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Section:

SECTION 01

1. Existing Turf Demolition:
    a. Prior to turf demolition, silt fence measures shall be installed (see Std. & Spec 3.05 Silt Fence from the 1992 DEQ Erosion & Sediment Control Handbook). Silt fencing is to be maintained throughout all construction steps until new sod is installed.
    b. All disturbed areas shall be sod cut. Cut sod shall be stripped and hauled to on-site disposal area(s) as directed by the OAR.

2. Topsoil Strip & Store:
    a. The contractor shall remove & stockpile existing topsoil locally (within the area of work) to 3" average depth. Topsoil may be stockpiled in multiple locations as to not interfere with grading operations or to interrupt lines of sight as coordinated with the OAR.

3. Excavation/Cut-to-Fill:
    a. Site grading shall be completed as directed by the golf course architect. Fill soil is to be properly compacted to prevent future settling.

4. Artwork & Contouring
    a. The contractor shall develop the proposed tee sizes, elevations, directions, and slopes as outlined within the design drawing, or as directed by the golf course architect and/or the OAR.
    b. The contractor's artwork & contouring costs shall include all necessary adjustments to achieve the design objectives. Reworking of some shaped features should be expected.
    c. All teeing surfaces are to pitch in a direction outlined by the architect at a uniform 1.5% slope. This subgrade plane of 1.5% shall be replicated following the installation of the topsoil material and during the laser leveling process.
    d. Surrounding tee slopes shall have no slopes steeper than a 25% slope unless otherwise directed by the golf course architect. Surrounding grades shall have no slopes slower than a 2.5% slope unless otherwise directed by the golf course architect.

5. Topsoil Replate
    a. Following approval of the subgrade artwork & contouring, topsoil is to be replated as directed by the golf course architect or OAR.
    b. Special care is to be taken to replate the original modified sandy tee rootzone material upon the new teeing surfaces.

6. Irrigation Installation shall follow topsoil replating.

7. Tee Construction
    a. Once irrigation is installed to the satisfaction of the OAR, final preparations of the teeing surfaces can begin:
        i. Soilbuilder (course grade) compost material shall be purchased by the contractor and shall be bucket spread at an average depth of 1". The compost shall then be incorporated into the topsoil by toothing the topsoil with a mini track loader machine in three varying directions to a depth of 4".
        ii. Following the compost installation, the tees shall be laser leveled with an hydraulically operated, laser guided tractor-mounted boxblade machine. Laser leveling shall be completed ONLY with optimum soil moisture content to prevent excess soil compaction.
        iii. Following laser leveling, the teeing surfaces may be loosened by solid tine aerification (completed by golf course staff)
        iv. Final soil preparation of all teeing surfaces and surrounds shall include hand raking all surfaces to remove all debris and irregular grades that prohibit the creation of a smooth grade.

8. Grassing:
    a. All Bentgrass and Turf Type Tall Fescue shall be ordered and installed while still fresh and viable as determined by the OAR.
    b. The contractor shall be responsible for the first watering of all sod. After that time, the golf course staff will assume responsibility for the grow-in of the turf.
    c. If grassed grades are in any way irregular, the OAR may require the rolling of the installed turf with a riding turf roller to smooth the grassed surfaces.
    d. All exterior surround sod shall be "keyed-in" to surrounding grades and existing turf.
    e. The contractor shall coordinate the installation of all sod with the OAR to allow the golf course staff the opportunity to install desired soil amendments as necessary.

9. General:
    a. The contractor shall facilitate play by coordinating construction activities with the OAR on a daily basis.
    b. The contractor shall have survey tools and marking equipment/supplies available for the golf course architect's/OAR's use at all times.
    c. The contractor shall utilize plastic or plywood construction matting materials to limit haul road disturbance.

SECTION 02

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1.1 GENERAL

A. Install pipe, wire, valves, sprinklers, splices, and all other appurtenances in strict accordance with the manufacturers recommended procedures, standard industry practices and the Plans and Specifications.

1.2 ORDER OF WORK AND PLAN PROCEDURE

A. It shall be to the advantage of both the Contractor and the Owner for the Contractor to plan his work to interfere as little as possible with daily activities. The Contractor is to notify the Owner as to the work schedule for the next day, to best schedule daily activities.

1.3 STAKE OUT

A. The Contractor, Owner, or Project Manager, and Supplier shall stake out all proposed sprinkler heads, quick coupler, valve locations and pipelines prior to trenching operations. The location of said items shall conform in general with the locations shown on the plans. The location of the flags will be checked by the Owner prior to trenching. Of particular importance is the location of sprinkler heads where prevailing winds, surface slope and special ground conditions must be taken into consideration. The final location of all sprinklers must be approved by the Owner's representative. Any discrepancy with sprinkler count shall be brought to the Owner and Supplier's attention.

B. Contractor will be responsible to cup cut sod, flip over install whisker and paint with color coordinating ground spray paint for sprinkler and quick coupler locations after hole is completely staked.

1.4 SALVAGE OF EXISTING MATERIALS

A. The Contractor is responsible to remove abandoned controllers and controller components in a safe manor. Care should be taken to keep the components in operational condition.

B. The Contractor is responsible to remove abandoned sprinklers and quick coupler valves. Cut pipes shall be filled with expanding foam spray to eliminate ground settling over time. Ground repair shall be performed with similar care as to ground repair around new sprinklers and valves.

C. The contractor will be responsible to collect and hand off to owner the removed components.

1.5 BASE BID - SPRINKLER HEADS – 1" SERIES SPRINKLERS

A. 1" FLEX Series sprinklers shall have a radius throw range of 43'-83' ft. A flow rate of 8.2 to 47.3 gpm. A precipitation rate between .41 and .45 in per hr. Capability and shall be a gear driven rotary type. The sprinkler shall be of a pop-up design with an overall height of min. of 7".

B. The sprinkler shall be mounted at final finished grade and shall have a 1.0" ACME swing joint.

C. The body and cap of the sprinkler shall be injection molded from cycolac, a non-corrosive, impact-resistant, UV-resistant, heavy-duty plastic material. The sprinkler shall have a plastic filter screen sized to prevent entry of foreign material into the nozzle.

D. Retraction shall be achieved by a heavy-duty stainless steel retraction spring. The sprinkler shall have a riser seal and a wiper. Rotation shall be accomplished by a water lubricated gear-drive assembly.

E. The sprinkler shall have a stainless-steel valve seat molded to the body to eliminate seat damage.

F. Sprinkler shall have the ability to be adjusted in arc from 40° to 330° part circle sprinklers and have the capability to be a complete full circle sprinkler 360° rotating in one direction.

G. The sprinkler shall have the ability to have main nozzle vertical trajectory adjustment between 15° and 30° to minimize contact with native vegetation.

H. Sprinkler to provide access from the top for foot valve service and conversion assembly service, without digging.

I. The sprinkler heads shall be manufactured within the United States of America by an ISO 9001-certified facility.

J. The sprinkler body assembly shall consist of five significant components:

K. The sprinkler Body assembly shall have a molded-in, indestructible stainless-steel valve seat capable of withstanding debris contamination with no permanent damage and shall never require removal for servicing or replacement. The sprinkler body shall have a spin-welded PVC, ACME-threaded inlet to ensure chemical compatibility with the O-rings used for sealing purposes. The sprinkler body shall house the control valve and riser assembly, using a single snap-ring to retain each, and a removable rock screen.

L. The Pilot Valve assembly shall incorporate a variety of activation types to control the ON-OFF operation of the sprinkler. It shall provide four pressure-point selections (50, 65, 80 and 100 psi; 3,5, 4,5, 5,5 and 6,9 Bar), with a vandal-resistant locking feature that ensures the desired setting is maintained. The pressure points shall be graphically illustrated in PSI and kg/cm2. The pilot valve assembly shall include a pressure-regulation feature that continuously monitors the operating pressure inside the sprinkler body while in operation, making the necessary adjustments to ensure the desired and set regulation pressure is maintained. The pilot valve assembly shall incorporate a manual control feature that is accessible from the top and allows the sprinkler to be manually selected "ON", "OFF" or placed in the "AUTO" position awaiting commands from the control device. The manual

selector shall be red in color for enhanced visibility. The pilot valve assembly shall be stamped with the manufactured date code.

M. The sprinkler shall be of a pop-up design with an overall height of 10" (254mm), a cap diameter of 3 3/8" (85mm) and a pop-up stroke of 4 3/16" (106mm). The sprinkler shall have a 1" (25mm) ACME female-threaded inlet.

N. Water distribution shall be via three nozzles mounted in a 2¼"-diameter (57mm) plastic nozzle turret. The three nozzles shall be oriented in the same direction and elevate 3¼" (83mm) above the body when in operation. All of the sprinkler nozzles shall be of a thread-in type accessible from the front with no other disassembly required. All nozzles are color-coded for easy identification of radius and gallonage performance capabilities and shall be designed to allow any particle capable of passing through the riser screen to pass through the nozzle. The sprinkler shall be capable of accepting a fourth and fifth nozzle that can be installed 180° from the main nozzle to provide coverage behind the sprinkler. These back nozzle positions shall be manufactured with a factory-installed plug that can be removed to accept over 100 different inner and intermediate nozzle combinations. The sprinkler shall be capable of accepting 7 different color-coded main nozzles, a main nozzle plug, a main nozzle adapter, and 10 different color-coded inner/intermediate nozzles.

O. The main nozzle shall incorporate a selectable adjustment that provides main nozzle discharge angle adjustment at 15° and 25°. Close-in watering distribution shall be achieved by a patented helical restrictor inserted into the inner nozzle and shall be capable of adjusting the distribution profile to optimize uniformity. An optional radius reduction screw can be installed to break up the main nozzle stream. The cap shall identify the installed main nozzle size and the date of manufacture.

P. The sprinkler shall include a ratcheting riser feature that allows the user to adjust the position of the riser in the body without disassembly.

Q. The sprinkler shall be capable of full- and part–circle operation and be a gear-driven rotary type. The arc of the sprinkler shall be adjustable by the use of an adjustment band located between the nozzle base and riser. The left terminus of the arc shall be fixed with the right position adjustable from a 40 degree arc minimum up to a 360° arc maximum. When the 360° arc adjustment position is reached, the sprinkler will rotate uni-directionally in the clockwise direction. The sprinkler shall be adjustable wet or dry, by hand, and using no tools. The arc adjustment band shall identify the 90°, 180°, 270° and 360° arc positions. The end-of-arc dwell time shall not exceed 2 seconds and will generally be less than 1 second.

R. Rotation shall be accomplished by a water-lubricated compound cluster gear drive with balanced reversing gear plate. The drive assembly shall be driven by a spring-loaded, poppet-type variable stator, sized to provide 3-minute, full-circle rotation speeds throughout the pressure range. The drive and stator assemblies shall be constructed of corrosion-proof plastic and stainless-steel components.

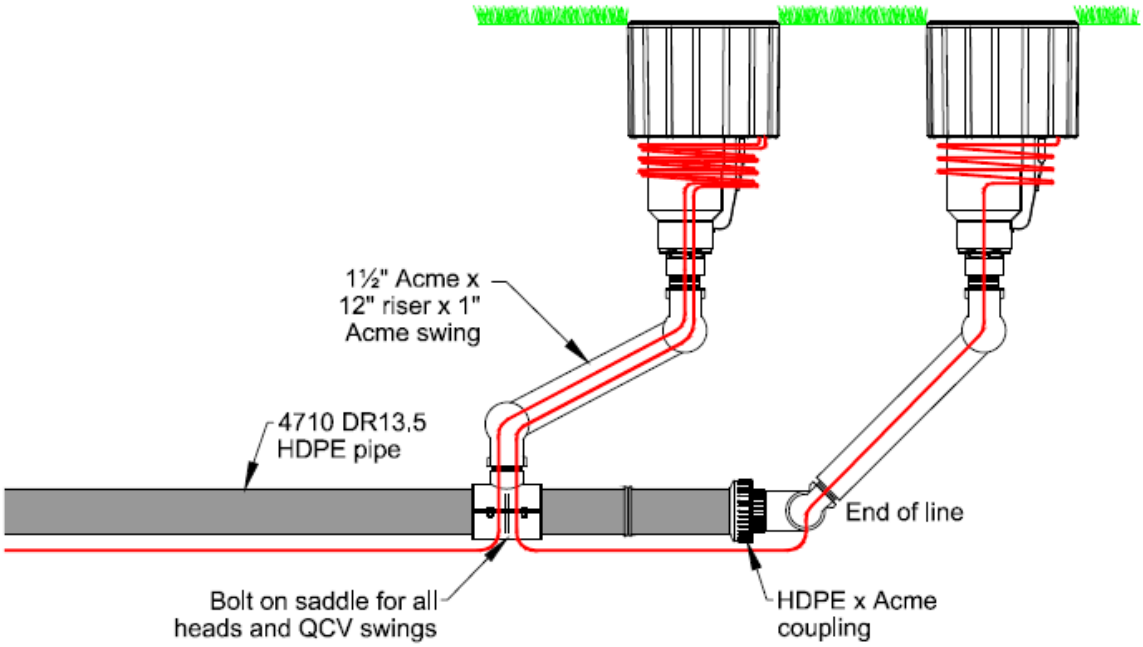
S. The sprinkler shall include a nozzle base clutching feature that allows the user to rotate the nozzle base in either direction, wet or dry, and hold in one position during operation to allow for spot watering.

T. The internal valve assembly shall be a piston-type that vents to the atmosphere, providing valve friction loss of less than 5 psi (0,34 Bar). The sprinkler shall be designed to provide smooth valve closure in excess of two seconds to minimize damage resulting from surges and water hammer. All valve seals shall be constructed of natural rubber. The valve seat seal shall be constructed of fabric-reinforced natural rubber. The electric valve assembly shall incorporate a 100-mesh stainless-steel screen for the control water, preventing entry of foreign materials into the pilot valve assembly.

U. The sprinkler body and cap shall be injection-molded from ABS– a corrosion-proof, impact-resistant, UV-resistant, heavy-duty, engineering-grade plastic material. The cap and nozzle base shall incorporate a pull-up feature that provides improved serviceability of nozzle and riser. The sprinkler shall have two plastic filter screens – a top-serviceable coarse rock screen in the body inlet sized to prevent larger foreign material from entering the body, and a finer screen threaded into the riser, sized to prevent foreign material from clogging the nozzles.

V. The sprinkler shall have a riser/body seal assembly that regulates flushing during pop-up and retraction to clear any debris from around the riser, and a heavy-duty, stainless-steel spring to ensure positive retraction. The riser is sealed by a durable, over-molded urethane ring on the seal retainer. Sprinkler flush rate shall not exceed 5 GPM (18,9 LPM).

W. The sprinkler shall identify the use of effluent water via a lavender-colored cap marking. The sprinkler cap shall indicate model designation, nozzle number and manufacturing date code.



1.6 BASE BID - SPRINKLER HEADS – 1.5" SERIES SPRINKLERS

A. 1.5" FLEX Series sprinklers shall have a radius throw range of 52'-99' ft. A flow rate of 13.2 to 61.8 GPM. A precipitation rate between .38 and .77 in per hr. Capability and shall be a gear driven rotary type. The sprinkler shall be of a pop-up design with an overall height of min. of 4 3/16".

B. The sprinkler shall be mounted at final finished grade and shall have a 1.5" ACME swing joint.

C. The body and cap of the sprinkler shall be injection molded from cycolac, a non-corrosive, impact-resistant, UV-resistant, heavy-duty plastic material. The sprinkler shall have a plastic filter screen sized to prevent entry of foreign material into the nozzle.

D. Retraction shall be achieved by a heavy-duty stainless steel retraction spring. The sprinkler shall have a riser seal and a wiper. Rotation shall be accomplished by a water lubricated gear-drive assembly.

E. The sprinkler shall have a stainless-steel valve seat molded to the body to eliminate seat damage.

F. Sprinkler shall have the ability to be adjusted in arc from 40° to 330° part circle sprinklers and have the capability to be a complete full circle sprinkler 360° rotating in one direction.

G. The sprinkler shall have the ability to have main nozzle vertical trajectory adjustment between 15° and 30° to minimize contact with native vegetation.

H. Sprinkler to provide access from the top for foot valve service and conversion assembly service, without digging.

I. The sprinkler heads shall be manufactured within the United States of America by an ISO 9001-certified facility.

J. The sprinkler body assembly shall consist of five significant components:

K. The sprinkler Body assembly shall have a molded-in, indestructible stainless-steel valve seat capable of withstanding debris contamination with no permanent damage and shall never require removal for servicing or replacement. The sprinkler body shall have a spin-welded PVC, ACME-threaded inlet to ensure chemical compatibility with the O-rings used for sealing purposes. The sprinkler body shall house the control valve and riser assembly, using a single snap-ring to retain each, and a removable rock screen.

L. The Pilot Valve assembly shall incorporate a variety of activation types to control the ON-OFF operation of the sprinkler. It shall provide four pressure-point selections (50, 65, 80 and 100 psi; 3,5, 4,5, 5,5 and 6,9 Bar), with a vandal-resistant locking feature that ensures the desired setting is maintained. The pressure points shall be graphically illustrated in PSI and kg/cm2. The pilot valve assembly shall include a pressure-regulation feature that continuously monitors the operating pressure inside the sprinkler body while in operation, making the necessary adjustments to ensure the desired and set regulation pressure is maintained. The pilot valve assembly shall incorporate a manual control feature that is accessible from the top and allows the sprinkler to be manually selected “ON”, “OFF” or placed in the “AUTO” position awaiting commands from the control device. The manual selector shall be red in color for enhanced visibility. The pilot valve assembly shall be stamped with the manufactured date code.

M. The sprinkler shall be of a pop-up design with an overall height of 11 3/8” (289mm), a cap diameter of 3 5/8” (92mm) and a pop-up stroke of 4 3/16” (106mm). The sprinkler shall have a 1.5” (40mm) ACME female-threaded inlet.

N. Water distribution shall be via three nozzles mounted in a 2¼”-diameter (57mm) plastic nozzle turret. The three nozzles shall be oriented in the same direction and elevate 3¼” (83mm) above the body when in operation. All of the sprinkler nozzles shall be of a thread-in type accessible from the front with no other disassembly required. All nozzles are color-coded for easy identification of radius and gallonage performance capabilities and shall be designed to allow any particle capable of passing through the riser screen to pass through the nozzle. The sprinkler shall be capable of accepting a fourth and fifth nozzle that can be installed 180□ from the main nozzle to provide coverage behind the sprinkler. These back nozzle positions shall be manufactured with a factory-installed plug that can be removed to accept over 100 different inner and intermediate nozzle combinations. The sprinkler shall be capable of accepting 7 different color-coded main nozzles, a main nozzle plug, a main nozzle adapter, and 10 different color-coded inner/intermediate nozzles.

O. The main nozzle shall incorporate a selectable adjustment that provides main nozzle discharge angle adjustment at 15° and 25°. Close-in watering distribution shall be achieved by a patented helical restrictor inserted into the inner nozzle and shall be capable of adjusting the distribution profile to optimize uniformity. An optional radius reduction screw can be installed to break up the main nozzle stream. The cap shall identify the installed main nozzle size and the date of manufacture.

P. The sprinkler shall include a ratcheting riser feature that allows the user to adjust the position of the riser in the body without disassembly.

Q. The sprinkler shall be capable of full- and part–circle operation and be a gear-driven rotary type. The arc of the sprinkler shall be adjustable by the use of an adjustment band located between the nozzle base and riser. The left terminus of the arc shall be fixed with the right position adjustable from a 40° arc minimum up to a 360° arc maximum. When the 360° arc adjustment position is reached, the sprinkler will rotate uni-directionally in the clockwise direction. The sprinkler shall be adjustable wet or dry, by hand, and using no tools. The arc adjustment band shall identify the 90°, 180°, 270° and 360° arc positions. The end-of-arc dwell time shall not exceed 2 seconds and will generally be less than 1 second.

R. Rotation shall be accomplished by a water-lubricated compound cluster gear drive with balanced reversing gear plate. The drive assembly shall be driven by a spring-loaded, poppet-type variable stator, sized to provide 3-minute, full-circle rotation speeds throughout the pressure range. The drive and stator assemblies shall be constructed of corrosion-proof plastic and stainless-steel components.

S. The sprinkler shall include a nozzle base clutching feature that allows the user to rotate the nozzle base in either direction, wet or dry, and hold in one position during operation to allow for spot watering.

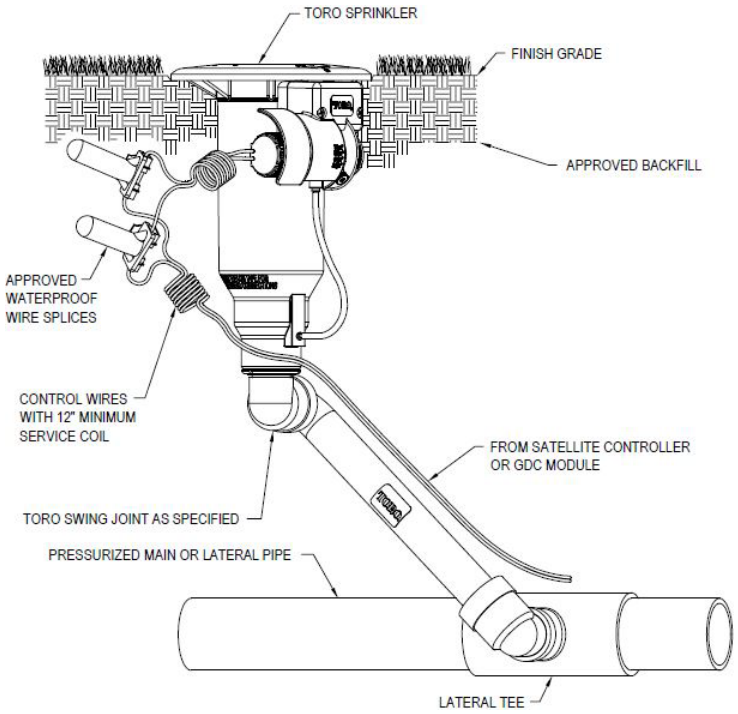
T. The internal valve assembly shall be a piston-type that vents to the atmosphere, providing valve friction loss of less than 5 psi (0,34 Bar). The sprinkler shall be designed to provide smooth valve closure in excess of two seconds to minimize damage resulting from surges and water hammer. All valve seals shall be constructed of natural rubber. The valve seat seal shall be constructed of fabric-reinforced natural rubber. The electric valve assembly shall incorporate a 100-mesh stainless-steel screen for the control water, preventing entry of foreign materials into the pilot valve assembly.

U. The sprinkler body and cap shall be injection-molded from ABS– a corrosion-proof, impact-resistant, UV-resistant, heavy-duty, engineering-grade plastic material. The cap and nozzle base shall incorporate a pull-up feature that provides improved serviceability of nozzle and riser. The sprinkler shall have two plastic filter screens – a top-serviceable coarse rock screen in the body inlet sized to prevent larger foreign material from entering the body, and a finer screen threaded into the riser, sized to prevent foreign material from clogging the nozzles.

V. The sprinkler shall have a riser/body seal assembly that regulates flushing during pop-up and retraction to clear any debris from around the riser, and a heavy-duty, stainless-steel spring to ensure positive retraction. The riser is sealed by a durable, over-molded urethane ring on the seal retainer. Sprinkler flush rate shall not exceed 5 GPM (18,9 LPM).

W. The sprinkler shall identify the use of effluent water via a lavender-colored cap marking. The sprinkler cap shall indicate model designation, nozzle number and manufacturing date code.

X. Installation shall be as shown in diagram below:



1.7 PVC - PIPE AND FITTING MATERIAL

A. All PVC pipe from size 3-inch to 14-inch shall be gasketed joint, all pipe shall be of the "integral bell" gasket joint so as to reduce chance of installation error. All pipe shall conform to the National Sanitation Foundation (NSF) standards for potable water pipe. The pipe shall be Class 200 and have a standard dimension ratio (SDR) classification of 21.

B. All Fittings from size 3-inch to 14-inch shall be gasketed joint, Ductile Iron. Grade shall be grade 70-55-05 in accordance with ASTM A-536. Fittings shall have deep bell push-on joints with gaskets meeting ASTM F-477. Fittings shall be HARCO DEEP BELL as manufactured by The Harrington Corporation of Lynchburg, VA. or approved equal.

1.8 HDPE - PIPE MATERIAL

A. PE Pipe shall be DR 13.5, IPS diameters, of a 4710 Bimodal Resin with a Slow Crack Growth Resistance (PENT) of >1500 hours per ASTM F1473. Pipe shall be manufactured BY CMF Global, Flying W, or approved equal.

1. Pipe diameters 3” and larger shall be per ASTM F714 or ASTM D3035.
2. Pipe diameters less than 3” shall be per ASTM D3035.

B. Pipe shall be supplied in 40' or 50' lengths. 3” and smaller may be supplied in up to 2,000’ coils. Coils must be straightened and re-rounded by the contractor prior to use.

C. Pipe connections may be connected by socket fusion, butt fusion and electrofusion fittings.

D. All pipe shall be installed with lavender marking tape on top to indicate effluent water. Tape shall be installed in conjunction with backfilling and tamping at a level of 6” below finished grade and shall be located directly above pipe.

1.9 HDPE - FITTINGS - FOR PE PIPE

A. PE Fittings shall be IPS diameters, made from PE 4710 resin with a cell classification of 445574C per ASTM D3350.

B. Butt fusion fittings shall be DR 11. Contractors may use DR11 fittings with their ends machined to DR 13.5 at their preference.

C. Molded butt fusion fittings shall be DR 11 per ASTM D3261 prior to optional machining of their ends.

D. Reductions on Run and/or Branch Tee's shall be such that the size of the “main body” is that of the largest leg of the tee.

E. Fittings fabricated from pipe are not permitted other than elbows with angles of deflection less than 45°. These elbows shall be DR 11/Class 160 psi and comply with AWWA C906 prior to machining of ends to DR 13.5.

F. Side wall fusion branch saddles are permitted.

G. Electrofusion Fittings including Electrofusion Couplings, Electrofusion Branch Saddles, Electrofusion x FNPT Saddles, and Electrofusion Swivel Saddles shall be rated DR 11 at a minimum per ASTM F1055.

H. Electrofusion Branch Saddles with branches of greater than 2” are not permitted on mainline piping for a change of direction. Branches of electrofusion branch saddles shall be DR 11 with end machined to DR 13.5.

I. Flange adapters for PE Pipe

1. Flange adapters shall be molded or machined from stock and be DR 11 rated complying with ASTM F2880 prior to machining of end to DR 13.5.

2. Back Up Rings shall be Ductile Iron per ASTM A536 and DR 11 rated.
3. Accessories shall be 1/8" Neoprene Gaskets and Grade 5 or stronger, zinc plated Cap Screws or Threaded Rod and Nuts.

J. Threaded Transitions: HDPE x MNPT Brass or Stainless Steel transitions shall be DR 11 rated prior to machining end to DR13.5.

K. Transition pieces with stiffeners are required at the outlet of the lateral isolation valve to connect with the lateral. The transition shall be DR 11 with fusion end machined to DR 13.5.

L. Polypropylene compression fittings

1. Polypropylene compression fittings may be used for all service sprinkler heads.
2. Polypropylene Compression Fittings with Female Acme outlets: Philmac service tees and service elbows with 1 ½" Female Acme thread outlets shall serve compatible swing joints serving irrigation sprinkler heads. They must be suitable for use on HDPE pipe per ASTM D3035 (IPS diameter, OD controlled). Fittings shall be rated for 230 psi complying with ISO 14236 and meet the dimensional and performance requirements of AWWA C800. Fitting "Bodies" shall be Polypropylene. Fitting "Compression Nuts" shall be Acetal. Joint seal activation shall be accomplished solely by the Compression Nut. Joint "Seals" shall not "interfere" with pipe insertion. No beveling or lubrication of pipe shall be required. Fitting components shall not require dismantling prior to assembly on to pipe. Compression fittings shall be Philmac.
3. Polypropylene Compression Fittings are permitted on 2" and smaller lines. They must be suitable for use on HDPE pipe per ASTM D3035 (IPS diameter, OD controlled). Fittings shall be rated for 230 psi complying with ISO 14236 and meet the dimensional and performance requirements of AWWA C800. Fitting "Bodies" shall be Polypropylene. Fitting "Compression Nuts" shall be Acetal. Joint seal activation shall be accomplished solely by the Compression Nut. Joint "Seals" shall not "interfere" with pipe insertion. No beveling or lubrication of pipe shall be required. Fitting components shall not require dismantling prior to assembly on to pipe. Compression fittings shall be Philmac.

1.10 HDPE & PVC - EXCAVATION OF TRENCH

A. The Contractor will do all necessary excavation required for the proper installation of the system. All equipment used for excavation, as well as material handling and transportation are required to be equipped with rubber tires unless otherwise approved by the Owner.

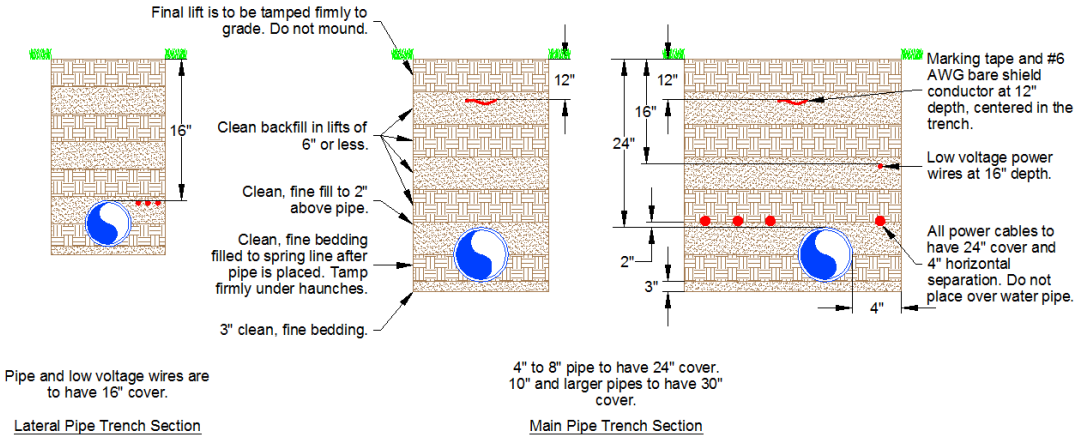
B. Pipe Trenches are to be excavated to a depth sufficient to provide not less than SIXTEEN INCHES (16") of covering over the pipe of 2" Diameter and Less and TWENTY-FOUR INCHES (24") of cover for pipes of 3" to 8" Diameter and THIRTY INCHES (30") of covering of 10" Diameter and larger as measured from the top of the barrel of the pipe to the surface

grade. The trench is to be of sufficient width to allow soil to be tamped solidly under the pipe to provide firm continuous support and to allow for proper installation of pipe.

C. 120/240 Volt Wire Trenches are to be excavated to a depth sufficient to provide not less than TWENTY-FOUR INCHES (24”) of covering over the wire. The trench is to be of sufficient width to allow soil to be tamped solidly under the wire to provide firm continuous support and allow for proper installation of wire.

D. The bottom of the trench is to be graded to a line so that the pipe and wire, as nearly as possible, will have bearing for its full length. All rock and organic material shall be removed from the trench bottom prior to placing of pipe or wire. If rock is encountered in the excavation, the trench must be excavated an additional depth of six inches (3”) and filled with suitable material. There will be at least six inches (3”) of earth between the bottom and four inches (4”) between the sides of the pipe or wire and any rock. If unstable bedding material is encountered, it will be removed and replaced with suitable material supplied by the Contractor at no additional cost to the Owner.

E. Depths shall be as shown in the diagram below.



- 2" and 3" lateral pipes are to have 16" cover.
- 3", 4", 6" and 8" main pipes are to have 24" cover .
- Pipes 10" and larger are to have 30" cover.
- Pipe may not be installed at a greater or lesser depth without prior approval by owner or consultant.
- Pipe is to have continuous support on bedding. No bridging across voids.
- Changes in direction are to be accomplished by bending pipe into curved trenches and use of 45 degree or smaller angled elbows. 90 degree elbows are to be used only with prior approval.
- Cables are to be laid in trenches without tension. Bundle cables at regular intervals of 10 feet. All cables to be installed with slack loops of 3 feet at changes in direction and entry into splice boxes.

1.11 BACKFILLING

A. Backfilling of all trenches shall progress as rapidly as the conditions of the work permit. Excavated material may be used for fill. Any borrowed backfill material required to complete backfilling shall be approved and shall be free of roots, wood scrap material, other vegetable matter, refuse, stones, organic or frozen materials. This shall be supplied by the Contractor at the Owner's expense. In all areas, trenches shall be backfilled in two compacted layers to finish grade. Compaction shall be such that the original density of the material is obtained.

B. The Contractor will guarantee all trenches, disturbed areas and irrigation equipment to be free from heaving or settling more than 1/2 inch from the original grade. This "no settlement" clause shall extend over the entire period of the Contractor's guarantee.

1.12 SEEDING

A. Upon completion of backfilling, all trenches and disturbed areas shall be reseeded with an approved seed mix under the direction of the Owner.

B. Areas where seeding is improperly performed shall be completely reseeded by the Contractor at his expense within ten (10) days of notification by the Owner. The seed shall contain grasses similar to existing grass in the area to be corrected.

1.13 SOD REMOVAL AND REPLACEMENT

A. The Contractor shall be responsible to remove, maintain, and replace the sod. If areas are found, in part or entirety, to be less than satisfactory it shall be the Contractor's responsibility to repair or relay those, and only those areas in question within ten (10) days of notification in writing by the Owner.

1.14 VIBRATORY PLOWING PIPE

A. Pipe may be installed by standard trenching techniques or by "vibratory plowing". If the vibratory plow method is used, the "plow" shall be a vibratory type and equipped with a turf roller device to prevent tearing of the turf. The "mole" or "bullet" which precedes the pipe and is used to form the opening for the pipe, shall be not less than 1" larger in diameter than the outside diameter of the pipe. Starting and finishing holes shall not exceed a 2-foot square opening with the sod removed from such holes to be preserved and replaced. Moling, where soil conditions are favorable, is encouraged, but is not required

1.15 PVC & HDPE - PIPE, FITTINGS AND ACCESSORIES

A. Pipe, fittings and accessories shall be handled in such a manner as to ensure delivery to the trench in sound, undamaged condition. If the coating or lining of any type of pipe or fitting is damaged, the repair shall be made by the Contractor, at his expense.

B. Pipe shall be carried into position, not dragged. The interior of the pipe, fittings and accessories shall be thoroughly cleaned of foreign matter before being lowered into the

trench and shall be kept clean during laying operations by plugging the open end or other approved methods. Before installation, the pipe shall be inspected for defects.

C. Cutting of the pipe shall be done in a neat and workmanlike manner. The edge shall be true and at right angles to the pipe. The end shall be reamed out to the original diameter of the pipe. Appropriate angle fittings must be used where the angle of pipe deflection is greater than five degrees off center.

D. Pipe, fittings and accessories shall be carefully lowered into the trench with suitable equipment. Under no conditions shall any of the water main materials be dropped or dumped into the trench. Care should be taken to avoid abrasion of pipe coating. The full length of each section of pipe shall rest solidly upon the pipe bed with recesses excavated to accommodate coupling and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and re-laid.

E. When work is not in progress, open ends of pipe, fittings and accessories shall be securely closed so that no earth or other substances can enter.

F. Pipe ends left for future connections shall be valved, plugged or capped. Where connections are made between the new work and existing mains, special fittings shall be used to suit the actual conditions. Standard methods are readily available for making connections to various types of pipe, either under pressure or in a dewatered condition. Where made under pressure, these connections shall be installed according to the recommendations of the manufacturer of the pipe being tapped.

G. For PVC Gasketed joint pipe and fittings all rubber gaskets shall be handled, lubricated where necessary and installed in accordance with the recommendations of the manufacturer.

H. The installation of steel couplings, cast iron couplings, mechanical joints and bolted joints shall be in accordance with the recommendations of the manufacturer.

I. Connections between different types of pipe, fittings and accessories shall be made with transition fittings recommended by the manufacturer.

J. During the installation of PVC and/or HDPE pipe the installer shall provide safeguards against the problem of contraction of the pipe by “snaking” the pipe as much as possible in the trench according to manufacturer recommendations.

K. Anywhere solvent weld joints are used, only the solvent and cleaner recommended by the pipe manufacturer should be used. The solvent weld joints shall be made in the following manner:

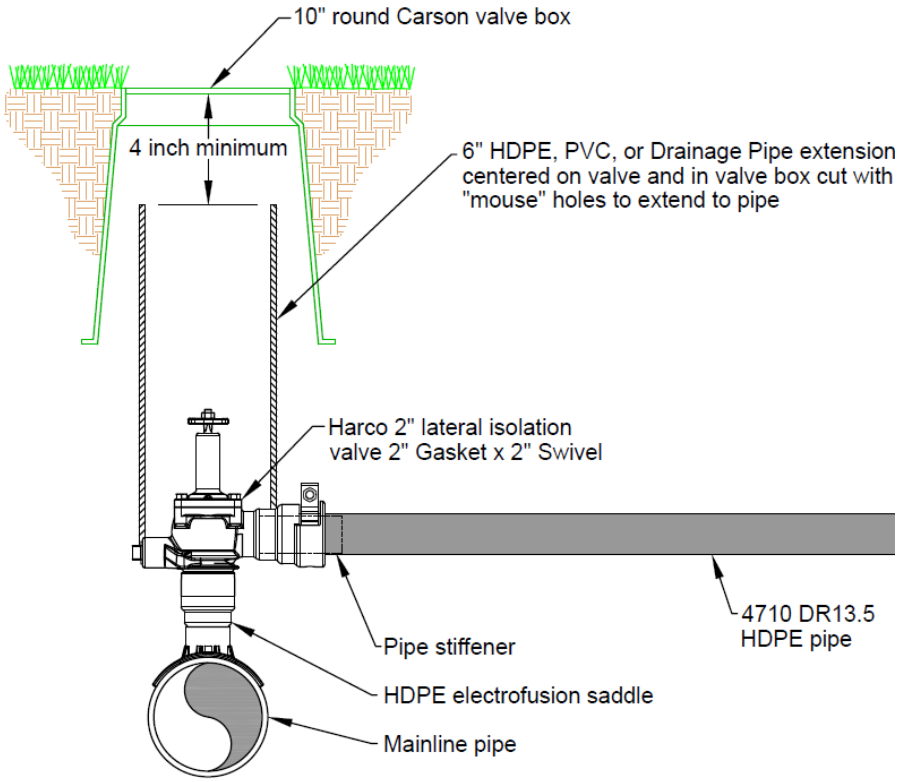
1. All pipe ends, inside of fittings and bell ends shall be completely cleaned with the recommended cleaner. The pipe shall be welded by butt fusion, socket fusion, or electrofusion. The process for these fusions shall be completed with the manufactures correct weld times. The pipe and fitting shall be promptly joined,

the pipe shall be pushed to the full extent of the fitting, and then the pipe shall set to a correct cooled down time. No excess welds will be accepted. All pipe, fittings and accessories shall be installed in accordance with recommendations of the pipe manufacturer.

2. There shall be no PVC pipe or fittings welded or glued if the temperature is below 37 degrees on that day. This does not apply to HDPE fusion which can be fused regardless of temperature as long as manufactures best practices are used for fusing and setting times.
3. The owners represented has the right to ask that a maximum of 3 each welded connections be cut out to be tested. The contractor will not be responsible test costs. The contractor shall replace the test connections at no additional cost from the initial bid.

1.16 HDPE PIPE - MAINLINE TO LATERAL PIPE CONNECTIONS - WITH SHUTOFF

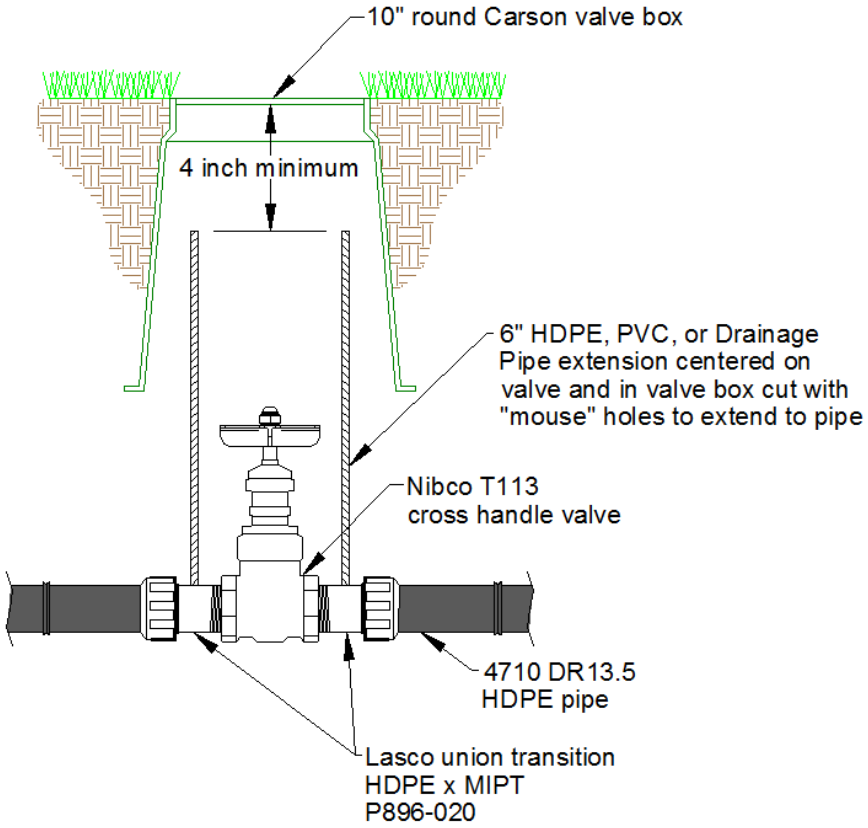
A. Installation of connectors to laterals shall be installed with manufacture's best practices and shall incorporate a HDPE Electrofusion Swivel saddle installed vertically on the HDPE pipe and when cooled appropriately the core (center) drilled out and then a LIV valve horizontal lateral to the vertical branch saddle output. An appropriately sized Stainless steel pipe stiffener shall be properly inserted in the end of the 2" HDPE horizontal pipe prior to assembly. The valve shall be accessible by a 10" round valve box with access lid overtop of a 6" HDPE, PVC or Drainage Pipe vertical extension centered on the valve and in the valve box with "mouse holes" cut out so vertical pipe is not resting on HDPE water line.



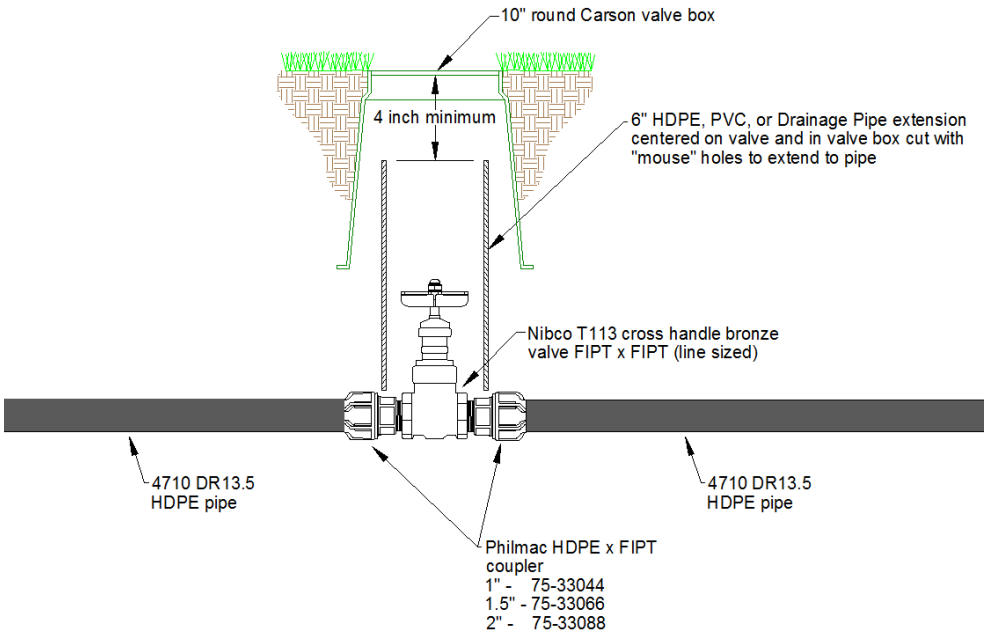
1.17 HDPE PIPE - VALVES 1 INCH TO 2 INCH

A. In line valves shall be installed in conjunction with the installation of the piping system. Threaded HDPE adapter fittings shall be used between valve and pipe. Valves shall be placed in an upright position. Valves shall be housed in a 10” round valve box with cover. A piece of 6-inch ADS Drainpipe shall be located between Valve Box and Valve. Each valve shall be installed as per the diagram shown below and in accordance with manufacturer’s recommendations.

B. Valves shall be a full port gate valve type construction rated for a minimum of 200 PSI. All gate valves shall be of bronze construction and provided with female I.P.S. threaded inlets. Lasco HDPE x MIPT transition unions shall be used to connect both sides of the valve to the HDPE pipe via the butt fusion process. Installation shall be in accordance with manufacturers recommendations.



C. Valves shall be a full port construction and made of Bronze. The valve shall be Nibco model T113 with bronze cross handle or similar. The valve shall be installed with Philmac HDPE x FIPT male adapters as per manufactures recommendation and as show in the detail below.



1.18 SWING JOINTS

A. All sprinklers shall be installed on swing joints and located as shown on the Plan. The sprinkler head shall be installed plumb, even with the finished grade level and in accordance with manufacturer's recommendations. All sprinkler head threaded connections shall be wrapped with Teflon tape or suitable Teflon paste that does not include linseed oil as an ingredient. The use of any pipe dope with linseed oil is prohibited.

B. Sprinkler head and quick coupler swing joints shall be manufactured by Toro, Lasco, or approved equal. Each swing joint shall be a minimum of Schedule 40 PVC construction, with an "O" ring seal at each "swing" joint for sealed flexibility. Risers and extensions shall be of no less than Schedule 40 PVC construction and shall be assembled using PVC solvent as per manufacturers' recommendations.

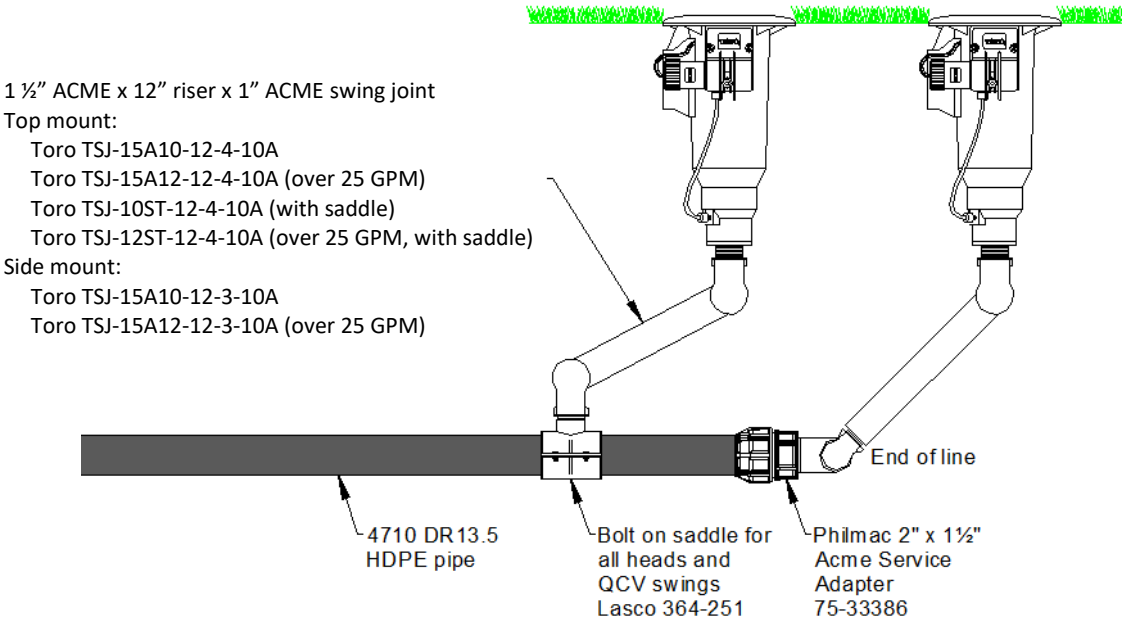
C. Swing joints for quick couplers shall include a one (1) piece brass insert molded into place. An "O" ring seal shall be present between the brass MIPT and the PVC components of the swing joint.

D. Swing joints shall be a minimum of 12" lay length and at the base have a 1.5" in diameter Male ACME thread to attach to Acme thread saddle or Acme service tee/elbow.

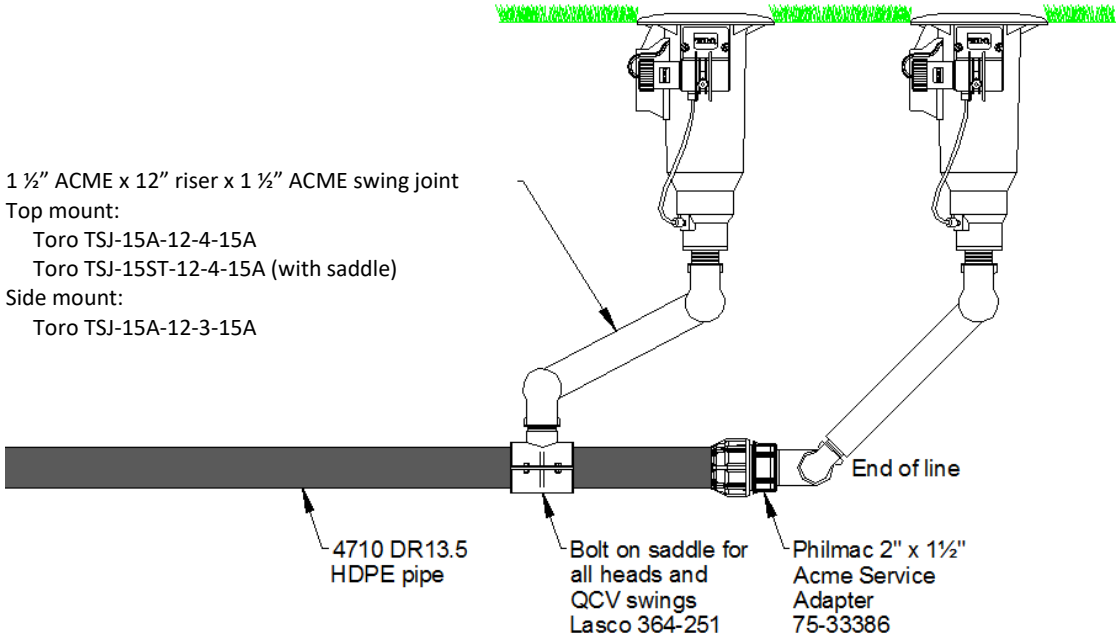
E. The swing joint risers and nipple lengths shall be of a sufficient size to allow for a minimum of 4-inch swing above and below the finished grade and in accordance with manufacturer's recommendations.

F. The swing joint and sprinkler shall have a minimum 5-year manufacturer warranty.

G. 1" FLEX Series Sprinklers shall be installed with the same manufacturer's swing joints as per the diagram shown below: (Diagram provided by Toro. Other manufacture's nomenclature and part numbers will vary).



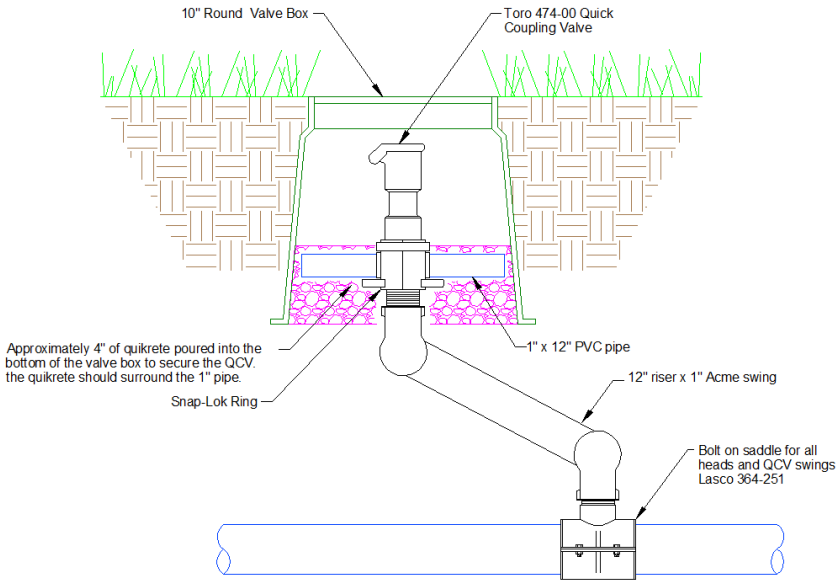
H. 1.5" FLEX Series Sprinklers shall be installed with the same manufacturer's swing joints as per the diagram shown below: (Diagram provided by Toro. Other manufacture's nomenclature and part numbers will vary).



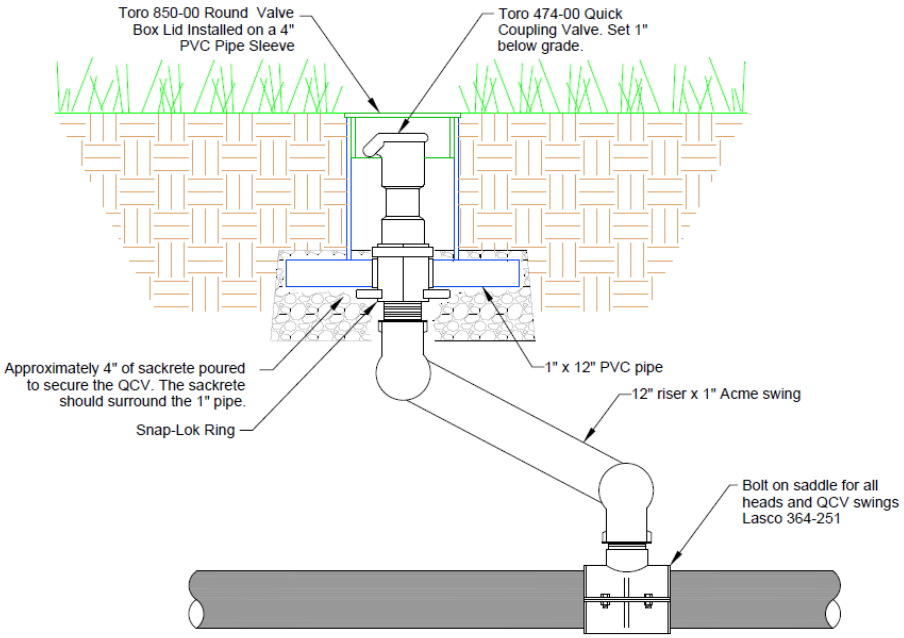
I.

1.19 QUICK COUPLING VALVES

A. All quick coupler valves shall be installed on swing joints, in locations agreed upon by the owner's representative, project manager and installer. All quick coupler valves shall be housed in a Tan 10" round valve box with cover unless otherwise directed by the owner's representative or project manager. Approximately 4 inches of quikrete shall be poured into the bottom of the valve box and around the 1" PVC pipe stabilizer to secure the QCV as shown in the detail below:



B. All quick coupler valves shall be installed on swing joints, in locations agreed upon by the owner's representative, project manager and installer. All quick coupler valves shall be housed in a 4" diameter SDR21 PVC sleeve capped with a Toro 850-00 OR Aspen Earth plastic lid unless otherwise directed by the owner's representative or project manager. Approximately 4 inches of quikrete shall be poured into the bottom of the 4" diameter PVC Sleeve and also around the 1" PVC pipe stabilizer to secure the QCV as shown in the detail below: (Diagram provided by Toro. Other manufacture's nomenclature and part numbers will vary).



C. Quick Couplers shall be located with a height so the stainless-steel lid can be flipped open and the key inserted and operated normally and without obstruction.

D. Any valves found to have settled, heaved or not be housed in valve boxes shall be reset at the Contractor's expense.

1.20 FIELD SATELLITE CONTROLLER - WIRE AND SPLICE INSTALLATION

A. Common Wire shall be 12 AWG solid copper conductor with PE insulation rated at 30 VAC minimum and carrying an embossed or printed Underwriters Laboratory file number indicating UL approval for direct earth burial installation. Paige Spec # P7079D (PE Jacket) or Regency Series #12PE25.

B. Control Wire shall be 14 AWG solid copper conductor with PE insulation rated at 30 VAC minimum and carrying an embossed or printed Underwriters Laboratory file number indicating UL approval for direct earth burial installation. Paige Spec # P7079D (PE Jacket) or Regency Series #14PE35.

C. All wire connections shall be done with 3M, DBR/Y-6 Connectors, which are UL listed under "UL 486D-direct burial" for wet or damp locations, 600 volts.

D. Do not yank, stretch, or excessively pull wire during installation. Provide a minimum of one foot of slack, in an expansion coil, in each 100 feet of wire. Lay wire on a firm, even bed in the trench, which shall support the wire its entire length.

E. At splice locations, provide sufficient slack to allow the splice to be raised a minimum of 24 inches above grade for inspection.

F. Take strict precautions to ensure that wires are not cut, scraped, or nicked during installation.

G. Do not lay wire above, or on top of, the pipe, except where pipe and wire are being vibratory plowed simultaneously.

H. Install the wire to the right side of the pipeline.

I. All wiring shall be buried to a depth of at least 16 inches (minimum) and to the depth of the pipe when new pipe is installed. Wire splices shall be kept to an absolute minimum number.

J. NOTE: All wiring to be installed shall be sized and located as indicated on the wiring plans and/or described in the drawing notes and specifications.

K. Trenched wire installation - Wiring shall be laid along with and under the mainline with enough slack to avoid wire being pulled taut during backfill procedure. Provide a minimum of one foot of slack, in an expansion "Z", in each 100 feet of wire and at all changes in direction. Take strict precautions to ensure that wires are not cut, scraped, or nicked during installation.

L. Pulled wire installation - Wire shall be laid down via a suitable size wire chute and shall in no case be "pulled" in with pipe. Pipe and wire depth must be monitored closely to insure 16" of cover is available at all times.

M. 24 Volt control wire shall be continuous between the controller and the electric control valve or Valve in head sprinkler with no splices. There is to be an individual control wire run from Controller to each electric control valve or valve in head sprinkler.

N. All controllers shall have separate commons. No tying together of common wires between controllers will be allowed.

O. Three (3) spare wires shall be provided to each green location from the controller feeding that respective green. The wires should be terminated with an individual DBR/Y-6 and located at the quick coupler valve closest to mainline.

P. For field satellite-based systems wire jacket color coding shall be as follows:

1. **24 Volt common** neutral wires shall be **yellow** in color
2. **Green and Green surround** signal wires shall be **Green** in color
3. **Tee and Tee surround** signal wires shall be **Orange** in color
4. **Fairway and Fairway surround** signal wires shall be **Blue** in color
5. **Spare signal wires** shall be **purple** in color
6. See Design plans for any additional colors that may be specified.

Q. Splice all wires to requirements of local wire code regulations or to the manufacturer's Specifications, whichever is more restrictive.

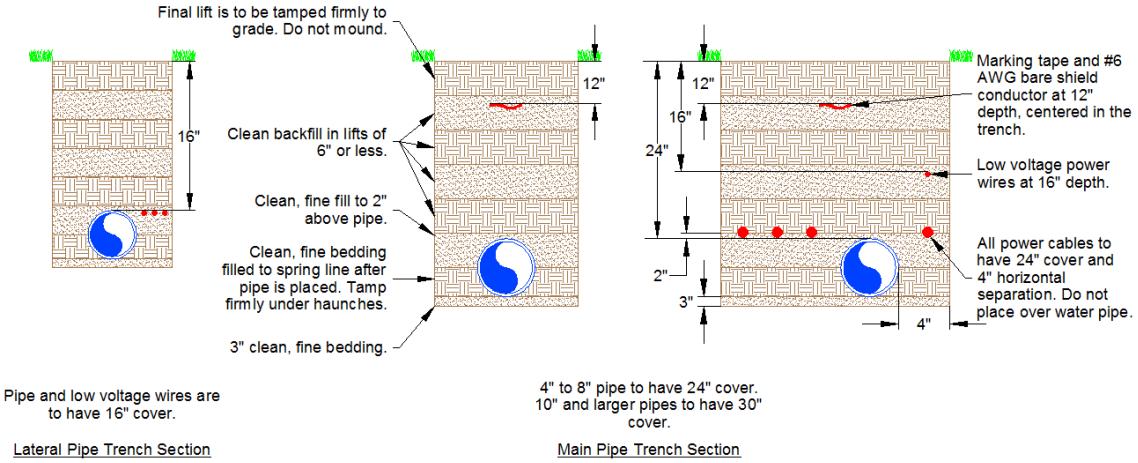
R. Make all splices by baring a minimum of three-quarters inch of cooper conductor, twisting the leads together. Crimp sleeves, wire nuts, or brass service clamps are acceptable. Make the splice using wire nuts and connector kits in strict accordance with manufacturer's recommendations during installation.

S. All in ground 24 VA wire splicing shall be accomplished with UL approved 3M DBR/Y-6 splice kits installed per the manufacturer's instructions. All 2-wire and LSM wire splicing shall be accomplished with UL approved 3M scotchcast resin splice kits.

T. A minimum of twenty-four inches (24") of wire shall be left at all electric control valves and valve-in-head sprinklers to allow extraction of the solenoid from the valve box or ground without cutting the wire. The extra wire shall be neatly coiled in the valve box or coiled up behind pilot valve tube, or inside the Top-accessible sprinkler.

U. At all splice locations including, mid wire run splices, wire size change locations, electric valve locations, and all in ground Tray Cable splices, contractor must provide sufficient slack to allow the splice to be raised a minimum of 24-inches above grade for inspection and locate them in a suitable valve box for future access.

V. Wire installation depths with and without pipe shall be as shown:



- 2" and 3" lateral pipes are to have 16" cover.
- 3", 4", 6" and 8" main pipes are to have 24" cover .
- Pipes 10" and larger are to have 30" cover.
- Pipe may not be installed at a greater or lesser depth without prior approval by owner or consultant.
- Pipe is to have continuous support on bedding. No bridging across voids.
- Changes in direction are to be accomplished by bending pipe into curved trenches and use of 45 degree or smaller angled elbows. 90 degree elbows are to be used only with prior approval.
- Cables are to be laid in trenches without tension. Bundle cables at regular intervals of 10 feet. All cables to be installed with slack loops of 3 feet at changes in direction and entry into splice boxes.

End of section

SECTION 03

High Density Polyethylene (HDPE) Pipe
(From the Fairfax County Pubic Facilities Manual, Section 6-0902.2.N.)

1. HDPE pipe must conform to the requirements of AASHTO M 294. The maximum size permitted is 48 inches. High Density Polyethylene pipe must conform to the classification Type S.

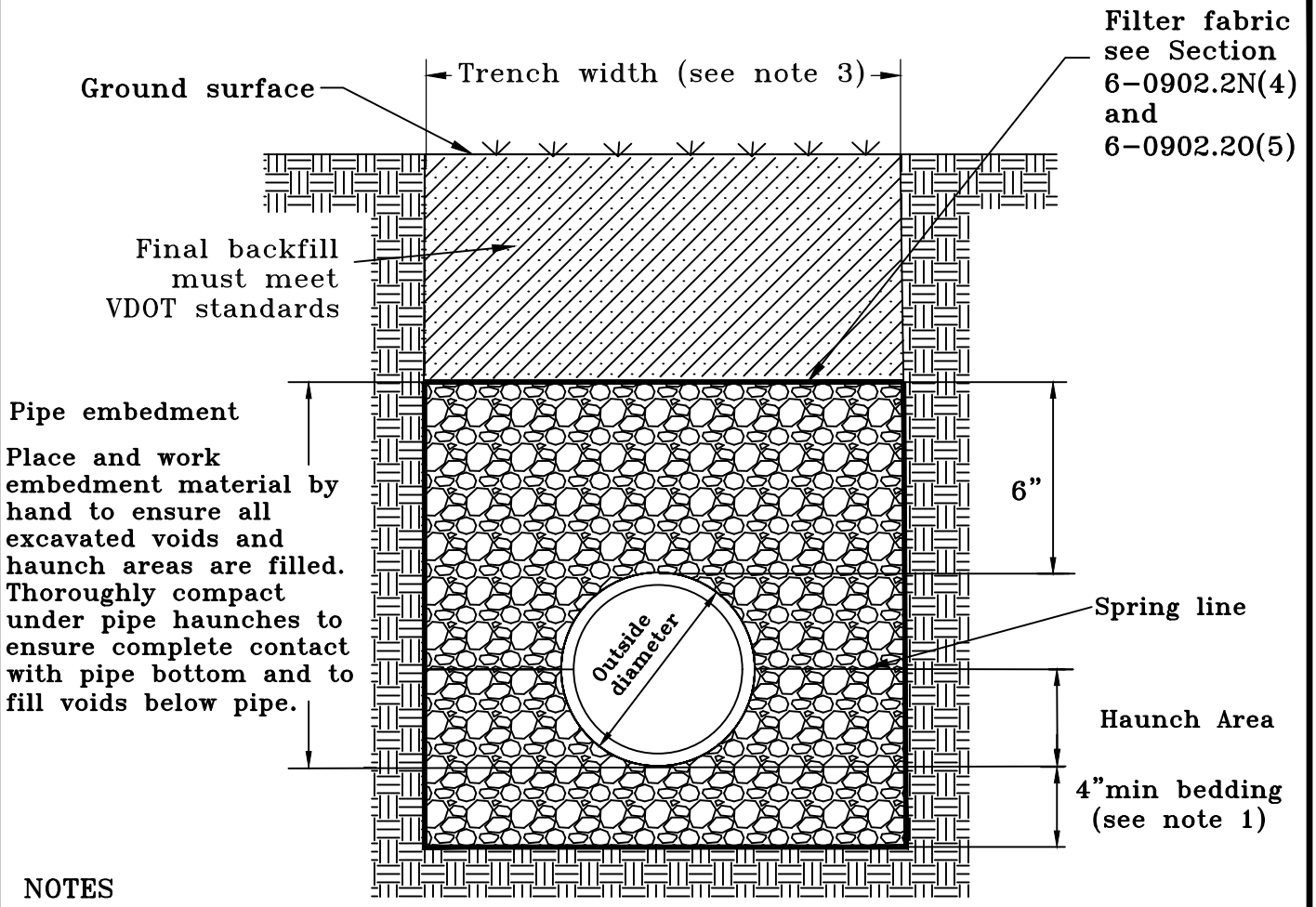
2. Joints must be watertight meeting a pressure test of 10.8 psi per ASTM D 3212 and use a bell and spigot design with a rubber gasket meeting the requirements of ASTM F 477, "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe." These joints are designed to prevent infiltration of soil and exfiltration of storm water.

3. Installations and pipe cover must be in accordance with ASTM D 2321 "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications", the manufacturer's recommendations and VDOT standards, whichever are more stringent. Pipe bedding and backfill must conform to the standards set forth in Plate 61-6 (see next page).

4. Filter fabric must surround the aggregate fill material when there is a high-water table or where the movement of groundwater can cause the migration of fines from the soil envelope. Provide an overlap of 2 feet minimum. Use non-woven geotextile fabric with AOS of 70-100 US Sieve or 0.22 mm – 0.15 mm as determined by ASTM D 4751 and a trapezoidal tear strength of 45 LB as determined by ASTM D 4533. Geotextile fabric may not be exposed to direct sunlight for more than 24 hours before installation.

5. The installer must use flexible waterstops, resilient connections, or other flexible systems to make watertight connections to manholes and other structures in accordance with ASTM F 2510/F 2510M, "Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Corrugated High Density Polyethylene Drainage Pipes," or ASTM C923 "Standard Specifications for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals" such as A-LOK, KOR-N-Seal, or approved equal. Grouting between the thermoplastic pipe and the manhole and other structures is not permitted.

6. All pipes must undergo inspection and deflection testing during and after installation to ensure proper performance in accordance with § 2-0401.



NOTES

1. Bedding must be in accordance with VDOT Road and Bridge Specifications, Section 302.023(a).
2. Embedment material must be placed alongside the pipe in uniform layers in lifts not to exceed 6" in depth. Embedment material must be VDOT aggregate No. 25 or 26, aggregate base material size 21A or 21B, flowable fill, or crushed glass conforming to the size requirements for crusher run aggregate size 25 or 26. Compaction must meet VDOT standards and be in accordance with PFM Section 4-0503 for minimum required site density testing.
3. Trench width must be specified by the Engineer and meet VDOT standards. Refer to ASTM D2321 for procedures for trench excavations that are especially important in flexible thermoplastic pipe installations such as support of trench walls and trench boxes. Moveable supports (e.g. trench boxes) should not be used below the top of the pipe zone (i.e. top of pipe to bottom of pipe) unless approved methods are used to maintain the integrity of the embedment material in accordance with ASTM D2321.

Ref. Sec. 6-0902.2N, 6-0902.20 Rev. 1-03, 2011 Reprint, 2018 Reprint, 1-19, 10-20	~~PP AND~~ HDPE PIPE TRENCH	PLATE NO.	STD. NO.
		61-6	

SECTION 04

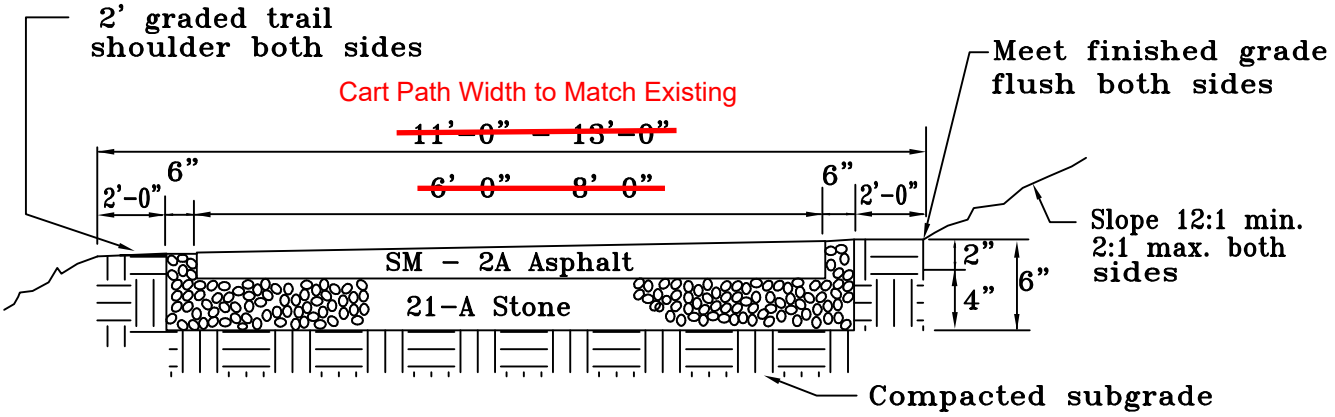
Asphalt Curbing:

Asphalt curbing construction shall meet the asphalt concrete requirements of "Section 502 - Incidental Concrete Items" of the Virginia Department of Highways (VDOT) 2020 or current Road and Bridge Specifications. Locations are as shown on the plans.

Cart Path:

Cart path construction shall meet the asphalt concrete requirements of "Section 504 - Sidewalks, Steps and Handrails" of the Virginia Department of Highways (VDOT) 2020 or current Road and Bridge Specifications, and "Plate 1-8 Trail Cross-Sections" of the Fairfax County Public Facilities Manual shown on the next page. Locations are as shown on the plans.

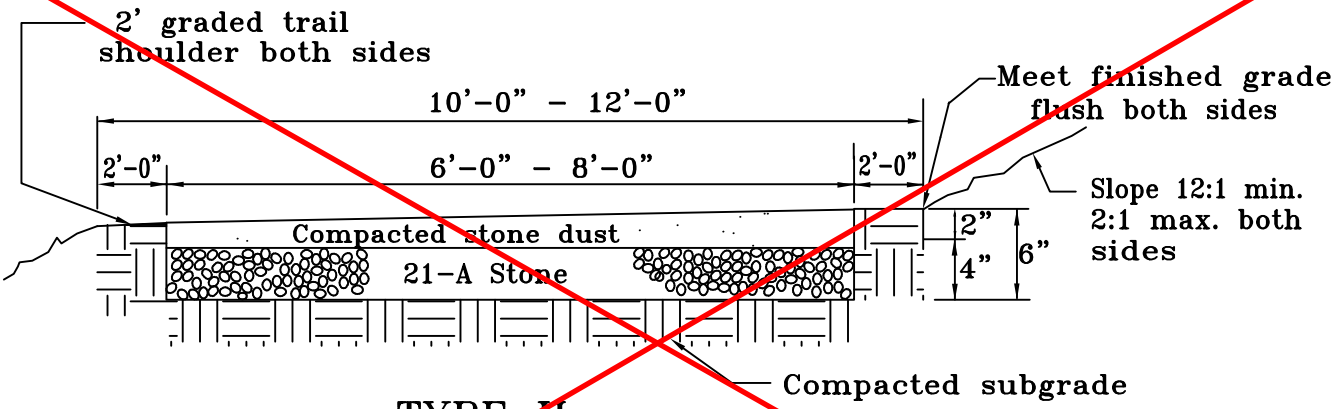
FAIRFAX COUNTY PUBLIC FACILITIES MANUAL



TYPE I

Suitable for bicycle and general pedestrian use. 8' is the required minimum width for bikeways and 6' the required minimum for walkways. Wider sections may be required in heavily traveled areas.

~~Where soil is well drained and compactable, the stone base may be eliminated and this section replaced by a 3 1/2" full depth asphalt section. Construction of this substitute section is subject to the approval of the Director.~~



TYPE II

Suitable for equestrian use, hiking and all-terrain (mountain) bicycle use in gently sloped topography. Susceptible to washout and sheet erosion on grades greater than 5%.

Depth of stone base depends on soil type, stability and drainage.

Ref. Sec. 8-0202.1B, 8-0203.1B Rev. 1-00, 2011 Reprint, 2018 Reprint	TRAIL CROSS-SECTIONS	PLATE NO.	STD. NO.
		1-8	

SECTION 05

For Fairway Seeding:

Creeping Bentgrass (*Agrostis palustris* "Penncross") Certified Seed 007, L-93 or approved equal:

Certified seed: seed used for all permanent seeding shall be certified. Certified seed is inspected by the Virginia Crop Improvement Association or the certifying agency in other states. The seed must meet published state standards and bear an official "Certified Seed" label.

Seedbed preparation: Prepare well drained soil by using highly permeable mixtures of sand and organic amendments.

Seeding rate: 1 pound per 1,000 sq. ft shall be used. If mulch is applied over the seed, about 50 pounds mulch per 1,000 sq. ft. shall be used. Light, frequent watering is necessary on these highly permeable soil mixtures to keep the seedbed moist. The mulch may reduce the frequency of watering from 5 to 7 times per day to 2 to 3 times per day.

Reseeding: Contractor is responsible for seeding and watering all disturbed areas as the project moves from tee box to tee box. If vegetative cover is inadequate, over-seed and fertilize in accordance with soil test results.

Fertilization: Cool season grasses shall begin to be fertilized 90 days after planting to ensure proper stand and density by Town staff. Warm season fertilization shall begin at 30 days after planting by the Contractor. Soil tests shall determine amounts. For bidding purposes, assume 4 lbs. of nitrogen per 1,000 square feet of disturbed area.

For Non-Fairway Permanent Seeding (pond area, etc.):

See "Standard & Specification 3.32 – Permanent Seeding" from the 1992 VA DEQ Erosion & Sediment Control Handbook. Only TALL FESCUE (*Festuca arundinacea*) or TALL FESCUES (Improved) shall be used on this project.