

THE SPECIFICATIONS ARE NOT PROVIDED AS AN INDICATION OF WORK, BUT PROVIDE REQUIREMENTS AND STANDARDS OF WORK REQUIRED, OR COULD BECOME REQUIRED, DUE TO UNFORESEEN CONDITIONS. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH AUTHORITY HAVING JURISDICTIONS REQUIREMENTS. WHEN THESE SPECIFICATIONS ARE IN CONFLICT WITH THE REQUIREMENTS OF THE AUTHORITY HAVING JURISDICTION THE MORE STRINGENT SHALL BE REQUIRED AS DETERMINED BY THE ENGINEER AND AUTHORITY HAVING JURISDICTION.

**GENERAL CONSTRUCTION CONDITIONS**

- The term of Owner as used in these specifications and notes shall include the owner of the property, the company or party that hired the Contractor, the company or party that signed the contract for this work, and the agents of each. The Owner's representative shall be the individual or party assigned by the Owner to be the Owner's representative. Owners of adjacent properties shall include the property owner, lessee, legal occupier, and operator of any business on that property.
- All work and materials shall comply with all local, state, and federal regulations, codes, and OSHA standards and be constructed to meet or exceed those codes.
- The Contractor shall be responsible for all temporary permits, connection permits, fees, inspections and record keeping required by all municipal, utility, health, environmental, state, or federal agencies that may have jurisdiction. Furthermore, the Contractor shall be responsible to meet or exceed all requirements of the agencies or authorities having jurisdiction over his work. All conflicts in requirements of different agencies, authorities, and/or the design shall be brought to the attention of the owner's representative before proceeding.
- The Contractor shall be responsible to locate and maintain the property and project limits throughout the project. All conflicts between the design and the project/property limits shall be brought to the attention of the owner's representative before proceeding. Unless described in the contract documents or shown on the drawings the Owner has not secured any right of ways, easements or agreements with other property owners or property users. Therefore, it shall be the Contractor's responsibility to secure and maintain any temporary right of ways, easements, permits, or agreements he may need to perform his work. All such agreements shall hold the Owner, Engineer of Record, and his agents harmless and the responsibility of the Contractor to bear all costs. The Contractor shall copy the Owner on releases of all agreements prior to final payment by the Owner to the Contractor. The Contractor shall not interfere with operations of adjacent businesses and work shall be completed off-hours, as necessary. Coordinate with Municipality for any restrictions on allowable working hours.
- Unless otherwise noted on the drawings or in the contract documents the Contractor shall be responsible for all construction survey, layout, and record drawings for this contract. Any conflicts in survey/layout and the design or agencies requirements shall be brought to the attention of the owner's representative prior to proceeding with the work. The Contractor shall protect and safeguard all existing survey corners, monuments, control and tie-downs. The Contractor shall pay all costs to repair or replace damaged survey monuments, control and tie-downs. Record drawings shall be provided in accordance with any requirements of the authorities having jurisdiction including the required information to be provided, and signatures, seals, and certifications that may be required.
- No changes to the design or materials specified may be made without written authorization by the Engineer of Record or in the case of utilities or road work to be dedicated, the authority receiving dedication. At the end of the contract, the Contractor shall provide to the Owner a record set of drawings reflecting all changes made by the Contractor during construction.
- Erosion control is necessary whenever sediment, dust, erosion, or contaminated run-off may occur. The Contractor shall be responsible to place and maintain whatever erosion control or run-off protection is required to protect his work, the work of others, the project, adjacent properties and the health and well being of the workers, public and surrounding natural resources. This shall include additional measures beyond the project documents and plans, as necessary to protect the contractor, state and local requirements regarding erosion and run-off control.
- The Contractor shall be familiar with the project site and all adjacent pedestrian, traffic, and business uses. The contractor shall take whatever precautions and steps necessary to maintain safety and operation of these uses in accordance with federal, state, county, and local requirements. The Contractor shall be responsible for costs and damages caused from his failure to take proper and adequate precautions. The Contractor shall be familiar with all federal, state, and local requirements regarding these uses.
- The Contractor shall be responsible for costs and delays associated with weather, groundwater, and other circumstances that could be expected or are common with this type of work. The Contractor shall review all pertinent documents including soils reports, soils borings, and other soil or site data.
- The Contractor shall be responsible to save and protect his work throughout the contract. Any damages requiring repairs or replacement shall be corrected by the Contractor at his expense.
- When work is done within a road, utility or private easement, right of way, or other property agreement, the Contractor shall do all work within that area per the authority having jurisdiction.
- When separate site and building contracts are performed, the site Contractor shall be responsible to bring utilities to within 5 feet of building foot unless noted otherwise on drawings or contract documents.
- All utilities are shown per surface surveys and/or record maps and may vary from actual in-field locations. The Contractor is responsible for all utility stakes and locating utilities prior to commencing work. Any damage to utilities due to improper stakes, use of stakes, or the failure to verify differences between drawings and actual field conditions will be the responsibility of the Contractor to repair, replace, or pay damages at no expense to the contract.
- Contractor shall comply to the fullest extent with the latest standards of OSHA directives or any other agency having jurisdiction for excavation and trenching procedures. The Contractor shall use support systems, sloping, benching, and other means of protection. This includes, but is not limited to, access and egress from all excavation and trenching. Contractor is responsible to comply with performance criteria for OSHA Trench excavation requiring shoring, shoring or other shoring devices shall be designed by a Professional Engineer and meet all OSHA requirements. All excavations shall maintain safe slopes with reference to all federal, state and local requirements regarding excavation and run-off control.
- The contractor shall select the means and methods for providing support and operations in accordance with safety requirements, plans, and project specifications. The contractor must evaluate soil conditions during excavations since variations in the soil can occur across the site. The excavations should be monitored continuously for signs of deterioration such as seepage of water or sloughing of soil into the excavation. The contractor is ultimately responsible for excavation safety.
- The Contractor shall notify the Owner immediately and stop all work in areas where hazardous materials are discovered. When required, the Contractor shall notify the appropriate environmental and health agencies.
- The Contractor shall coordinate with the Authority having jurisdiction for all directed inspections and be responsible to hire any required third party inspectors.
- For any testing, inspections, and/or certifications requiring a Professional Engineer, the Contractor shall be responsible to hire a third party engineer. A copy of all tests shall be provided to the Engineer of Record.
- Any discrepancies between plans, details, and specifications shall be immediately brought to the attention of the Engineer of Record.
- Stabilizing fabric (woven geotextile), if required, shall meet the following requirements "modulus (load at 10% elongation) =1130 per ASTM D1682-64," "grab tensile strength 200lb per ASTM D 1682-64," "tullen burst strength = 400psi per ASTM D 3786-87," "tropicoid tear strength when applicable = 113lb per ASTM D1117-80," "coefficient of permeability K<sub>o</sub>/SEC = .015 per ASTM D 4491-85," "water flow rate (GM/5" = 60 per ASTM D 4491-85". When stabilization fabric is used it shall be pulled tight and all wrinkles removed. Overlaps shall be in accordance with manufacturer's recommendations. Refer to Geotechnical Engineers report, if available, for additional information.
- Filter fabric (non-woven geotextile), if required, shall meet the following requirements "grab tensile elongation =50% per ASTM D1682-64," "Grab tensile strength 70lb per ASTM D 1682-64," "tullen burst strength = 200psi per ASTM D 3786-87," "tropicoid tear strength when applicable = 33lb per ASTM D1117-80," "coefficient of permeability K<sub>o</sub>/SEC = .2 per ASTM D 4491-85," "water flow rate (GM/5" = 180 per ASTM D 4491-85". When filter fabric is used it shall be pulled tight and all wrinkles removed. Overlaps shall be in accordance with manufacturer's recommendations.

**DEMOLITION**

- The Contractor shall inspect all structures, facilities and areas slated for demolition to gain a full understanding of the work required. The Contractor shall take whatever measures necessary to protect the safety of the public, his employees and agents during the inspections and subsequent work. The Owner, Client, and Engineer of Record are not responsible for the condition of the buildings, facilities, or other areas slated for demolition.
- All materials not slated for reuse must be disposed of off site in a legal manner. The Contractor may salvage any equipment or materials not designated by the Owner to be saved. All salvaged material or items shall be removed from the site immediately upon removal. No such materials shall be stored on the site. Absolutely no sales of salvaged materials will be allowed on the project site. All salvaged material must be removed, transported, and disposed of in a legal manner.
- Upon approval by Owner, the Contractor shall be responsible to remove and store safely all materials slated to be saved or reused. The Contractor shall document existing conditions using photographs prior to start of work and notify Owner of any existing damage prior to construction start. The Contractor shall be responsible for all costs to repair or replace existing features to remain (including but not limited to fencing, lighting, curbing, pavement, utilities, storm structures, landscaping, etc.) that are damaged due to his work or failure to protect throughout the duration of his contract.
- No burning, explosives, or other potentially dangerous methods of demolition will be allowed unless written permission is granted by the Owner and all appropriate permits are granted.
- The Contractor will provide whatever safety equipment and devices are necessary to protect the adjacent properties, structures and other areas slated to remain. This will also include erosion control, dust control, and settlement.
- All areas shall be brought back to their original grade or that of the surrounding area, which ever is closer to the final grades of the project for that area. All areas requiring fill shall be compacted to the requirements of the area but in no case less than 90% of modified proctor (ASTM D 1557).
- All demolition within the proposed building footprint shall be coordinated with the building drawings.
- Light pole removal shall include complete removal, backfill of concrete bases, and capping of any conduits/wiring in to be abandoned in place.

**CLEAR AND GRUB**

- Clearing and grubbing shall not commence until any required erosion control and BMP's are in place.
- The Contractor shall review plans and identify and safely mark all plants and trees to be saved. The Contractor shall protect all plants and trees to be saved throughout the contract. This shall include prohibiting any work within the drip line of the tree, except under the supervision of a licensed Landscape Architect.
- All areas to be cleared and grubbed shall be surveyed in the field to establish the appropriate limits of work.
- The Contractor shall take whatever measures necessary to locate and protect existing utilities, structures, wetlands, and other facilities to remain.
- All trees, shrubs, stumps, roots, and other debris shall be removed from site and disposed of in a legal manner.
- No burning will be allowed on site.

**PAVEMENT AND STRUCTURAL SUBBASE**

- The type of subbase required for each use shall be called out on the drawings. If no reference is made on the drawings or details to the type of subbase required the following shall be used:
  - The source of the material shall be approved for use by the State Department of Transportation.
  - The material shall be a crushed stone conforming to AASHTO M 147-65 (1980 or latest revision), grade A.
  - Gravel or other materials can only be substituted for crushed stone when approved in writing by the Owner and Engineer of Record.
  - Material applied for use as subbase shall have 100% passing the 2 inch sieve, 30% to 65% passing the 3/8 inch sieve, 25% to 55% passing the No. 4 sieve, 15% to 40% passing the No. 40 sieve and 2% to 10% passing the No. 200 sieve.
- Subbase shall be placed in lifts not to exceed 8 inches and compacted to the requirements stated in the soils report. If not stated, the compaction requirement shall be 98% of maximum dry density per ASTM D1557 (modified proctor).
- The Contractor will be responsible for all costs in preparing the subgrade to receive subbase. This shall include fine grading and compacting as necessary to meet the requirements stated here and under Earthwork.
- The amount of testing required to verify the compaction shall be the same as stated under Earthwork.
- Refer to General Construction Conditions for filter fabric requirements, if applicable.

**EARTHWORK**

- Earthwork shall not commence until any required erosion control and BMP's are in place.
- Refer to Project Geotechnical Report for full project recommendations. Where Geotechnical Report is not clear or does not give requirements, the following may be used.
- Prior to starting any cuts or fills the Contractor shall strip and stockpile all topsoil. Stripping of topsoil can only commence after the clear and grub operations are complete and all erosion control devices are in place in that area. Topsoil shall be stockpiled in areas designated on the plans or approved by the owner's representative. The Contractor shall review the soils reports, boring logs, and, when necessary, his own field verification so as to be familiar with the depth of topsoil. The Contractor shall take all reasonable precautions to prevent over and under field.
- Unless otherwise noted, the grades shown on the plans are finished grades. Therefore, pavement, floors, subbase, and other improvements must be subtracted to calculate subgrade elevations.
- The Contractor shall maintain a surveying grid of not less than 100' x 100' or other means acceptable to the Owner's representative that will indicate location and amount of cut or fills remaining. All subgrade this grid shall be 50' x 50' with location and final grade marked clearly or survey shall be completed demonstrating that the subgrade is +/- .01 feet of required subgrade.
- Unless otherwise noted on the drawings or in the contract documents, the Contractor shall retain and pay all cost for soil compaction testing to be performed by an independent testing laboratory. For each lift placed, compaction testing shall be done every 2000 sq. ft. In trenches, compaction testing shall be done every other lift with all lifts tested every 50' lift.
- Structural fill placed 2 feet or deeper below the finished subgrade elevation or finished grade of graded areas shall have a maximum particle size of 6 inches. Structural fill placed within the upper 2 feet of proposed subgrade or finished grade of graded areas shall have a maximum particle size of 3 inches.
- Compaction requirements shall be those outlined in the soils report, if provided. If the soils report is not clear or does not give requirements, the following will be used:
  - Under and to 20 feet outside the building envelope the soils shall be compacted to a minimum of 98% maximum dry density per ASTM D 1557 (modified proctor).
  - Under proposed or future pavement areas, including 10 feet outside such areas, the soil shall be compacted to a minimum of 93% maximum dry density per ASTM D 1557 (modified proctor).
  - All landscape and lawn areas shall be compacted to 90% maximum dry density per ASTM D 1557 (modified proctor).
  - The testing lab shall test soils in accordance with ASTM D 2922 (nuclear method) with protocols for each soil type.
  - Constructed berms shall be compacted to 98% maximum dry density per ASTM D1557.
- All material to be used for fill shall be free of organics, frozen material, contaminated material, debris, and any rocks larger than 4 inches. For fill placement within 1 foot of subgrade, no rock shall be greater than 2 inches in diameter. The Contractor shall bear all cost associated with drying, segregating, or required methods to treat soils to meet compaction and other requirements.
- All fill placed within berms that detain/retain water shall be a minimum of 20 percent by weight of material passing the No. 200 sieve, and a maximum particle size shall be no larger than the upstream and downstream slopes down to an elevation equal to the bottom of the planting soil media (excluding this planting soil media area). Any on-site cut areas could be utilized as fill material for the berm, as long as all construction requirements and specifications were met (placement, compaction, gradation, permeability, etc.) Inclusion of vegetation, organic material, or frozen soil in the embankment, as well as placing of embankment material on a frozen surface is prohibited. Bedding material for all pipes and conduits within berm area shall be placed in layers not thicker than 4 inches before compaction with particle size limited to 3 inches in the greatest dimension, and compacted to required density of fill material for berm. Anti-seep collars are required for all pipes/ductiles within the berm area.
- The Contractor shall take all necessary precautions to protect earthwork operations from weather and ground water including keeping positive drainage, dewatering devices, and sealing unneeded areas with steel drums, bentonite, or other approved methods.
- If imported material is required, the source and a random composite sample shall be reviewed by the testing laboratory prior to being brought to site. The testing laboratory shall test for percent passing the 200 sieve that does not exceed the existing on site material or in no case greater than 10%. They shall also verify consistency with existing on site materials and all other requirements. Waivers to these requirements can only be given jointly by Engineer of Record and the Geotechnical Engineer that prepared the soils report.
- The testing lab may restrict some on site materials from being used as fill in building or pavement areas when it is their opinion that the material will not meet requirements stated here. In such conditions do exist and other materials are not available on site, the owner's representative must authorize in writing the use of import material unless there will be no additional cost to the contract.
- Fills shall be placed in lifts not to exceed 8 inches in mass fills and 6 inches in trench or restricted areas. All subgrades shall be thoroughly profiled using a smooth drum roller with a minimum static drum weight of 20 tons, operated in static mode. A minimum of 2 overlapping passes in each direction, followed by 2 overlapping passes in a direction perpendicular to the first 2 passes. Areas which are unsuitable and which cannot be stabilized with repeated compactive effort shall be overexcavated to a suitable subgrade. The undercut should be of adequate depth such that, after backfilling is complete the resulting subgrade surface is firm and stable under profiling. Onsite structural fill may be used to obtain proposed subgrade elevation to replace the removed unsuitable material. If imported structural fill, base, or subbase course materials are used to backfill the undercuts within the building or pavement areas, a woven geotextile shall be placed at the bottom of the undercut area prior to placement of the fill.
- Contractor is to remove any debris or surficial organic soils (ie. topsoil, organic subsoil, reworked soil) which may be encountered within the proposed building footprint, floor slabs, and pavement areas prior to the placement of any fill.
- All fill subgrade upon proposed pavement, building, or other structure shall be pre profiled as described above for the identifying of soft areas. Areas found to be unacceptable shall be scarified, drilled, and re-compactation. Refill by proctor roll as necessary.
- All fill material is to be in place and compacted prior to installation of proposed utilities and only after approval of the Engineer of Record. No more trench shall be open in one day than can be properly backfilled in that same day to minimize weather and safety concerns. When backfilling around pipes, provide uniform support of invert and proper compaction under, along and over the pipe. Care shall be given while backfilling around pipes to prevent damage to the pipes including: plough backfilling/bedding by hand, using hand operated plate tamp or jumping jacks, and all other restrictive techniques until fills are a minimum of 2 feet or manufacturers recommended depth, which ever is greater, above the top of the pipe. Compaction requirements are not relaxed in these areas and will remain as stated on the drawings or above. If clean stone is used as a bedding or encasement, filter fabric shall be placed between the natural soils and backfill and the stone to prevent migration of fines. Anti-seep collars shall be provided in accordance with the details. The Contractor is cautioned against the migration of fines from soils adjacent to walls. Where such conditions exist the Contractor shall install or wrap those areas with filter fabric: to prevent fines from migrating into voids.
- If rock is encountered that was not indicated on the plans or soils report, the area for removal should be measured and reviewed with the owner's representative prior to rock removal. Rock will be defined as the natural earth materials that can not be removed with conventional earth working equipment.
- Where rock is adjacent to a structure or utility, the rock shall be removed to a minimum of 6 inches below and 1 times the diameter, but not less than 1 foot or greater than 3 feet on any side.
- No explosives will be allowed until all permits are granted and the Owner has signed off. Pre and post blast reports must be kept and recorded. All structures within the area of the blast must receive a pre-blast survey. All blasting must be performed by a licensed blaster.
- Unless otherwise noted on the drawings, the Contractor shall remove all excess topsoil, cut material, or waste material from the site and dispose of in a legal manner.

**TRAFFIC SIGNAGE AND PAVEMENT MARKINGS**

- Pavement markings shall be the type, color, size, and locations shown on the plans. Contractor shall provide two (2) coats of paint for all pavement markings. If the information on the plans and details is not complete and the authority having jurisdiction does not have all requirements regarding this, use the following:
  - Paint shall be supplied in accordance with AASHTO: M 248 latest addition. Colors shall be as follows:
    - YELLOW - parking stalls, parking islands, and fire lanes
    - WHITE - stop bars and lettering pedestrian crossings, handicap parking symbol and characters, and traffic control lettering and characters
    - BLUE - backgrounds of handicap parking symbol
  - The pavement shall be clean and free of dirt, dust, moisture, oils, and other foreign materials. Any pavement markings shall be removed unless permits are comparable and overly identical. The surface of the pavement prior to application shall be 45 degrees F and rising unless manufacturer's recommendations are greater. All painting shall be applied in appropriate weather conditions (eg. temperature, wind, precipitation), and in accordance with manufacturer's recommendations.
  - The signage and pavement markings shall be the type and of the general location shown on the drawings. The signage and pavement markings shall be provided and installed in accordance with the Local Highway, County Highway, and State Department of Transportation. If local, county or state codes do not exist, use MUTCD.
  - Posts, brackets, and frames shall be steel per ASTM A-36, A-242, A-441, A-572, A598, Grade 50, and hot dip galvanized in accordance with ASTM A123. All cutting, drilling, or other pipe modifications shall be painted with galvanizing paint. All bolts, nuts, and washers shall be stainless steel.
  - Post holes in pavement shall be a minimum of four feet deep and 12 inches in diameter upon poor soils or frost conditions require greater depth. Sign posts shall be kept plumb, 6 inches off bottom and centered as 4000 psi concrete is placed around the post. The overall sign and post system should be able to withstand 33 pounds per square foot.
  - Contractor can place signs on posts after concrete has cured for seven days or 3/4 strength is achieved.
  - All handpainted striping and signage, including signs, crosswalk, accessible path, and curb ramps, shall meet Americans with Disabilities Act (ADA) requirements. Fine line striping and signage shall meet the requirements of the local building inspector and fire department.

**SITE CONCRETE - INCLUDING CURB, SIDEWALKS AND GUTTERS**

- The dimensions shall be those shown on the drawings. The Concrete mix shall be 4000 psi at 28 days made with type I or type II cement per ASTM C 150 and aggregates meeting State Department of Transportation requirements, unless otherwise noted. Slump for slip forming shall be 1 inch +/- 1/2 inch and for formed concrete the slump shall be 3 inch +/- 1 inch. An air entraining mixture shall meet the requirements of ASTM C 260 4% +/- 1 1/2% for slip form work and 6% +/- 1 1/2% for formed and placed concrete. Water reducing agent shall conform to ASTM C 494, type A. Curing compounds shall conform with ASTM C309, type I, class A moisture loss of not more than .055 g/sq ft when applied at 200 sq ft per gallon.
- Sidewalks, gutters and curbs shall be placed on compacted subbase consistent with the pavement subbase as shown on the drawings. When subbase details are missing and no agency has jurisdiction use the following: sidewalks and gutters shall be placed on a minimum of 6 inches of compacted subbase and curbs shall be placed on a minimum of 4 inches of compacted subbase.
- All forming, placement, materials and curing shall conform to the latest addition of ACI 308 "Building code requirements for reinforced concrete" and all similar State Department of Transportation requirements.
- Reinforcing shall be in accordance with that specified on the drawings and the Concrete Reinforcing Steel Institute (CRS) "Manual of standard practices". Reinforcing steel shall be ASTM A 615, grade 60, deformed. Welded wire fabric shall be ASTM A 185, welded wire steel fabric.
- Sidewalks, and gutters shall have a broom finish perpendicular to flow with a picture frame edge joint all the way around. Curbs shall have a smooth finish or light rub finish but consistent throughout the project.
- Expansion joints shall be placed as per details and at adjoining structures such as walls, manholes, and vaults. Expansion joint material shall be preformed, 1/2 inch material with 23/64 inch cap in accordance with ASTM D1751. After concrete has set, the cap should be removed and void filled with waterproof joint filler. Curb and gutter shall be cut or tord jointed to 1/3 the depth every 10 feet. Sidewalks should have torted or cut joints to 1/3 the depth in squares or as close to square as possible not exceeding 6ft x6ft.
- The General Contractor shall provide copies of all material tickets and testing reports upon request by the Owner or Engineer.

**WATER SYSTEMS AND SERVICES**

- The water systems and services shall be applied and placed in accordance with all local, state and federal requirements. When the requirements of the authority having jurisdiction differ from those shown on this plan, Contractor shall adhere to the more stringent standards.
- Refer to Pipe Bedding Detail for pipe bedding requirements.
- All water piping, fittings and appurtenances shall be placed a minimum of 6 inches below frostline or with a minimum 5 feet cover, whichever is greater. Pipe sizes 4 inches and up shall be ductile iron or polyvinyl chloride as indicated on the drawings (if not shown use ductile iron). Pipe sizes below 4 inches shall be copper or polyethylene as indicated on the drawings (if not shown use copper).
- The minimum separation between water services and sewer lines shall be 18 inches measured vertically from outside to outside of pipe at the crossing. A standard length of water pipe shall be centered at the crossing to maximize the distance between the crossing and the nearest water service pipe joint. The sanitary line shall be ductile iron pipe with mechanical joints at least 10 feet on both sides of crossing, the waterline shall have mechanical joints with appropriate thrust blocking as required to provide a minimum of 18" clearance meeting requirements of AISC A20.10 or AISC 2.11 (AWWA C-151) (Class 50). Contractor shall adjust elevation of water as needed to maintain adequate separation and burial depth. When the water service runs under the sewer line, a ground or crushed stone bedding meeting the requirements of subbase shall be placed and compacted around the water pipe up half the diameter of the sewer pipe to provide adequate support to the sewer line. Ductile iron pipe shall be provided in accordance with AWWA C151, (6 inch diameter and greater shall be Class 50 and 6 inches and smaller shall be Class 5). Ductile iron pipe shall be lined with a cement mortar and seal coated in accordance with AWWA C104. Gaskets shall be provided in accordance with AWWA C111. Fittings shall be ductile iron in accordance with AWWA C153 compact fittings with a pressure rating of 350 psi. Standard ductile iron or cast iron fittings shall be supplied in accordance with AWWA C110 with a pressure rating of 250 psi. The lining and gaskets for the fittings shall meet the same requirements as the pipes if recommended in the soils report, ductile iron pipes shall be encased in polyethylene in accordance with AWWA C326 and for cast all fitting bolts whenever seals are primarily dry or not pH balanced.
- All pipes shall be installed per manufacturer's recommendations. Ten gauge copper tracer wire shall be placed with all plastic pipe. Pipe material shall be as follows:
  - PVC (Polyvinyl Chloride) pipe shall be furnished in accordance with AWWA C300 for pipe 4 inches or greater and ASTM D 1785, schedule 40, gaskets per ASTM F 477- elastomeric seal, solvent cement per ASTM D 2564 for pipe 4 inches or greater.
  - PE (Polyethylene) pipe shall be furnished in accordance with AWWA C301 and ASTM D2737. Ten gauge copper tracer wire will be placed with all plastic pipes.
  - DIP (Ductile iron pipe) shall be provided and installed in accordance with AWWA C151 and C900 (6 inches and greater shall be Class 50, smaller than 6 inches shall be Class 5). Ductile iron pipe shall be lined with a cement mortar and seal coated in accordance with AWWA C104. Gaskets shall be provided in accordance with AWWA C111. Fittings shall be ductile iron in accordance with AWWA C153 compact fittings with a pressure rating of 350 psi. Standard ductile iron or cast iron fittings shall be supplied in accordance with AWWA C110 with a pressure rating of 250 psi. The lining and gaskets for the fittings shall meet the same requirements as the pipes if recommended in the soils report, ductile iron pipes shall be encased in polyethylene in accordance with AWWA C326 and for cast all fitting bolts whenever seals are primarily dry or not pH balanced.
  - Copper water pipe shall be supplied in accordance with ASTM B 88- type K, seamless with fittings per AWWA C800.
- Gate Valves shall be nonaring steel, double disc, bronze disc Resilient seated, cast iron or ductile iron body and banded in accordance with AWWA C509 and pressure rated for 250 psi. Ten gauge copper tracer wire shall be placed with all pipes.
- Wave box shall be cast iron with a base compatible with wave, 5 inches in diameter, screw type extension at top and a cover that reads "WATER".
- All tap and/or connection material and work shall be done in accordance with and coordinated with the local Water Authority and Health Department. When the Authority so requires, the taps and/or connections shall be done by the Authority themselves and paid for by the Contractor.
- Thrust restraints shall be used at all fittings, plugs and appurtenances that cause a change in direction, flow or are subject to thrust or hammering by water flow. Thrust restraints will include concrete thrust blocks (3000 psi), anchoring joints and tie rods. Concrete thrust blocks shall be used unless pipes, access or maintenance restricts their use.
- Curb stops shall have a bronze body, ground key plug or ball with wide base. The curb stop shall be compatible with adjoining pipes. The service box shall have a telescoping top section with a length that allows for the adjustment centered when buried to the appropriate depth. The service box shall be of a size and type that is compatible with the curb stop. The cover shall have the lettering "WATER".
- All meters, vaults and backflow shall meet the requirements of the health department and other agencies having jurisdiction.
- Fire hydrants shall conform to the requirements of the local water authority, fire department and AWWA C502. Drain stone shall have 100% passing the 1 1/2 inch sieve, 90 - 100% passing the 1 inch sieve, 35 - 65% passing the 3/2 inch sieve and 0 - 15% passing the 3/8 inch sieve. All hydrants will include a gate valve and will be located at the hydrant trench to shut off the hydrant.
- All bedding and encasement shall be compacted with care to achieve proper compaction without damaging the pipes, fittings, or appurtenances.
- If clean stone is required by the local authority having jurisdiction and is approved by Owner and/or Engineer of Record, then the bedding material shall be wrapped in filter fabric and anti-seep collars shall be provided to prevent the migration of fines.
- All water mains fittings and valves shall be tested for pressure and leakage in accordance with AWWA C600. Test water shall be potable. Test pressures shall not be less than 1.25 times the working pressure of the highest point and 1.5 times the working pressure at the testing point. The pressure may not drop more than 5 psi during the 2 hour test. Leak tests shall not exceed more than 1.0-3.0% where "L" = allowable leakage, in gallons per hour. "S" = length of pipe tested, in feet. "D" = nominal diameter of pipe, in inches. "T" = average test pressure during test, in pounds per square inch (gauge) during the same 2 hour duration.
- Other fitting and appurtenances not part of the main line testing shall be tested by visual inspection for leakage under normal working pressures.
- All main lines and appropriate appurtenances shall be flushed and disinfected in accordance with AWWA C551 and the requirements of the appropriate health department.
- The Contractor will coordinate all testing and disinfecting with the water authority and health department.
- Any testing failure shall require the Contractor to repair or replace the failed section at no additional expense to the contract.

**STORM WATER SYSTEM**

- The storm water system shall be supplied and placed in accordance with all local, state and federal requirements.
- Storm design includes many variables, such as pipe roughness coefficient, that can affect the actual final run-off. If no alternative materials are listed on the utility drawings, no substitutions may be made by the Contractor unless first reviewed and accepted by the Engineer of Record.
- Refer to Pipe Bedding Detail for pipe bedding and anti-seep collar requirements.
- Storm pipe material shall be as follows:
  - 12 inches and up shall be corrugated polypropylene pipe (PP) with smooth interior, in accordance with AASHTO M252 & M294 and ASTM F406 & F667, with a Manning friction number (n) of 0.013 or less, install in accordance with ASTM F449 and the manufacturer's recommendations.
  - Smaller than 12 inches shall be CPP, as per requirements above, or Polyvinyl Chloride (PVC) per ASTM D 3034, SDR 35 with gaskets per ASTM D 3212, elastomeric seal.
  - End sections shall be the same material as the preceding pipe and appropriate color.
  - Increase size of manhole if in the same horizontal plane there is two areas where the area between two pipes is less than 8 inches or 1/2 of the circumference is supported by less than 1/2 of the diameter of the manhole. Inverts shall be smooth cast in place concrete. Gaskets between risers shall be rubber, per ASTM C 443. Adjustment rings shall be precast concrete 4000 psi and 5 to 8% air entrainment.
  - Inlets shall meet the same requirements as those listed for manholes, except ramps shall be provided as per details, rather than a smooth top.
  - Grates shall be galvanized per ASTM A123. Minimum grate opening size will be 24 inches x 24 inches and design for a minimum of 2+20 loading. Refer to details for additional information.
  - Dry wells shall meet the same requirements as those listed for manholes with the addition of openings of approximately 15% of the rings interior surface. The openings shall be 1 x 3 inch slots or 1 inch diameter on the inside surface. Dry wells shall be backfilled with a minimum of 1 foot of clean stone sized between 3 and 4 inches above the stone, the entire structure shall be wrapped in filter fabric to prevent outside soils from entering the stone and dry well.
  - Unless otherwise noted, underdrains and trench drains shall be made with 4 inch perforated corrugated polyethylene pipe encased in clean stone sized between 2 inch and 1/2 inch and then wrapped in filter fabric. Outside dimensions of the trench drain will not be less than 1 foot.
  - All storm pipe entering structures shall be grouted to ensure connection of structure is watertight and structurally sound. All storm sewer pipes entering and exiting structures shall be flush with the inside of the structure wall.
  - All pipe shall be placed in accordance with the manufacturer's recommendation and to the lines and grades shown on the drawings. Care shall be given during backfill operations not to move or damage pipe or appurtenances while achieving the appropriate compaction requirements.
  - All systems shall be visually inspected for alignment and workmanship. All debris, dirt or other foreign objects shall be removed from system by a method of thin flushing and material removed shall be disposed of properly.
  - Any pipes found with diameter deflections greater than 5% of the specified pipe diameter will be repaired or replaced. Any alignment differentials greater than 5% of the diameter of the pipe will be corrected or replaced.
  - Any clearing, repairs, or replacement required due to failure of testing or poor workmanship shall be done by the Contractor at no additional expense to the contract.

**ASPHALT PAVEMENT**

- Asphalt shall be the type or types specified on the drawings. If no type is indicated the Contractor shall use a mix specified by the State Department of Transportation for top and binder. In Pennsylvania State that would be 19 mm Supabase Base Course and 9.5 mm Supabase Wearing Course. All asphalt shall be produced in state approved plants with state approved products.
- Asphalt will only be placed when the outside temperature is 45 degrees F and rising. Asphalt will never be placed from frozen material, during medium or heavy precipitation or when preceding precipitation has saturated the subbase and/or soil.
- Surfaces that will abut the new asphalt shall be back coated prior placement of asphalt including curbs, gutters, existing curbs and structures. Tack coat shall be applied evenly to match the lines and grades of the proposed abutting asphalt at a rate of .05 to .15 gallons per square yard.
- When binder is used as a working surface during construction, or there is a prolonged time period between binder and top placement, the surface must be power washed, not just swept, and a tack coat should be applied prior to installation of top course. In addition, any yielding area of pavement binder should be removed and replaced prior to application of the top course.
- Asphalt shall be placed in layers equal to those specified on the plans. Thickness of each layer or the thickness of all layers combined shall not vary more than 1/4 inch for thickness of 0 to 4 inches and 1/2 inch for thickness of 4 inches or greater, from those specified on the drawings. The asphalt shall also be tested for smoothness by laying a 16 foot straight edge on the pavement and verifying that there are no gaps greater than 1/4" in any direction.
- Placement and compaction requirements shall be the same as those specified by the State Department of Transportation of which the project is located. The rolling shall be done in such a manner that will match joints and leave a smooth uniform surface while providing the proper compaction which will be 95% of laboratory density.
- When matching into existing pavement, all match joints shall be saw cut to provide a straight smooth joint. The asphalt depth at the match point shall be equal to that of the proposed or existing which ever is greater.
- Paving equipment shall be of good condition and quality. Asphalt shall be placed by mechanical equipment except in small areas that are inaccessible to a paver. The binder joints and top joints shall be offset. The top course shall be placed parallel to the direction of travel. Asphalt shall be transported in covered trucks and scheduled in such a manner that will maintain asphalt temperature. Asphalt shall be rejected when temperatures fall below 250 degrees F or the minimum temperatures specified by the State Department of Transportation.
- All sub-base, asphalt, curb or other work performed in a State, County or Municipal right-of-way shall be furnished, installed, inspected and completed in accordance with their specifications, details and other requirements.
- The General Contractor shall provide copies of all material tickets and testing reports upon request by the Owner or Engineer.

**SEEDING AND LANDSCAPING**

- Topsoil shall be removed from stockpiles and spread in the areas shown on the plans. The depth of topsoil shall be a minimum of 4 inches in low areas and a minimum of 12 inches in landscape planting areas. If enough topsoil is not available locally, the Contractor is required to import as necessary. All disturbed low areas are to receive topsoil, seed, mulching, and water until a healthy stand of grass is established.
- Topsoil shall consist of fertile, natural agricultural soil substantially free of subsoil, stumps, roots, brush, stone, clay lumps, or similar objects larger than 2 inches in the greatest diameter. Topsoil for reuse shall be screened if required to remove size and debris removal. Topsoil shall be approved by the owner of its source prior to transporting. The topsoil shall be free graded to the lines and grades shown on the plans. The Contractor is responsible for keeping topsoil, seed, fertilizer, etc. off structures, pavements, and other site amenities, and will clean up unwanted deposits, at his expense.
- Moist all areas to be cleared & seeded to 6" minimum maximum prior to beginning any new lawn work.
- Lawn and till subgrade of low areas to a minimum depth of four inches, remove stones measuring 1.5 inches in any dimension, remove sticks, soil, rubbish, and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.
- Preparation of unchanged grades: where lawns are to be planted in areas that have not been altered of disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: till to a depth of six inches, apply soil amendments and initial fertilizers as specified, till soil to a homogeneous mixture and fine texture and complete fine grading.
- Clean all new lawn areas to be seeded of all debris, branches, stumps, brush, logs, metal, sticks, stones, etc. larger than two inches in diameter.
- Rill, rake, and/or drag low areas to remove ridges and fill depressions to meet, finish grades and to create a smooth, mowable lawn surface.
- Use natural diatomitic limestone containing at least 65% of total carbonates, and 33% magnesium carbonates, ground so that at least 90% passes a ten mesh sieve, and at least 50% passes a 100 mesh sieve.
- The topsoil shall have a pH of 6.0 to 6.8 and an organic content of 3 to 20%. The gradation of the topsoil shall be 100% passing 2 inch sieve, 85 to 100% passing the 1 inch sieve, 65 to 100% passing the 1/4 inch sieve and 20 to 80% passing the No. 200 sieve.
- Lawn fertilizer shall be 50% nitrogen, 10% phosphorus and 10% potash where 50% of the nitrogen is derived from ureaform source. Work into soil at a rate of 100 lbs per acre before seeding.
- Lawn seed shall be "50% by weight, 85% purity, 85% germination of Perennial Ryegrass", "30% by weight, 97% purity, 85% germination of Perennial Red Fescue", "20% by weight, 85% purity, 80% germination of Common Kentucky Bluegrass" at a rate of 200 lbs per acre. Much all seeded areas with approved seed at rate of 4000 lbs per acre. Maintain mulch as necessary and clean up until satisfactory germination.
- Steep slope mix (Type B unimowed - 1/4-3/4" or steeper) apply at a rate of 100 lbs. per acre using the following proportions by weight: 15% Oaseno Rapid Release, 35% Oaseno Growthmate, 25% Kentucky 31 Tall Fescue, and 25% Empire Birdseed. Tolerant.
- Hydroseeding shall be applied in accordance with the following: fertilizer shall be placed at 80 pounds per acre, hydro-mulch at 1200 pounds per acre, water at 500 gallons per acre, and seed at a minimum of 2200 pounds per acre. Inoculate at 4x manufacturer's rate. A non-harmful color additive which colors the hydroseeded mixture green shall be added to the mixture to allow visual maturing of its application. The hydroseeded mixture shall be sprayed uniformly and uniformly on the surface of the soil to form an absorbent cover, allowing penetration of water to the underlying soil.
- The Contractor will be responsible to water, reseed, or any other means necessary to ensure the growth of the lawn until a complete and uniform stand of grass has grown and been cut at least three times. Water by approved means immediately after mulching and thereafter a minimum of two times each week, or more when weather conditions require to a depth of one inch soil saturation. Much all seeded areas to two inch height until final acceptance. In the event grass becomes too slow resulting in excessive splashing that could damage the lawn, the contractor shall remove clippings at his expense. Lawn shall be presented to Owner in a condition that it may be maintained with standard mowing equipment.
- Where substantial lawn remains (but is thin), mow, rake, aerate (if compacted), fill low spots, remove bumps, and scarify soil, fertilizer, and seed. Remove weeds before seeding, if extensive. Apply selective chemical weed killers as required. Apply mulch if required to maintain moist condition.
- Plantings shall be supplied in accordance with the plans and ANSI 2601 "American Standard for Nursery Stock" in good health, vigorous, and free of insects, larvae, eggs, defects and disease.
- Plants shall be located per the plans. The holes shall be excavated per the details on the drawings with the center 5/16 height higher to promote drainage. Use a topsoil backfill mix of 4 parts topsoil, 1 part peat moss, 1/2 part well rotted manure, 2 pounds 5-10-5 planting fertilizer properly mixed per cubic yard. Berm ground plants to form a bowl shape.
- Two layers of weed barrier made from fiberglass and ultraviolet light resistant shall be placed under all planting beds prior to mulching. Both trees and shrubs shall be staked as detailed on the drawings. Tree wrapping will be provided for the base of all trees as noted.
- Match all beds around building and other-tv equipment with 6 inch depth fiber rock graded rock, 3" to 4" size range on fiber mat weed barrier. Mulch for all perimeter beds shall be 50% shredded bark and 50% wood chips, 3/4 to 2 inch in size, uniformly mixed and free of debris wood. Mulch shall be placed uniformly over the planting bed allowing no weed barrier to be seen to a minimum depth of 3". Care to be taken by all landscaping.
- All landscaping shall be guaranteed for one year after final acceptance. Any plantings needing replacement will be guaranteed from the time of replacement if after final acceptance. Contractor shall maintain plants until completion and final acceptance of the entire project. Maintenance shall include pruning,