PART 1: MATERIALS

1-1 PIPE:

Select the pipe resin that apply

A. Pipe shall be manufactured from a PE 4710 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D3350-05 with a cell classification of PE 445474C. Pipe shall be manufactured to the dimensions and requirements of ASTM F714. Pipe shall be DR ___ (____ psi WPR) unless otherwise specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All HDPE pipe shall be in straight lengths. (2" HDPE pipe can be in coils if contractor straighten and re-rounds pipe with a Line Tamer Machine). The Pipe shall be supplied by ISCO Industries, LLC. (800) 345-ISCO or equal.

A. Pipe shall be manufactured from a PE 3408/3608 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D3350-05 with a cell classification of PE 345464C. Pipe shall be manufactured to the dimensions and requirements of ASTM F714. Pipe shall be DR ___ (____ psi WPR) unless otherwise specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All HDPE pipe shall be in straight lengths. (2" HDPE pipe can be in coils if contractor straighten and re-rounds pipe with a Line Tamer Machine). The Pipe shall be supplied by ISCO Industries, LLC. (800) 345-ISCO or equal.

B. The supplier of the HDPE pipe and fittings must comply with the following requirements:

1. The supplier must be capable of supplying both the pipe and fittings.
2. The supplier must be capable of manufacturing special fittings within its own manufacturing facility using a DataLogger.
3. The supplier must have the capability to train the contractor's employees in butt fusion, electrofusion and socket fusion of HDPE pipe and fittings.
4. The supplier must be capable of providing a "Hot Line" phone number to assist in fusion and fusion equipment questions.
5. The supplier must be capable of providing a trained representative on site upon the request of the contractor, owner or consultant to address any problems that are encountered during the installation.
6. The supplier must be capable to rent, sell and service fusion equipment.
7. The supplier must furnish a written 5 year limited Warranty for HDPE pipe and fittings Golf and Turf Irrigation Applications as provided by ISCO Industries, LLC.
8. Recommended supplier: ISCO Industries, LLC.

2-1 FITTINGS:

A. Butt Fusion Fittings - Fittings shall be PE3408/3608 HDPE, Cell Classification of PE 345464C as determined by ASTM D3350-05. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall

have the same pressure rating as the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using a DataLogger. Reference to the DataLogger Quality Control records should be referenced from an indented stamp in each fusion bead of each fitting. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records.

B. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 3408/3608 HDPE, Cell Classification of 345464C as determined by ASTM D3350-05. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D3261. Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

C. Compression Fittings – Compression Fittings shall be polypropylene, manufactured for connection to HDPE pipe, manufactured by Cepex and supplied by ISCO Industries LLC.

Select the valves that apply

D. Main Line Isolation Valves shall be Broen Ballomax Polyethylene Ball Valves with HDPE SDR fusible ends to connect to HDPE pipe as manufactured by Broen and supplied by ISCO. They shall be PE3408/3608 and have operating nut and be pipe line size.

D. Main Line Isolation Valves shall be D. I. AWWA C509 gate valves with HDPE fusible ends, SDR and size the same as the main line, 2” operating nut, and as manufactured by AVK and supplied by ISCO.

D. Main Line Isolation Valves shall be D.I. AWWA C509 gate valves with Flange ends and 2” operating nut. They shall be pipe line size.

D. Main Line Isolation Valves Shall be D. I. AWWA C509 gate valves with M. J. ends and 2” operating nut. They shall be pipe line size.

Select the lateral valves that apply

E. 2” Lateral Isolation Valves shall be Cepex model BV-200-FMI-FMI with female IPT ends as supplied by ISCO Industries, LLC.

E. 2” Lateral Isolation Valves shall be Cepex model BV-200-IPS-IPS with compression ends for HDPE pipe as supplied by ISCO Industries, LLC.

E. 2” Lateral Isolation Valves shall be Cepex model BV-200-IPS-FMI with one compression end and one female IPT end as supplied by ISCO Industries, LLC.

E. 2” Lateral Isolation Valves shall be Omni threaded ball valve as Manufactured by Asahi and supplied by ISCO Industries, LLC.

Select the branch saddles that apply

F. All lateral line mechanical taps on main line piping 3" and larger shall be made using a JCM 406 double-strap tapping saddles as supplied by ISCO Industries, LLC, with the hole drilled after the saddle is installed.

F. Fused taps on HDPE pipe shall be made using Electrofusion branch saddles with 2" IPS HDPE outlet. The pressure rating shall be equal to or greater than the pipe. Frialen as supplied by ISCO Industries, LLC.

F. Fused taps on HDPE pipe shall be made using Electrofusion VA saddles with 2" FIPT outlet. The pressure rating shall be equal to or greater than the pipe. Frialen as supplied by ISCO Industries, LLC.

F. Fused taps on HDPE shall be ISCO HDPE side wall fusion branch saddle using a McElroy Sidewinder machine, supplied by ISCO Industries, LLC.

Select the sprinkler connection fitting that applies

G Mechanical taps on 2", 3", and 4" pipe for sprinkler connections shall be made using LASCO 364 saddle tee with 1½ acme thread outlet, drilling the hole prior to installing the saddle

G 2" HDPE molded tee with AL/BR 1 ½" FIPT tap outlet as manufactured by Poly-Cam and supplied by ISCO Industries, LLC shall be fused by the contractor into the 2" lateral HDPS pipe for sprinkler connection.

G. 2" Cepex Tee model 24016 with compression ends and 2" FIPT outlet. With 2"x1 ½" bushing for sprinkler connection, as supplied by ISCO Industries, LLC.

PART 3: EXECUTION

3-1 GENERAL:

A. Pipe and Fittings: Size as indicated on the plans. Install as shown in accordance with manufacturer's recommendations.

3-2 HAULING, UNLOADING and DISTRIBUTING PIPE: During loading, transportation and unloading, every precaution shall be taken to prevent injury to the pipe. No pipe shall be dropped from cars or trucks, or allowed to roll down slides without proper retaining ropes. During transportation each pipe shall rest on suitable pads, strips, skids or blocks securely wedged or tied in place. Any pipe damaged shall be replaced.

3-3 FUSION:

A. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe supplier's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe supplier, including, but not limited to, temperature requirements of 400 degrees

Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The fusion equipment used shall be manufactured by McElroy Manufacturing, or equal. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself.

B. Electrofusion may be used where the butt fusion method cannot be used. Electrofusion couplings and fittings shall be PE3408/3608 HDPE, Cell Classification of PE 345464C as determined by ASTM D3350-05. Electrofusion couplings or fittings shall have a manufacturing standard of ASTM F1055. Couplings and fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.

C. Mechanical connection to other types of pipe shall be made by one of the Following methods:

1. Flange, using HDPE flange adapter with ductile iron back up ring, and ISCO zinc-plated bolt pack.
2. Mechanical joint, using HDPE Mechanical Joint (MJ) adapter kit.
3. ISCO bell MJ adapter with kit (4”- 12”)
4. Threaded connection; ISCO Al/Br male threaded x HDPE transition fitting.

3-4 INSPECTION: Inspect the pipe for defects before installation and fusion. Defective, damaged or unsound pipe will be rejected.

3-5 TESTING: Hydrostatic testing shall be in accordance with Section XXXXX (Shall be provided by engineer)

Quality Control testing (select all that apply)

Quality Control Testing (On Site Bend Back Test)

Prior to HDPE pipe being installed in the trench, at the beginning of the job, the contractor shall cut out the first butt fusion of each pipe size. The contractor shall prepare the sample for the test in accordance with the “Job Aid/ Bend Back Testing” procedure document prepared by ISCO Industries, LLC dated Oct. 26, 06 or as revised, and in accordance with ASTM D 2657. The samples shall be tested in the presence of the owner’s representative and / or the irrigation consultant, all in accordance with testing procedures outlined in the ISCO document. All samples shall be labeled and saved. Testing must be done at 73 degrees F plus or minus 5 degrees. The test temperature and sample size are critical to testing.

The purpose of the test is to determine if a good weld was made. A pass means no failures during the bend back test. This means a good weld. A break means a bad weld. Any failure shall require additional testing.

Quality Control Testing (F M Destruction Test)

Prior to HDPE pipe being installed in the trench, after the contractor has begun butt fusion of the pipe, the irrigation consultant and/or the owners representative reserve the right to select at random two butt fusion joints (with a minimum of 18” of pipe on each

side of the joint). These samples shall be sent to the HDPE supplier (ISCO) for hydrostatic testing at the contractor's expense.

The testing procedure shall be to Factory Mutual Standards. In no case will the failure be in the butt fusion joint. The test will be recorded and sent to the contractor and irrigation consultant. Upon failure of any butt fusion weld; contractor may/will be required to cut and re-weld all questionable butt fusion joints as directed by the Irrigation Consultant.

Quality Control Testing (McSnapper Test)

Prior to HDPE pipe being installed in the trench, after the contractor has begun butt fusion of the pipe, the irrigation consultant and/or the owners representative reserve the right to select at random two butt fusion joints (with a minimum of 8" of pipe on each side of the joint). These samples shall be sent to the HDPE supplier (ISCO Industries, LLC) for McSnapper testing at the contractor's expense.

ISCO will prepare and test pipe sample with a McSnapper Impact Tensile Test Unit. The test sample must be cut to the exact dimensions required for the McSnapper test. A good weld will provide a ductile failure. A bad weld will be indicated by a brittle failure usually in the weld. The test results will be recorded and sent to the contractor and irrigation consultant. Upon failure of any butt fusion weld; contractor may/will be required to cut and re-weld all questionable butt fusion joints as directed by the Irrigation Consultant

Record Butt Fusion Detail

All main line pipe joints are to be butt fused using McElroy fusion equipment. Each McElroy butt fusion unit shall be equipped with a McElroy DataLogger. The contractor shall label each butt fused joint so as it will be recorded on the DataLogger. The DataLogger shall record temperature, fusion pressure, with a graphic representation of the fusion cycle and shall be part of the quality control records. The DataLogger information shall be downloaded weekly and given to the irrigation consultant or owners representative for quality control records.

Contractor Qualifications

The contractor shall have successfully installed high density polyethylene pipe in golf/turf irrigation projects. References will be required. These reference(s) must provide a satisfactory response or the experience will not be accepted.

If a contractor has not previously successfully installed HDPE pipe for golf/turf irrigation projects, he will be required to have a qualified fusion technician from the pipe supplier for a period of three to five day (at the expense of the contractor). The length of time required for HDPE pipe (fusion and mechanical) training shall be determined by the owner or his representative. The technician must have been trained and have fusion certification. The training must have been completed within the past twelve months. A designated person or persons will be trained by the technician. The training will include the following:

1. butt fusion
2. socket fusion
3. electrofusion
4. attachment of mechanical saddles.

5. If electrofused or side wall fusion is required, this training must also be complete while the technician is on site.

Contractor Equipment Qualifications

If the contractor owns butt fusion equipment, the equipment must be serviced prior to use for this project. The machine must be environmental friendly and satisfactory working order. The hydraulic system must be leak free. The pressure gage must be checked for accuracy and the thermometer checked.

If a butt fusion machine is rented, it must be rented from company that has a fusion machine service center or centers certified by the butt fusion machine manufacturer. The machine must arrive with certification that the pressure gage and heater thermometer were accurate when shipped.

ISCO HDPE Pipe 5 Year Limited Warranty for Golf and Turf Irrigation Applications

LIMITED WARRANTY: Seller warrants that, for a period of five years from the date of shipment for a Golf and Turf application, it will replace any section of ISCO HDPE pipe product that is defective in materials or workmanship, provided that Buyer, upon discovery of a defect, promptly notifies Seller of the defect and, as instructed by Seller at such time, either returns the product to Seller for inspection or allows Seller to inspect at the place of installation. If Seller determines the product to be defective, Seller will provide new product of the same specification and same quantity as the defective product and Seller will bear the expense of freight to deliver the replacement product to the jobsite for domestic projects, and to the closest USA port for foreign projects. Seller does not warrant the installation of product. Any defects introduced after the shipment of product by Seller, whether due to handling, installation or other cause, are not covered by this warranty. This warranty does not cover labor or other costs of installing products. Buyer's sole remedy for defective product shall be to receive replacement product as provided in this Limited Warranty.

OTHER THAN THE ABOVE LIMITED WARRANTY, SELLER MAKES NO WARRANTY AND EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

SELLER'S LIABILITY ARISING OUT OF OR RELATED TO THIS CONTRACT OR ANY PRODUCT OR SERVICE SUPPLIED BY SELLER (WHETHER SUCH LIABILITY IS ALLEGED AS A BREACH OF CONTRACT, BREACH OF WARRANTY, MISREPRESENTATION, NEGLIGENCE, INDEMNIFICATION, PRODUCT LIABILITY OR OTHERWISE) SHALL IN NO EVENT EXCEED THE ORIGINAL PURCHASE PRICE OF THE DEFECTIVE PRODUCT PLUS APPLICABLE FREIGHT COSTS ACTUALLY PAID BY BUYER. SELLER WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT OR PUNITIVE DAMAGES, LOSS OF PROFITS, LOSS OF BUSINESS OPPORTUNITY OR OTHER LOSS EVEN IF SELLER KNEW OR SHOULD HAVE KNOWN OF THE POSSIBILITY OF SUCH DAMAGES OR LOSSES.

CONTRACTOR'S WARRANTY

LIMITED WARRANTY: Contractor warrants that, for a period of five years from the date of installation, it will re-fuse or repair a fusion connection that is defective in workmanship, provided that Buyer, upon discovery of a defect, promptly notifies Contractor of the defect and, allows the Contractor to inspect at the place of installation.

If it is determined the fused connection to be defective, Contractor will re-fuse or repair the connection at the jobsite. Contractor does not warrant the product itself, only the fused connection. This warranty does not cover labor or other costs, only the fused connection. Buyer's sole remedy for defective connection shall be to receive replacement fusion of the pipe or fitting as provided in this Limited Warranty.

OTHER THAN THE ABOVE LIMITED WARRANTY, CONTRACTOR MAKES NO WARRANTY AND EXPRESSLY DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

CONTRACTOR'S LIABILITY ARISING OUT OF OR RELATED TO THIS CONTRACT OR ANY PRODUCT OR SERVICE SUPPLIED BY CONTRACTOR (WHETHER SUCH LIABILITY IS ALLEGED AS A BREACH OF CONTRACT, BREACH OF WARRANTY, MISREPRESENTATION, NEGLIGENCE, INDEMNIFICATION, PRODUCT LIABILITY OR OTHERWISE) SHALL IN NO EVENT EXCEED THE ORIGINAL PURCHASE PRICE OF THE DEFECTIVE CONNECTION PLUS APPLICABLE FREIGHT COSTS ACTUALLY PAID BY BUYER. CONTRACTOR WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL, SPECIAL, INDIRECT OR PUNITIVE DAMAGES, LOSS OF PROFITS, LOSS OF BUSINESS OPPORTUNITY OR OTHER LOSS EVEN IF CONTRACTOR KNEW OR SHOULD HAVE KNOWN OF THE POSSIBILITY OF SUCH DAMAGES OR LOSSES.