D, all contractors performing regulated land disturbing activities within VDOT right-of-way must have an employee that has successfully completed the VDOT Erosion & Sediment Control Contractor Certification training. Regulated land disturbing activities are defined as those activities that disturb 2,500 square feet or greater in Tidewater, Virginia or 10,000 square feet or greater in all other areas of the State. The Department will require evidence of this certification with any Land Use Permit application that involves utility and/or commercial right-of-way improvement.

NON-COMPLIANCE MAY RESULT IN PERMIT SUSPENSION &/OR A STOP WORK ORDER

Applicant/Project Name: _____

Contractor: _____

District: _____ County: _____ Route Number: _____

Please select one of the following:

[ ] In accordance with the VDOT Road & Bridge Specification 107.14 (a), Special Provision 107D, I, _____, as representative for the permit applicant, acknowledge that the permittee must have an individual that has successfully completed the VDOT Erosion & Sediment Control Contractor Certification training on site during all land disturbance activities. This individual will be responsible for insuring compliance with all applicable local, state and federal erosion and sediment control regulations during land disturbance activities and will provide evidence of said certification upon request from VDOT personnel.

[ ] Land disturbance within VDOT right-of-way on this project is less than 2,500 or 10,000 square feet, whichever is applicable, and is therefore exempt from the Erosion & Sediment Control Contractor Certification requirements outlined in § 107.16(a) of the current VDOT Road & Bridge Specifications.

_____

Signature *Date*

THIS DOCUMENT MUST ACCOMPANY THE VDOT LAND USE PERMIT APPLICATION

NOTE: Training for the VDOT Erosion & Sediment Control Contractor Certification can be obtained from any of the sources listed under "Upcoming Courses" at: ***http//www.virginiadot.org/business/pr-essce-main.asp***

Commonwealth of Virginia
Department of Transportation
PERMIT 01/2011

LUP-ESCCC
LAND USE
Special Provision

VDOT Erosion & Sediment Control Contractor Certification

In accordance with the Virginia Department of Transportation (VDOT) Road and Bridge Specification § 107.14 (a), Special Provision 107D, all contractors performing regulated land disturbing activities within VDOT right-of-way must have an employee that has successfully completed the VDOT Erosion & Sediment Control Contractor Certification training. Regulated land disturbing activities are defined as those activities that disturb 2,500 square feet or greater in Tidewater, Virginia (as defined in § 10.1-2101 of the Code of Virginia) or 10,000 square feet or greater in all other areas of the State. The Department will require evidence of this certification with any Land Use Permit application that involves utility and/or commercial right of way improvement.

NON-COMPLIANCE MAY RESULT IN PERMIT SUSPENSION &/OR A STOP WORK ORDER

Applicant/Project Name:_____

Contractor:_____

Route Number:_____ **County:**_____

I, _____, as representative for the permit applicant, acknowledge that the permittee must have an individual that has successfully completed the VDOT Erosion & Sediment Control Contractor Certification training on site during all land disturbance activities. This individual will be responsible for insuring compliance with all applicable local, state and federal erosion and sediment control regulations during land disturbance activities and will provide evidence of said certification upon request from VDOT personnel.

_____ *Work on this project involves less than 2,500 square feet or 10,000 square feet of land disturbance activities, whichever is applicable, and therefore is exempt from this reguirement.*

_____

Signature *Date*

THIS DOCUMENT MUST ACCOMPANY THE VDOT LAND USE PERMIT APPLICATION

NOTE: Training for the VDOT Erosion & Sediment Control Contractor Certification can be obtained through the Virginia Transportation Construction Alliance at: htpp//www.vtca.org

LAND USE PERMIT
LUP-OC
Open-Cut Pavement Restoration Requirements
August 27, 2014

Permittee Agreement for Land Use Permit Issuance

I the undersigned hereby acknowledge that I am fully cognizant of all of the following requirements associated the restoration of pavement impacted by open cut pavement trenching operations on state maintained highways:

Applicant Name: _____

Applicant Signature: _____

Project Name: _____

District: _____ County: _____Route Number: _____

Any of the following provisions that may apply, shall apply:

1) The permittee shall be responsible for the restoration of pavement on state maintained highways in accordance with all applicable sections of the VDOT Road and Bridge Specifications, VDOT Road and Bridge Standards and this document.

2) Whenever existing pavement is permitted to be cut, not over one-half of the roadway width shall be disturbed at one time and the first open cut trench section shall be satisfactorily restored to allow for the passage of traffic prior to the second half of the roadway surface can be disturbed.

3) All trench backfill material shall be Select Material Type I having a minimum CBR of 30 and free from any wood, decaying material, asphalt, concrete, ice, frost, large clods, stone or debris.

4) Trench backfill material shall be compacted to a minimum of 95% of the theoretical maximum density at optimum moisture content, as determine by VDOT testing procedures (VTM1), using mechanical tamping throughout the depth of the trench in 6-inch lifts to ensure that the adequate support is provided for the aggregate sub-base layer is adequately supported.

5) For roadways with a bituminous concrete asphalt pavement section the compacted trench backfill shall be capped with 10 inches (10”) of Type I, Size 21-A or 21-B aggregate compacted to 100% of the theoretical maximum density at optimum moisture content covering the entire trench width and a minimum six inch (6”) bench on each side of the excavated trench or as determined by the district administrator’s designee.

6) A bituminous concrete asphalt base course (BM-25) having a minimum thickness of six inches (6”), or matching the existing base course thickness, shall be placed over the benched aggregate sub-base to the bottom elevation of the existing asphalt concrete surface course.

7) All sides of the excavated trench shall be saw-cut trimmed to neat straight lines and a tack coat of RC-250 liquid asphalt applied at a rate of 0.1 gallon per square yard (or as determined by the district administrator’s designee) prior to placing the bituminous concrete asphalt base course (BM-25.0) and/or replacement of the bituminous concrete asphalt surface course (SM-9.5A or SM-9.5D).

8) The existing pavement surface course adjacent to the excavated trench shall be milled and repaved with bituminous concrete asphalt (SM-9.5A or SM-9.5D) having of a minimum thickness of 1-1/2 inches (1.5”). This operation shall cover the entire trench width and extend 12 inches (12”) beyond the edge of the trench on longitudinal open cuts and 25 feet (25’) beyond the trench centerline on perpendicular open cuts, or as determined by the district administrator’s designee.

9) Open cuts in surface treated roadway sections with an aggregate base course shall be replaced with the same layer(s) as roadway sections with a bituminous concrete asphalt pavement structure except the sub-base layer (Type I, Size 21-A or 21-B) may be reduced to six inches (6”) and the bituminous concrete asphalt base layer (BM-25.0) may be reduced to four inches (4”) while maintaining the required six inch (6”) bench on both sides of the excavated trench. The surface course restoration material and thickness shall match the existing surface.

10) Replacement of all bituminous concrete asphalt and surface treated courses shall be rolled with equipment having a manufacturer’s rating of ten (10) tons until the aggregate is keyed into the bitumen. Where rolling is not possible, a mechanical tamper shall be utilized.

11) Full depth aggregate stone may be placed in the trench daily up to maximum length of 500 feet, at which time either temporary or permanent pavement restoration procedures must be implemented.

12) Should the application of the bituminous concrete asphalt surface course be delayed due to adverse weather conditions, the contractor shall provide and maintain a temporary pavement section that is acceptable to the district administrator’s designee until such time as the appropriate permanent pavement restoration can be achieved.

13) The permittee shall be responsible for any settlement in the backfill or pavement for a period of two (2) years after the completion date of permit and for the continuing maintenance of the facilities placed within the highway right-of-way.

14) A one-year restoration warranty period may be considered, provided the permittee adheres to the following criteria:

- The permittee retains the services of a professional engineer (or certified technician under the direction of the professional engineer) to observe the placement of all fill embankments, pavement, and storm sewer and utility trench backfill.
- The professional engineer (or certified technician under the direction of the professional engineer) performs any required inspection and testing in accordance with all applicable sections of VDOT's Road and Bridge Specifications.
- The professional engineer submits all testing reports for review and approval, and provides written certification that all restoration procedures have been completed in accordance with all applicable sections of VDOT's Road and Bridge Specifications prior to completion of the work authorized by the permit.

15) The district administrator’s designee may request and review the backfill compaction test results and/or authorize an inspector to monitor the trench backfill and compaction operations.

16) The use of steel plates to provide a temporary riding surface will not be allowed between November 1 and April 1. The use of steel plates between April 2 and October 31 shall be in accordance with VDOT standards and specifications.

17) Traffic shall be maintained at all times in accordance with the Virginia Work Area Protection Manual and a VDOT approved Maintenance of Traffic (MOT) plan.

18) The permittee shall notify the district administrator's designee a minimum of 72 hours prior to initiating any pavement open cutting operations.

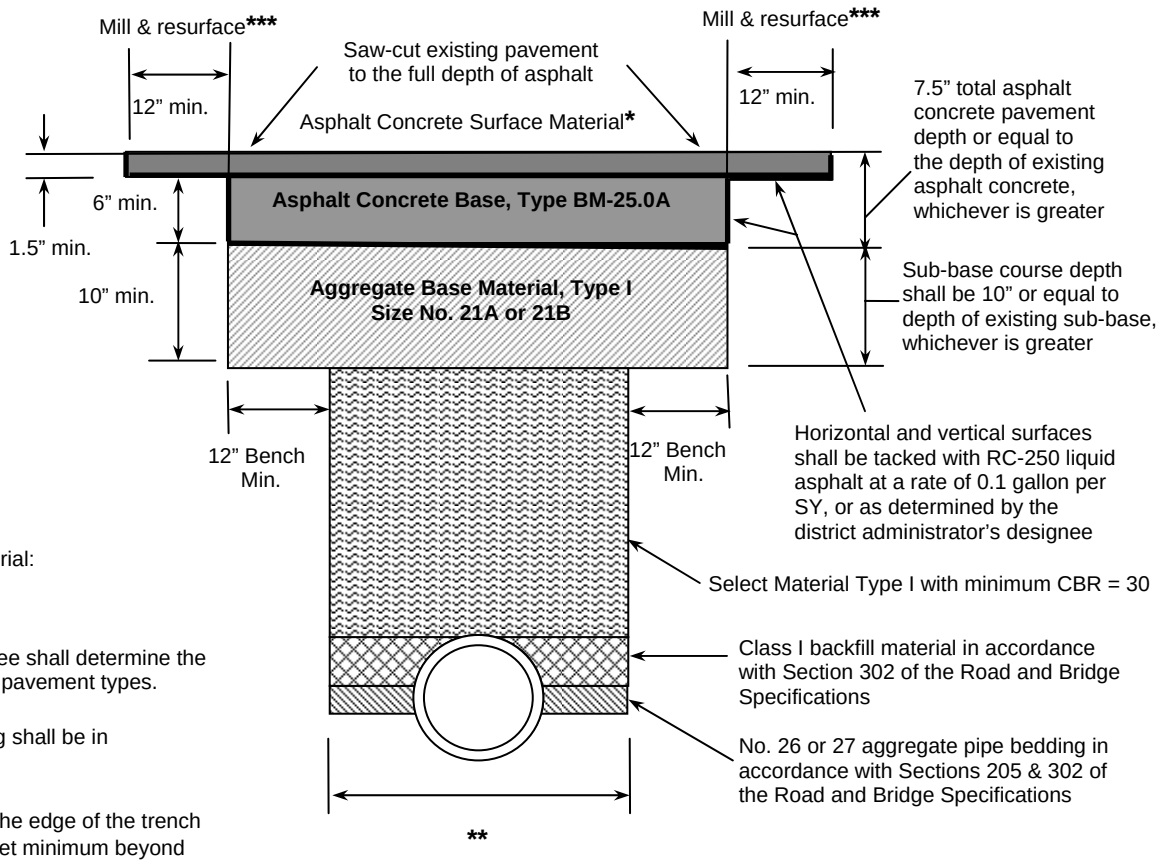
19) The trench to be backfilled shall be made as dry as practicable at the time of backfilling by pumping, bailing, draining, or other approved dewatering method.

20) All asphalt pavement restoration activities shall be in accordance with the Asphalt Pavement Restoration Detail for Open Cut Utility Installations contained herein.

Permittee Notice

The preceding provisions are intentionally condensed in format and should not be loosely interpreted by the permittee without consultation with the central office permit manager and affirmation from the **Land Use Permit Regulations**.

Asphalt Pavement Restoration Detail for Open Cut Utility Installations



NOTES:

***** Asphalt Concrete Surface Material:
SM-9.5A for ADT < 10,000
SM-9.5D for ADT > 10,000

The district administrator's designee shall determine the restoration requirements for other pavement types.

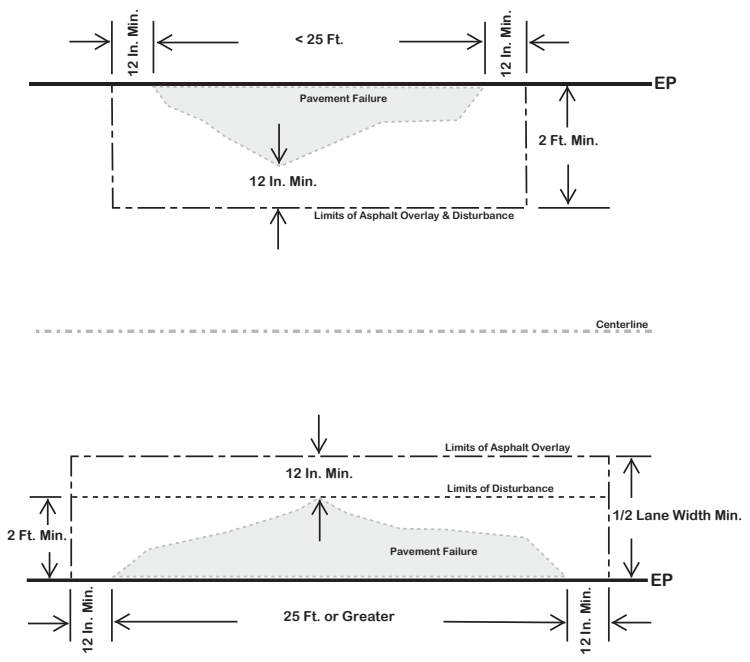
****** Trench width and pipe bedding shall be in accordance with VDOT Std. PB-1

******* 12 inches minimum beyond the edge of the trench on longitudinal open cuts, or 25 feet minimum beyond the trench centerline on perpendicular open cuts, or as determined by the district administrator's designee.

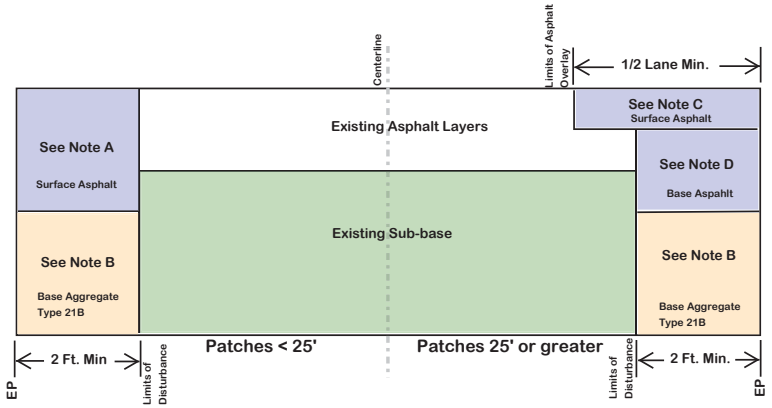
Date: August 27, 2014

Not to Scale

PLAN VIEW (Not to Scale)



MINIMUM TYPICAL PAVEMENT SECTION (Not to Scale)



BRISTOL DISTRICT PLANNING & INVESTMENT MANAGEMENT DIVISION

Longitudinal Pavement Patching for Pavement Failures Resulting From Utility Installations in Roadway Shoulders

Effective 09 September 2015

GENERAL NOTES:

1: Sub-base preparation shall extend a minimum of 12 inches beyond the limits of disturbance (both length and width) for all patches, but in no case shall the width be less than 2 feet.

2: A liquid asphalt tack coat shall be applied to all saw-cut or milled edges of existing pavement prior to placing asphalt patches.

3: For asphalt patches less than 25 ft in length, the existing asphalt shall be saw-cut to provide a uniform pavement joint:
- a: The patch width shall be a minimum of 12 inches beyond the limits of disturbance, but in no case shall it be less than 2 feet.
- b: The patch length shall be a minimum of 12 inches beyond the limits of disturbance on each end.

4: For asphalt patches 25 ft in legnth or greater, the existing asphalt shall be saw-cut or milled to provide a uniform pavement joint:
- a: The patch width shall be a minimum of 12 inches beyond the limits of disturbance, but in no case shall it be less than one-half of the lane width.
- b: The patch length shall be a minimum of 12 inches beyond the limits of disturbance on each enad.

5: VDOT may modify the minimum typical pavement section given herein based on the type of roadway, the amount of pavement damage, and/or the existing pavement typical section.

6: Density requirements for sub-base material and asphalt concrete shall be in accordance with the current edition of the Virginia Department of Transportation Road & Bridge Specifications.

7: Any disturbed pavement markings shall be replaced immediately upon completion of the asphalt patching and shall be in accordance with the current editions of the Virginia Department of Transportation Road & Bridge Specifications and the Virginia Department of Transportation Road & Bridge Standards.

8: The amount of patching required shall be determined by VDOT personnel based upon a field inspection.

MINIMUM TYPICAL PAVEMENT SECTION NOTES:

Note A: Depth of asphalt patch shall a minimum of 1.5 times the depth of the existing asphalt layers, but in no case shall it be less than 3 inches. Asphalt shall be type SM12.5A or SM19.0A

Note B: The contractor shall excavate the disturbed area and re-compact with a minimum of 6 inches of Aggregate Type 21B

Note C: For patches 25 ft or greater in length, the contractor may elect to mill the existing surface asphalt to a depth no less than two inches and a width no less than one-half the lane width. However, should the contractor elect to to saw-cut and remove existing asphalt down to the sub-base, the sub-base must be prepared in accordance with Note B. Surface asphalt shall be Type SM12.5A or SM19.0A

Note D: For patches 25 ft or greater, the contractor shall place a minimum of 3 inches base mix asphalt Type BM25.0. The combined depth of the base asphalt and the surface asphalt shall be a minimum of 1.5 times the depth of the existing asphalt layers.

Proposed asphalt layers

Existing asphalt layers

Proposed sub-base layers

Existing sub-base layers

DESIGN SPEED	DESIGN ADT	FORESLOPES			BACKSLOPES		
		6:1 or Flatter	5:1 to 4:1	3:1	3:1	5:1 to 4:1	6:1 or Flatter
40 mph or less	Under 750[c]	7-10	7-10	[b]	7-10	7-10	7-10
	750-1500	10-12	12-14	[b]	12-14	12-14	12-14
	1500-6000	12-14	14-16	[b]	14-16	14-16	14-16
	Over 6000	14-16	16-18	[b]	16-18	16-18	16-18
45-50 mph	Under 750[c]	10-12	12-14	[b]	8-10	8-10	10-12
	750-1500	14-16	16-20	[b]	10-12	12-14	14-16
	1500-6000	16-18	20-26	[b]	12-14	14-16	16-18
	Over 6000	20-22	24-28	[b]	14-16	18-20	20-22
55 mph	Under 750[c]	12-14	14-18	[b]	8-10	10-12	10-12
	750-1500	16-18	20-24	[b]	10-12	14-16	16-18
	1500-6000	20-22	24-30	[b]	14-16	16-18	20-22
	Over 6000	22-24	26-32[a]	[b]	16-18	20-22	22-24
60 mph	Under 750[c]	16-18	20-24	[b]	10-12	12-14	14-16
	750-1500	20-24	26-32[a]	[b]	12-14	16-18	20-22
	1500-6000	26-30	32-40[a]	[b]	14-18	18-22	24-26
	Over 6000	30-32[a]	36-44[a]	[b]	20-22	24-26	26-28
65-70[d] mph	Under 750[c]	18-20	20-26	[b]	10-12	14-16	14-16
	750-1500	24-26	28-36[a]	[b]	12-16	18-20	20-22
	1500-6000	28-32[a]	34-42[a]	[b]	16-20	22-24	26-28
	Over 6000	30-34[a]	38-46[a]	[b]	22-24	26-30	28-30

Source: AASHTO Roadside Design Guide, Chapter 3.

TABLE A-2-1
CLEAR ZONE DISTANCES (IN FEET FROM EDGE OF DRIVING LANE)*

a. When a site specific investigation indicates a high probability of continuing crashes, or when such occurrences are indicated by crash history, the designer may provide clear zone distances greater than the clear zone shown in Table A-2-1. Clear zones may be limited to 30 feet for practicality and to provide a consistent roadway template if previous experience with similar projects or designs indicates satisfactory performance.

b. Because recovery is less likely on the unshielded, traversable 3:1 fill slopes, fixed objects should not be present in the vicinity of the toe of these slopes. Recovery of high speed vehicles that encroach beyond the edge of shoulder may be expected to occur beyond the toe of slope. Determination of the width of the recovery area at the toe of slope should take into consideration right of way availability, environmental concerns, economic factors, safety needs, and crash histories. Also, the distance between the edge of the travel lane and the beginning of the 3:1 slope should influence the recovery area provided at the toe of slope. While the application may be limited by several factors, the fill slope parameters which may enter into determining a maximum desirable recovery area are illustrated in FIGURE A-2-4. A 10 foot recovery area at the toe of slope should be provided for all traversable, non recoverable fill slopes.

c. For roadways with low volumes it may not be practical to apply even the minimum values found in Table A-2-1. Refer to Chapter 12 for additional considerations for low volume roadways and Chapter 10 for additional guidance for urban applications in AASHTO Roadside Design Guide.

d. When design speeds are greater than the values provided, the designer may provide clear zone distances greater than those shown in Table A-2-1.

* Rev. 1/12

LAND USE PERMIT
LUP-WZTCC
Work Zone Traffic Control Certification
August 27, 2014

VDOT Work Zone Traffic Control Certification

In accordance with the Virginia Department of Transportation (VDOT) Road and Bridge Specification, Special Provision 105.14, beginning July 1, 2009, all activities performed under the auspices of a VDOT Land Use Permit involving the installation, maintenance and removal of work zone traffic control devices must have at least one (1) person on-site who, at a minimum, is accredited by VDOT in Basic Work Zone Traffic Control. The person accredited by VDOT in Basic Work Zone Traffic Control may install, maintain and remove work zones that are in accordance with the Virginia Work Area Protection Manual and/or a work zone that has been preapproved by VDOT. A person accredited by VDOT in Intermediate Work Zone Traffic Control must be on-site to provide supervision during work zone adjustments or changes to traffic control due to field conditions. These persons must have their accreditation card with them while on the project site.

NON-COMPLIANCE MAY RESULT IN PERMIT SUSPENSION &/OR A STOP WORK ORDER

Applicant: _____

Project Name: _____

District: _____ **County:** _____ **Route Number:** _____

Please select one of the following:

[ ] In accordance with the Virginia Department of Transportation (VDOT) Road and Bridge Specification, Special Provision 105.14, I, _____, state that I will have at least one (1) person that is accredited by VDOT in Basic Work Zone Traffic Control who will be responsible for the placement, maintenance and removal of work zone traffic control devices within the project limits in compliance with the permit requirements and conditions, the approved plans, specifications, the Virginia Work Area Protection Manual and the Manual of Uniform Traffic Control Devices. A person accredited by VDOT in Intermediate Work Zone Traffic Control will be on-site to provide supervision during work zone adjustments or changes to traffic control due to field conditions. These persons will provide evidence of their accreditation upon request from VDOT personnel.

[ ] In accordance with the Virginia Department of Transportation (VDOT) Road and Bridge Specification, Special Provision 105.14, the requested activity does not involve the installation, maintenance and removal of work zone traffic control devices and therefore is exempt from the Basic Work Zone Traffic Control requirement.

_____ *Signature*

Date

THIS DOCUMENT MUST ACCOMPANY THE VDOT LAND USE PERMIT APPLICATION

VIRGINIA WORK ZONE TRAFFIC CONTROL TRAINING OPTIONS

The following three options are available to receive Work Zone Traffic Control (WZTC) training based on an individual's job duties and responsibilities as required by the FHWA Final Rule on Work Zone Safety and Mobility and the Virginia Department of Transportation:

OPTION 1 – Have someone trained to become a qualified instructor in your company who can then instruct others , utilizing training material provided by VDOT. The following qualifications must be met in order to teach the VDOT Basic, Intermediate, or Advanced WZTC training courses:

- **Basic** – Be flagger certified either by VDOT or by the American Traffic Safety Services Association (ATSSA); posses two years of practical experience in Highway Design, Construction, Maintenance, or Traffic Operations; posses two years of documented experience in conducting training courses; and successfully complete the VDOT WZTC Intermediate or Advanced course or complete the ATSSA Virginia Intermediate/Traffic Control Supervisor (TCS) course.

- **Intermediate** - Be flagger certified either by VDOT or by ATSSA; posses two years of practical experience in Highway Design, Construction, Maintenance, or Traffic Operations; posses two years of documented experience in conducting training courses; complete and posses the ATSSA Virginia Intermediate/TCS certification.

- **Advanced** - Be flagger certified either by VDOT or by ATSSA; posses two years of practical experience in Highway Design, Construction, Maintenance, or Traffic Operations; posses two years of documented experience in conducting training courses; complete and posses the ATSSA Virginia Advanced Traffic Control Design Specialist (TCDS) certification or ATSSA Virginia Intermediate TCS certification.

To become an approved instructor, an application must be completed listing the above qualifications and sent to the chairman of VDOT's WZST committee at the following location:
http://www.virginiadot.org/business/resources/wztc/wztc_inst_app_form.pdf

Once a person has become an approved instructor, training material can be obtained from VDOT using the order form obtained from the following location (requires an approved instructor identification number):
http://www.virginiadot.org/business/resources/wztc/WZTC_order_form.pdf

OPTION 2 – Obtain the services of an approved instructor from VDOT's Approved WZTC Instructor List to teach the course or courses you need for your employees.

The Approved WZTC Instructor's List can be obtained at the following location:
http://www.virginiadot.org/business/resources/wztc/Approved_WZTC_Instructors.pdf

A list of Approved Providers of training can be obtained at the following location:
http://www.virginiadot.org/business/resources/wztc/wztc_training_sponsors.pdf

OPTION 3 – Send personnel to classes conducted by approved sources such as ATSSA Virginia or the Virginia Local Technical Assistance Program (LTAP).

Courses by ATSSA Virginia can be found at the following location:
http://atssa.com/cs/course_information/courses_by_state?state=56

Courses by the Virginia LTAP can be found at the following location:
http://ltap.cts.virginia.edu/2%20Page%20Calendar%20June%20-%20Sept%2009.pdf

Basic WZTC courses by the Virginia Rural Water Association can be found at the following location:
http://www.vrwa.org/ (See Training Schedule)

Training by the Virginia Transportation Construction Alliance (VTCA) can be found at the following location: **http://vtca.org/**

Visit the following site for additional information regarding Virginia's Work Zone Traffic Control training program:
http://www.virginiadot.org/business/trafficeng-WZS.asp