

SECTION 02624

HDPE PRESSURE PIPE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. High density polyethylene pipe including fittings and appurtenances
- B. Magnetic locator tape

1.2 RELATED SECTIONS

- A. Section 02200—Earthwork
- B. Section 15060—Pipe and Pipe Fittings

1.3 REFERENCES

- A. AWWA C901—Polyethylene (PE) Pressure Pipe and Fittings
- B. AWWA C906—Polyethylene (PE) Pressure Pipe and Fittings, 4 inch (100 mm) Th. 63 inch for Water Distribution and Transmission
- C. AWWA M55—Manual of Water Supply Practices: PE Pipe - Design and Installation
- D. ASTM D1248—Polyethylene Plastics Extrusions for Wire and Cable
- E. ASTM D3261—Butt heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- F. ASTM D3350—Polyethylene Plastics Pipe and Fittings Materials
- G. ASTM F585—Insertion of Flexible Polyethylene Pipe into Existing Sewers
- H. ASTM F714—Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter
- I. ASTM F1417—Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air
- J. PPI TR4—Hydrostatic Design Basis and Maximum Recommended Hydrostatic Design Stresses for Thermoplastic Piping Materials

1.4 REGULATORY COMPLIANCE

- A. Nevada Administrative Code 445A

1.5 SUBMITTALS

- A. Product data: Provide data on pipe materials, pipe fittings, and accessories. Provide manufacturer's catalog information with dimensions, material, and weights. Provide sufficient information or data to verify compliance with performance and design requirements
- B. Test reports: Submit reports of field pressure tests. Submit results of field butt fusion testing along with test strap samples
- C. Manufacturer's installation instructions: Provide additional installation instructions not specifically covered herein
- D. Manufacturer's certificate: Certify that polyethylene pipe and fittings provided meet or exceed the specified requirements

1.6 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of piping installation, connections, and top of pipe elevations. Survey using Barrick grid coordinate system with northing, easting, and elevation. Survey all pipe prior to burial except road crossings. Note all valves and manholes on survey. Provide survey to Owner in AutoCAD format or current version.
- B. Identify and describe unexpected variations to site conditions or discovery of uncharted utilities

1.7 QUALIFICATIONS

- A. Manufacturer:
 - 1. Company with manufacturing and quality control facilities capable of producing and assuring the quality of pipe and fittings as specified herein
 - 2. Polyethylene pipe and fittings provided by the same accepted manufacturer
 - 3. Pipe and fittings from different accepted manufacturers shall not be interchanged
- B. Installer: Company specializing in performing the work of this section approved by manufacturer

1.8 FIELD SAMPLES

- A. Provide fused joint sample upon initial use of thermal fusion machine. Retain joint sample acceptable to Engineer as a standard for fused joint quality
- B. Provide one fused joint strap sample with test reports for each day of pipe fusing. Identify date prepared

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site
- B. Exercise care to prevent damage to material during loading, transporting and unloading:
 - 1. Use wide belly-band slings to lift, move, or lower pipe and fittings
 - 2. Do not use rope
 - 3. Inspect and use slings of sufficient capacity for the load
 - 4. Do not use worn or defective equipment

1.10 COORDINATION

- A. Coordinate work with sub-contractor, surveyor, and deliveries from pipe manufacturer
- B. Coordinate the work with the Owner. Schedule work of this section so as not to interfere with Owner operations

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Polypipe
- B. Performance Pipe
- C. Driscopipe Piping Systems
- D. Or accepted equal

2.2 MATERIALS

- A. Pipe and fittings:
 - 1. ASTM D3350: PE 4710 high density polyethylene
 - 2. Standard grade ratings: 1,600 psi at 73 degrees F
 - 3. Pure material except for materials obtained from manufacturer's own production of the same formulations, no rework compounds are acceptable
 - 4. Polyethylene resin compound containing antioxidants
 - 5. AWWA C906

- B. Potable water service: Material listed and approved by NSF Standard 61

2.3 ACCESSORIES

- A. Bedding and backfill: Provide under provisions of Section 02200
- B. Pipe-joining equipment:
 - 1. Hydraulic pressure controls for fusing the two pipe ends together
 - 2. Electric or gasoline engine-powered facing unit to trim irregularities from pipe ends
 - 3. Electrically heated and thermostatically controlled heating plate with temperature monitoring gauge
 - 4. External appearance of fusion head: Smooth without significant juncture groove
- C. Warning Tape
 - 1. Width per plan, 10 mil minimum thickness, colored blue.
 - 2. Equal in all respects to Christy's warning tape
- D. Locator Wire
 - 1. Shielded copper, blue color wire, placed in the trench adjacent to each line.
 - 2. Locating wire shall be #8 AWG
 - 3. Install locating wire on top of pipe prior to backfilling, under laterals, extending into the meter set up to the meter cover, and extended up to fire hydrants and wrapped twice around flange.
 - 4. Prior to acceptance of water line, contractor shall perform a continuity test to the satisfaction of the Inspector.

2.2 FABRICATION

- A. Polyethylene pipe: ASTM F714 - AWWA C906, indicate on pipe:
 - 1. Homogeneous throughout, free of visible cracks, holes, foreign material, blisters, or other deleterious faults
- B. Polyethylene fittings, custom fabrications and manholes:
 - 1. Molded or fabricated by pipe manufacturer or authorized representative
 - 2. Thermal butt fusion outlets made to same outside diameter and wall thickness dimensions and tolerances as pipe to which joining is intended
 - 3. Construct custom fabrications and manholes to shop drawings accepted by Engineer
- C. Molded fittings: ASTM D3261, indicate on fittings
- D. Fabricated fittings: Not acceptable
- E. Polyethylene mechanical joint adapters:
 - 1. Fabricate with sufficient through bore length to be clamped in a thermal butt fusion joining machine without the use of stub-end holder

2. Machine sealing surface with series of small v-shaped grooves. Provide grooves for gasketless sealing and to restrain gasket against blow-out
3. Provide with MJ gasket, backing ring, and bolts

F. Service identification stripes:

1. Provide permanent identification by co-extruding four equally spaced color stripes into pipe outside surface
2. Use striping material as same material as pipe material except for color
3. Use the following stripe colors to identify pipe service if available: Light blue - potable water

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that work may proceed
- B. Carefully examine polyethylene pipe and fittings for cracks, deep cuts or scratches, kinking or other defects prior to installation
- C. Repair of damaged pipe may be performed by cutting out the damaged section and rejoining the pipe by thermal butt fusion as accepted by Engineer. Remove all defective pipe sections from site
- D. Start installation only when conditions are satisfactory
- E. Verify existing utilities prior to excavation

3.2 JOINING

A. Thermal fusion joining:

1. Join sections into long strings of pipe using only procedures that are approved by the pipe and fitting manufacturer
2. Join aboveground by leakproof, thermal, butt fusion joints
3. Do not remove external and internal beads
4. Strength of completed joints must be equal to or greater than that of adjacent pipe as demonstrated by tensile test
5. Threaded or solvent cement connections will not be permitted

B. Thermal butt fusion of unlike wall thicknesses:

1. Perform thermal butt fusion between pipe ends, or pipe ends and fitting outlets, of like outside diameter and wall thickness (SDR or DR)
2. Thermal butt fusion joining between like diameters but unlike wall thickness shall not be permitted
3. Make transitions between unlike wall thicknesses with a transition nipple. Use a short length of heavier wall pipe with one end machined to the thinner wall
4. Only use mechanical couplings with joint restraint where shown on the

Drawings or as accepted by Engineer

- C. Mechanical joining:
 - 1. Flanged connections: For joining polyethylene pipe and fittings together or other materials by means of flange adapters and back-up rings
 - 2. Mechanical couplings: Designed for joining polyethylene pipe or polyethylene pipe to another material, fully pressure rated
 - 3. Provide joint restraint where required by Engineer and as shown on Drawings
 - 4. Use fully restrained mechanical coupling in lieu of external joint restraint
 - D. Mechanical joints:
 - 1. Install per manufacturer's instructions
 - 2. Provide joint restraint where required by Engineer and as shown on Drawings
 - E. Pipe-Joining Equipment:
 - 1. Use equipment approved or provided by the pipe manufacturer
 - 2. Do not remove equipment from site until polyethylene pipe is acceptable to Engineer
 - 3. Make all butt fusion joints at temperature per pipe manufacturer instructions
 - 4. Periodically check temperature gage
 - F. At the end of each work provide temporary plug to prevent entrance of birds, insects, dust, and other foreign material into pipeline
- 3.3 INSTALLATION
- A. Install in accordance with manufacturer's instructions and AWWA C906 and M55
 - B. Perform Bedding and backfill work under provisions of Section 02200:
 - C. Mechanical joint and flange connections:
 - 1. Install per manufacturer's instructions
 - 2. Center and align flange faces to each other before assembling and tightening bolts
 - 3. Do not use flange bolts to draw flanges into alignment
 - 4. Lubricate bolt threads and fit flat washers under flange nuts
 - 5. Evenly tighten according to acceptable tightening pattern and torque step instructions of manufacturer
 - 6. Re-tighten flange connections one hour after initial assembly following the tightening pattern and torques step instructions
 - 7. Use final tightening torque of 100 ft-lbs or less as instructed by manufacturer
- 3.4 FIELD QUALITY CONTROL
- A. Field inspection and testing will be performed under provisions of Section 01400 in presence and to satisfaction of Engineer
 - B. Butt Fusion Testing:
 - 1. Perform trial fusion for first fusion of each day butt fusions are to be made

2. Allow trial fusion to cool completely and cut out fusion test strap with fusion in center
3. Test strap length: 12 inch minimum, or 30 times wall thickness
4. Test strap width: 1 inch minimum, or 1.5 times wall thickness
5. Bend test strap until ends of strap touch
6. If fusion fails at joint, make a new trial fusion, cool and test
7. Do not proceed with butt fusion of pipe to be installed until trial fusion passes the bent strap test
8. Submit passing bent strap samples as required herein

C. Pressure testing

1. Test each line at the Contractor's expense in the presence and to the satisfaction of Owner or Engineer
2. Test before pipe burial except at road crossings
3. Provide all testing equipment materials, tools, appliances, devices, and labor
4. Test potable water and raw water mains per plan set.

D. Procedure:

1. Disconnect all fixture devices and other accessories which may be damaged by the specified test pressure
2. Plug or cap ends as required
3. Test for 1 hr with no loss in pressure in other piping
4. Determine leakage by loss of pressure, soap solution, chemical indicator or other positive method
5. All joints shall be tight
6. Repair leaks and repeat test until no pressure loss over 1 hr period

3.5 PIPING SCHEDULE

A. Standard Dimension Ratio (SDR)

1. As shown on drawings
2. 11 unless noted otherwise

END OF SECTION

SECTION 11306 PUMPING PLANT

PART 1 GENERAL

This specification covers the installation and materials for a pumping plant. Pumping plants shall be installed in accordance with an approved design. Details of construction shown on the drawings but not included herein are considered as a part of this specification. Construction activities shall be in accordance with applicable OSHA regulations.

1.1 RELATED SECTIONS

- A. Section 02220—Water Well

PART 2 PRODUCTS

2.1 PUMP

- A. The pump or combination of pumps and associated power units shall be capable of delivering the design flow rate at the total dynamic head and efficiencies as specified on the drawings. The power unit shall be capable of operating the pump at the maximum capacity and head without being in an overload condition.
- B. The pump supplier shall provide a copy of the Manufacturer's pump curve.
- C. The power sources may be internal combustion engines, electrical motors or power takeoffs. The shield or guard from the drive units shall be in place and properly secured.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Electrical Work
 - 1. All electrical wiring and equipment shall be in accordance with current applicable standards of the National Electrical Code (NEC), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratory, INC. (UL), and local laws and regulations.
- B. Pipe Connections
 - 1. The inlet and discharge connections shall be sized for the pump and be installed to minimize losses through bends, valves and transitions.
- C. Power Sources
 - 1. The power source shall be properly secured as shown on the drawings or as per the manufacturer recommendations.

2. The area around the power source shall be protected from damage and fenced as necessary to prevent unauthorized access.

END OF SECTION

SECTION 13300
LIVESTOCK WATERING FACILITY

PART 1 GENERAL

This specification covers the installation and materials for a livestock watering facility. Installation shall be in accordance with an approved design and plan. Details of construction shown on the drawings but not included herein are considered as a part of this specification. Construction activities shall be in accordance with applicable Occupational Safety and Health Administration (OSHA) regulations.

1.1 RELATED SECTIONS

- A. Section 15060—Piping and Pipe Fittings

PART 2 MATERIALS

2.1 TROUGHS

- A. The trough shall be constructed of the materials as specified on the drawings. No used material is allowed in the installation, with the exception of heavy rubber tires retrofitted as troughs. PE and HDPE are the only plastic trough materials that will be accepted. No fiberglass troughs will be accepted.

2.2 CONCRETE

- A. Concrete work under these specifications shall be constructed to the dimensions, lines and grades as shown on the drawings. Concrete shall have a consistency such that it can be worked into corners and around reinforcement, but without permitting the materials to segregate or excess water to collect.
- B. Concrete compressive strength shall be at least 3000 psi at 28 days. The mix design shall be in accordance with ASTM C 94 and this specification.
- C. Cement shall be low alkali Type II or IIA Portland cement.
- D. Fly ash shall conform to requirements of ASTM C 618 as applicable.
- E. Water reducing admixtures shall be Type "A" meeting the requirements of ASTM C 494.
- F. Coarse aggregate shall be a maximum size of 1-1/2 inches per designations in ASTM C 33.
- G. Air entrainment conforming to the requirements of ASTM C 260 shall be used. The air content shall be 5 to 7 percent.

- H. Forms shall conform to the shapes, lines and dimensions as shown on the drawings. They shall be braced and/or tied together so as to maintain position and shape and be sufficiently tight to prevent leakage of mortar. Forms shall be thoroughly oiled or wetted and cleaned of debris prior to placement of concrete. Forms shall not be removed without the approval of the Engineer.
- I. Reinforcing steel deformed bars shall meet the requirements of ASTM A 615 and welded wire reinforcement shall meet the requirements of ASTM A 185. All reinforcement shall be free from rust, oil, grease, paint or other deleterious matter. Items to be embedded in the concrete shall be positioned accurately and firmly anchored to prevent displacement during placement of concrete. The minimum splice length for deformed bars is 30 bar diameters, and for welded wire mesh the larger of 6 inches or 2 mesh spacings.
- J. Concrete shall be deposited as closely as possible to its final position and shall be worked into the corners and angles of the forms and around all reinforcement and embedded items in a manner to prevent segregation of aggregates or excessive laitance. Consolidation of concrete shall be accomplished by means of internal type mechanical vibrators, rodding, spading or hand tamping. Concrete slump shall be in the range of 3 inches plus or minus 1 inch, unless cylinder test break data is submitted showing that compressive strength can be achieved with the higher slump.
- K. Construction joints shall be provided as shown in the plans or as approved by the engineer. Joints shall be thoroughly cleaned and laitance removed before a new pour is made. Each joint shall be wetted immediately before the placing of new concrete.
- L. After the concrete has been consolidated, the unformed surfaces shall be given a wood float finish. Immediately after form removal, formed surfaces shall be cleaned of all defective concrete and effectively repaired. Snap ties shall be removed and the holes mortared.
- M. Protection and Curing.
 - 1. Concrete shall be prevented from drying for a curing period of at least 7 days after it is placed. Exposed surfaces shall be kept continuously moist for the entire period. For formed surfaces, the protection may be accomplished by leaving the forms in place and keeping them wet for the entire curing period.
 - 2. In lieu of water curing, the concrete shall be cured by spraying with an approved sealing compound. The sealing compound shall be applied as soon as practicable after the concrete is finished. The sealing compound shall meet or exceed the requirements of ASTM C 309. All surfaces shall be kept moist until the compound is applied.

N. Concreting in Cold Weather

1. Before any concrete is placed, all ice, snow and frost shall be completely removed from all surfaces to be in contact with the new concrete and the temperature of these surfaces shall be raised to as close as may be practical to the temperature of the new concrete that is to be placed thereon. No concrete shall be placed on a frozen subgrade or on one that contains frozen materials.
2. Concrete shall not be mixed or placed when daily minimum atmospheric temperature is less than 40 degrees F. unless facilities are provided to ensure the adequate protection of the concrete. Temperature of the concrete at the time of placing shall not be less than 50 degrees F. or more than 90 degrees F. The use of accelerators or antifreeze compounds will not be allowed.

2.3 WOOD

- A. Unless otherwise specified on the drawings, all timber and lumber shall not be less than select merchantable boards, construction grade beams or timbers.

2.4 METAL

- A. Steel shall be a minimum thickness of 20 gage. All metal items, with the exception of galvanized or aluminum, shall be painted with two coats of synthetic primer paint and one coat of aluminum paint or equivalent protective coatings.

2.5 FROST FREE PLASTIC TROUGHS

- A. Commercial frost-free stock troughs may be used when specified on the drawings. The manufacturer's installation instruction shall be followed. However, the piping, foundation and site preparation shall also meet the minimum requirements of this specification.

2.6 HEAVY TIRE TROUGHS

- A. Large rubber tires with water-tight floors may be used when specified on the drawings.

2.7 WATER CONTROL

- A. Float controls shall be installed when shown on the drawings. Float controls shall be protected from damage by livestock. The piping shall be of the size, type and pressure class shown on the drawings.

2.8 PIPES

- A. Pipe shall be of the type, size and pressure rating shown on the drawings and shall meet the requirements of the appropriate material specifications.
- B. Steel pipe and fittings shall be galvanized and meet the requirements of AWWA Specification C-200.
- C. Plastic pipe shall comply with ASTM Specifications:
 - 1. D 1527 or D 2282 for AcrylonitrileButadiene-Styrene (ABS).
 - 2. D 2104, D 2239, D 2447, D 2737 or D 3035 for Polyethylene (PE).
 - 3. D 1785, D 2241, D 2672 or D 2740 for Polyvinyl Chloride (PVC).
 - 4. D 2513 for Thermoplastic Gas Pressure Pipe.
 - 5. D3350 and D 2837 for PE3408 HDPE Pipe.
- D. The pressure rating of fittings shall meet or exceed the strength requirements of the pipe. All fittings shall be of a material that is recommended for use with the type of pipe specified. As appropriate, plastic pressure pipe fittings shall conform to ASTM Specifications D 2464, D 2466, D 2467, D 2468, D 2609, D 2683, D 3139 and/or D 3261.
- E. 2683, D 3139 and/or D 3261.
- F. Solvents for solvent-welded, plastic pipe joints shall conform to one of the following ASTM specifications as appropriate: D 2235, D 2564 or D 2855. Rubber joints for pipe joints shall conform to ASTM F 477, Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- G. The pipe trench shall be excavated at the required location and depth as shown on the drawings and/or staked in the field. The bottom of the trench shall be reasonably smooth so that pipe will be properly supported.
- H. Trenches for pipelines shall be free of rocks and other sharp-edged materials. Plastic pipe shall be placed in a “snake” like position. Semi-rigid pipe may require expansion joint couplers.
- I. Plastic pipelines may be placed by “plow-in” equipment where soils are suitable, and rocks and boulders will not be detrimental to the pipe.
- J. Pipelines shall be placed so they are protected against hazards imposed by traffic, farm operations, freezing temperatures or soil cracking.
- K. Pipelines shall have a minimum cover of 18 inches. Other means of protection must be provided where the depth required for protection is impractical due to shallow soils over rock or for other reasons, i.e., mounding of backfill. Pipelines designated for winter use shall be buried the greater of (1) a minimum of three (3) feet, (2) below the depth of the anticipated frost line or (3) minimum depth shown on the drawings or specified in the plan.

- L. To minimize thermal stresses, installation should be planned to avoid exposing pipe to high temperatures prior to backfilling.

END OF SECTION

SECTION 15060
PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Piping complete with all fittings, jointing materials, hangers, supports, anchors and necessary appurtenances for:
 - 1. Distribution system potable water piping
 - 2. Waste and vent piping
 - 3. Building water supply piping
 - 4. Other miscellaneous piping

1.2 RELATED SECTIONS

- A. Section 02200—Earthwork
- B. Section 02624—HDPE Pressure Pipe
- C. Section 15100—Valves, Cocks, and Hydrants

1.3 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Shop Drawings:
 - 1. Submit under provisions of Section 01340
 - 2. Fabrication and/or layout drawings:
 - a. Exterior yard piping drawings (minimum scale 1-inch equals 10 feet) with information including:
 - 1) Dimensions of piping lengths
 - 2) Invert or centerline elevations of piping crossings
 - 3) Bury depth
 - 4) Details of fittings, tapping locations, thrust blocks, restrained joint segments, harnessed joint segments, hydrants, and related appurtenances
 - 5) Designated valve or gate tag numbers, manhole numbers, instrument tag numbers, pipe and line numbers
 - 6) Line slopes and vents
 - b. Interior piping drawings (minimum scale 1/8-inch equals 1 foot) with information including:
 - 1) Dimensions of piping and end connections
 - 2) Invert or centerline dimensions
 - 3) Location and type of pipe supports and anchors
 - 4) Locations of valves and valve operator type

- 5) Details of fittings, tapping locations, equipment connections, flexible expansion joints, connections to equipment and related appurtenances
 - 6) Valve and equipment tag numbers and instrument tag numbers
- C. Product Data: Sufficient data to verify compliance with the specifications:
 - 1. Technical product data on piping and piping appurtenances
- D. Test Reports:
 - 1. Copies of pressure test results on all piping systems
 - 2. Notification of time and date of piping pressure tests

1.4 REGULATORY REQUIREMENTS

- A. In accordance with all municipal codes and ordinances, laws and regulations of the state
- B. In case of apparent conflict, state and local requirements govern over these specifications
- C. In absence of state and local regulations, National Plumbing Code applies

PART 2 PRODUCTS

2.1 STEEL PIPE: GALVANIZED OR BLACK AS SCHEDULED

- A. Standard weight: ASTM A120, standard weight (Schedule 40) or FS WW-P-406, Weight A
- B. Nipples: CS5, extra strong (Schedule 80); close nipples permitted only by special authorization in each case
- C. Fittings:
 - 1. Malleable iron: ANSI B16.3 or FS WW-P-521:
 - a. Ungalvanized pipe: Type I, ungalvanized
 - b. Galvanized pipe: Type II, galvanized
 - 2. Drainage: FS WW-P-491
 - 3. Forged Steel: Schedule 40, 2,000 lb for standard weight pipe; Schedule 80, 3,000 lb for extra strong pipe:
 - a. Socket welding: ANSI B16.11; Bonney, Crane, Porter, or equal
 - b. Threaded: Bonney, Crane, Porter, or equal
 - 4. Flanged: Cast iron, 125 lb, ANSI B16.1
 - 5. Welding: ANSI B16.9
 - 6. Compression: Dresser "165 Plus-temp Couplings," with restraining rings, Telsco "Series 700 Clamp Style Fittings," with stainless steel clamp rings, or equal
 - 7. Unions:
 - a. Malleable iron: FS WW-U-531, Class 2:
 - 1) Ungalvanized pipe: Type A, ungalvanized
 - 2) Galvanized pipe: Type B, galvanized

- b. Forged steel: Tongue and groove flange type with non-metallic gaskets
- 8. Lightweight: To match pipe with flange diameter and drilling to match ANSI B16.1 125 lb
- 9. Flanges: ANSI B16.1, 125 lb or ANSI B16.5, 150 lb
- 10. Flange bolts and nuts: ASTM A307, length such that after installation bolts will project 1/8 to 3/8 inch beyond outer face of nut
- 11. Flange gaskets: ASTM D1330, Grade I; red rubber, ring type, 1/8 inch thick
- 12. Mechanical couplings: Dresser "Style 38," Smith- Blair "Type 411," or equal
- 13. Expansion joints:
 - a. 2-1/2 inch and smaller: Flexonics "Model H Expansion Compensation," or equal
 - b. 3 inch and larger: Flanged and with stainless steel bellows, "Flexonics Free Flexing Expansion Joint," or equal

2.2 PVC PIPE

- A. Water service:
 - 1. Pipe: ASTM D1785, Schedule 80, PVC 1120, with NSF International Seal
 - 2. Fittings: ASTM D2464 or D2467, PVC I; by pipe manufacturer or by Celanese, Chemtrol, or equal
 - 3. Flanges: Diameter and drilling per ANSI B16.5, 150 lb
 - 4. Flange bolts and nuts: ASTM A307, Grade B, galvanized, install such that bolts project 1/8 to 3/8 inch beyond the outer face of the nut
 - 5. Flange gaskets: Full face, 1/8 inch thick, neoprene or plasticized PVC
 - 6. Grooved couplings: Gustin-Bacon "Gruvagrip Series 100," Victaulic "Style 78," or equal

2.3 HDPE PIPE

- A. Refer to Section 02624 HDPE Pipe of the Technical Specifications for additional product information.
- B. All HDPE pipe shall be use PE 4710 resin, and shall have diameters and standard diameter ratios (SDR) as shown on the Project Drawings.
- C. The Contractor will be responsible for cutting and removing any damaged pipe and preparing ends for use in the Project.

2.4 Ductile Iron Pipe

- A. Standards: ANSI A-21.50, AWWA C150 and ANSI A-21.51, AWWA C151
- B. Thickness/Pressure Class:
 - 1. Below ground piping: Class 350 (4-inch to 12-inch), Class 250 (16-inch to 24-inch) and Class 200 (30-inch to 64-inch) unless otherwise noted or specified.
 - 2. Above ground piping: Flanged, Class 350 (minimum) unless otherwise noted or specified.
- C. Joints
 - 1. Push-on or Mechanical Joints (below ground piping)

- (1) Standards: ANSI A21.11, AWWA C111
 - (2) Class: 350-psi working pressure rating
 - (3) Gaskets
 - (a) Potable and Reclaimed Water Service: Styrene Butadiene Rubber (SBR) ring type.
 - (b) Wastewater Service: Neoprene rubber ring type.
- 2. Flanged (above ground or inside below ground vaults)
 - (1) Standards: ANSI A21.15, ANSI B16.1
 - (2) Class: 125-pound factory applied screwed long hub flanges, plain faced without projection.
 - (3) Gaskets
 - (a) Spans less than 10-feet: full-face 1/8-inch thick neoprene rubber
 - (b) Spans greater than 10-feet: Toruseal gaskets as manufactured by American Cast Iron Pipe or acceptable equal.
- 3. Restrained Joints
 - (1) Manufacturers: Lok-Ring system (all sizes) or locking type gasket systems (for 16-inch diameter and smaller) as manufactured by American Ductile Iron Pipe; MEGALUG System as manufactured by EBBA Iron; or acceptable equal.
 - (2) Class: 250-psi minimum design pressure rating.
 - (3) Standard mechanical joint retainer glands shall not be acceptable.
- 4. Joint Accessories
 - (1) Mechanical joint bolts, washers and nuts: Ductile iron or Corten steel.
 - (2) Flanged joint bolts, washers and nuts: 316 stainless steel with bolts and nuts conforming to ASTM A193 Grade B8M.
- D. Pipe Length (below ground installation): 20-feet maximum nominal length.

2.5 PIPE INSULATION AND ACCESSORIES

- A. Piping: FS HH-1-558B, 1 inch thick; glass fiber, with flame retardant vapor barrier jacket
- B. Watertight and dust-tight pipe sleeves: O-Z Electrical Manufacturing Company, Incorporated, Thruwall and Floor Seals, _____
- C. Modular, rubber, sealing elements: Thunder Line Corporation, "Link Seal," or equal
- D. Thread tape: Teflon; John Crane "Thread Tape," Garlock "Plasti-Thread," Hoke "EZ Seal," or equal
- E. Sealant: Thiokol or urethane as specified in caulking section
- F. Snubbers: Operating and Maintenance Specialties "Ray Snubbers," Ashcroft "Series 1112" or equal
- G. Gauge cocks: Bronze, tee handle; Lunkenheimer 1178, Powell 915, or equal
- H. Protective coatings:

1. Plastic-coated pipe: 3M "Scotchkote," Republic "X- Tru-Coat," or equal
2. Tape wrap: FS HH-T-30 Coal Tar Base: Protector Wrap "200," Tapecoat "CT," or equal
3. Coal tar coating: MIL-C-18480; Koppers "50 Bitumastic," Porter "Tarmastic 101," Tnemec "476 Super Tnemecol," or equal

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install as specified and indicated on Drawing
- B. Provide a shutoff valve and union at water supply connections to each fixture and unit of equipment, whether shown on the Drawings or not
- C. Provide a union within 2 feet of each threaded end valve unless other means for easy removal of the valve are available
- D. Provide unions where required for equipment removal, indicated on the Drawing or specified
- E. Do not install piping to obstruct openings and passageways
- F. Cut pipe to measurement taken at the site, not from the Drawings
- G. Layout piping to provide for expansion and contraction
- H. Provide taps for pressure gauge connections with a nipple, snubber, and gauge cock
- I. Hold pipes free of contact with building construction so that noise will not be transmitted after pipe expansion
- J. Arrange water supply piping within buildings for complete drainage
- K. Uniformly grade all piping serving metering equipment and provide complete venting to eliminate air traps
- L. Provide insulating fittings in all piping, wherever copper tubing or fittings are connected to iron or steel pipe or fittings
- M. Drainage piping:
 1. Conform, in general, to locations indicated on Drawings
 2. Slope horizontal soil and waste pipes at 1/4 inch per foot where possible, but never less than 1/8 inch per foot
 3. Provide cleanouts in finished floors or in partition walls with a nickel-bronze access cover and frame, with securing screw
 4. Install bell-ups flush with floor surface
 5. Lay on uniformly descending grades

6. Handle and store properly pipe with premolded joints
7. Properly lubricated joints before installation

3.2 JOINTS

- A. Make pipe joints carefully and neatly
- B. Threaded:
 1. ANSI B2.1, NPT fully and cleanly cut with sharp dies
 2. No more than 3 threads exposed after installation
 3. Ream pipe ends after threading to remove burrs
 4. Apply thread tape to joints in all plastic and stainless steel piping
 5. Apply thread tape or joint compound to joints in other piping
 6. Apply teflon thread tape or litharge and glycerin paste to joints in steel piping for chlorine service
- C. Flared:
 1. Cut tubing ends squarely, remove burrs
 2. Scratches or grooves in flared ends are not allowed
- D. Push on:
 1. Per recommendations of pipe manufacturer
 2. Bevel each spigot end to facilitate assembly
 3. Lubricate with a heavy vegetable soap solution immediately before joint is completed
 4. Store lubricant in closed containers, keep clean, suitable for use in potable waters

3.3 PIPE SLEEVES

- A. Provide for pipes passing through concrete or masonry
- B. Install before concrete is placed
- C. Where passing through floors, install so the sleeve projects between 1 and 2 inches above the floor
- D. Seal sleeves passing through slabs with 1 side against soil with a modular sealing element or a watertight pipe sleeve
- E. If insulated, extend insulation through sleeves
- F. For future pipe installation, provide sleeves and seal ends with plastic caps or plugs
- G. For piping through interior walls and floors with special finish provide pipe sleeves or holes drilled with rotary drill
- H. Make dust and gas tight through room walls and floor

- I. Use special dusttight sleeves

3.4 INSULATION

- A. Install neatly
- B. Clean, dry and test pipe before applying
- C. Tightly butt end joints
- D. Hold seams and joints with manufacturer's standard adhesive
- E. Paste jacket laps neatly
- F. Point joints with insulating cement
- G. For flanges, fittings and valves use molded insulation or insulating cement of same thickness as insulation
- H. Pass through hangers
- I. Provide saddles to prevent pipe support by insulation

3.5 FINISHES

- A. Tape wrap buried black steel pipe including joints
- B. Thoroughly clean surfaces immediately before wrapping
- C. Half-lap tape wrapping
- D. Apply 1 coat of coal tar paint to joints in buried galvanized steel piping
- E. Paint exposed threads of submerged galvanized piping with zinc rich paint

3.6 CLEANING

- A. General:
 - 1. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, and dirt when erected
 - 2. Blow all lines thoroughly before placing in service

END OF SECTION

SECTION 15100

VALVES, COCKS, AND HYDRANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Valves indicated on Drawings, specified or as required for proper operation of equipment or systems

1.2 RELATED SECTIONS

- A. Section 15060—Pipe and Pipe Fittings

1.3 REFERENCES

- A. AWWA C500—Metal-Seated Gate Valves for Water Supply Service
- B. AWWA C508—Swing Check Valves for Waterworks Service, 2 inch through 24 inch NPS
- C. AWWA C509—Resilient Seated Gate Valves 3 inch through 12 inch NPS, for Water and Sewage Systems
- D. AWWA C511—Reduced-Pressure Principle Backflow-Prevention Assembly
- E. AWWA C512—Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service
- F. AWWA C550—Protective Epoxy Interior Coatings for Valves and Hydrants
- G. NSF 61—Drinking Water System Components—Health Effects
- H. NSF 372—Drinking Water System Components—Lead Content

1.4 SUBMITTALS

- A. Submit under provisions of Section 01340
- B. Product Data: Provide data on valves and accessories. Provide manufacturer's catalog information with dimensions, materials, and assembled weight. Indicate valve data and ratings
- C. Manufacturer's Instructions: Provide complete manufacturer's installation instructions

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01720
- B. Record actual size, type and location of all valves
- 1.6 OPERATION AND MAINTENANCE DATA
 - A. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views
- 1.7 QUALITY ASSURANCE
 - A. Manufacturer's name and pressure rating marked on valve body
 - B. Test valves in accordance with applicable standards referenced above
- 1.8 QUALIFICATIONS
 - A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum 10 years documented experience
- 1.9 REGULATORY REQUIREMENTS
 - A. Conform to all municipal codes and ordinances, laws and regulations of the State
 - B. In case of apparent conflict, State and local requirements govern over these specifications
 - C. In absence of State and local regulations, Uniform Plumbing Code will apply
- 1.10 DELIVERY, STORAGE, AND HANDLING
 - A. Deliver, store, protect, and handle products to site under provisions of Section 01600
 - B. Prepare valves and accessories for shipment according to AWWA C500
 - C. Accept valves on site in shipping containers with labeling in place. Inspect for damage
 - D. Provide temporary protective coating on cast iron and steel valves
 - E. Seal valve ends to prevent entry of foreign matter into valve body

PART 2 PRODUCTS

2.1 GENERAL

- A. Construction:
 - 1. Actual valve length within $\pm 1/16$ inch of specified or theoretical length
 - 2. Ends, except as otherwise specified:
 - a. 2-1/2 inch and smaller, threaded or soldered ends
 - b. 3 inch and larger:
 - 1) Buried: Push-on or mechanical joint, ANSI A21.11
 - 2) Others: Flanges, ANSI 125 lb
 - c. Wafer style valves designed for installation between ANSI 125 lb flanges
- B. Shop Painting:
 - 1. Comply with provisions of Section 09900
 - 2. Shop paint all ferrous metal surfaces of valves and accessories, both interior and exterior for corrosion protection
 - 3. Manufacturer's standard paint will be acceptable if it is functionally equivalent to the specified paint and compatible with the specified field painting
 - 4. Surfaces to be painted:
 - a. Unfinished surfaces:
 - 1) Interior: Coal tar epoxy or epoxy
 - 2) Exterior to be buried, submerged, or located in manholes: Coal tar epoxy or suitable exterior coating acceptable to Engineer
 - 3) Other exterior: Rust inhibitive primer
 - b. Polished or machined surfaces: Rust-preventive compound
 - c. Operators and accessories: Rust inhibitive primer
- C. Actuators:
 - 1. Provide manual actuators for all valves not specified to be power actuated or designed for automatic operation:
 - a. General use: Handwheel or lever with position lock
 - b. Buried valve, valves operated through floor boxes, and as indicated on Drawings: Wrench nuts:
 - 1) AWWA C500, Section 19
 - 2) Provide 2 operating keys
 - c. Plug or ball valves not to be chain wheel or wrench nut operated: Lever:
 - 1) Provide 2 operating levers of each required size
 - 2. Rotation:
 - a. Counter clockwise (to the left) to open
 - b. The word "OPEN" and an arrow indicating the direction to open cast on each valve body or operator
 - 3. Extension stems:
 - a. Provide where indicated on Drawings, specified, required for proper operation and for buried valves with operating nuts more than 8 feet below grade
 - b. Non-rising stems:
 - 1) Solid steel shafting with O.D. not less than O.D. of valve stem or galvanized steel pipe with I.D. not less than O.D. of valve stem

- 2) Connected to the valve by a flexible socket coupling
 - 3) All other connections pinned, keyed, or socket
- c. Rising stem:
 - 1) Stainless steel or carbon steel shafting with O.D. not less than O.D. of valve stem
 - 2) Bronze or stainless steel sleeves securely attached to stem
 - 3) Sleeve length and location to extend through each stem guide throughout the full vertical travel of stem
- d. Stem guides:
 - 1) Cast iron, bronze brushed, adjustable in two directions
 - 2) If extension stem length exceeds 10 feet or the weight exceeds 50 lbs, design top guide to carry the stem weight and provide a collar on the stem to bear against the thrust guide
 - 3) Max spacing:
 - a) Non-rising stems: 100 times stem O.D.
 - b) Rising stems: 60 times stem O.D.
 - c) Ten feet max
- e. Buried valves:
 - 1) Stem extend to within 6 inches of grade
 - 2) Provide spaces to center stem in valve box
 - 3) Provide wrench nut
- 4. Operating Stands:
 - a. Provide as indicated on Drawings
 - b. Fabricated steel or cast iron
 - c. Support handwheel or lever approximately 36 inches above floor
 - d. Handwheel diam: 8 inch minimum
 - e. Provide standard weight galvanized pipe sleeve for opening in floor
 - f. For longer than 10 feet and without stem guides with thrust bearings, provide a suitable thrust bearing in each stand to carry extension stem weight
- 5. Floor boxes:
 - a. Provide when openings are provided in concrete slabs for key operation of wrench nuts in or below the slab
 - b. Cast iron with cover
 - c. Depth as required for slab
 - d. Nut in slab: Provide a stem guide to center nut in box
 - e. Nut below slab: Bottom opening to permit passage of key
 - f. Box and cover coated by coal tar epoxy
 - g. The word "WATER" cast on each cover
- 6. Valve boxes:
 - a. Provide for all buried valves
 - b. Cast iron extension sleeve type with boxes and covers
 - c. Depth as required for valve
 - d. Minimum diam: 5 inch
 - e. Minimum thickness: 3/16 inch

- f. Box, cover, and base coated by dipping in asphalt varnish
- g. An appropriate word designating the valve service case on the cover

2.2 GATE VALVES

- A. Clear water service, 3/4 inch to 2 inch:
 - 1. Bronze, rising stem, solid wedge, screw in bonnet
 - 2. Threaded ends: Nibco T-111, Grinnell 3010, or approved equal
 - 3. Soldered ends: Nibco S-111, Grinnell 3010 SJ, or approved equal
- B. Clear water service, 3 inch to 12 inch:
 - 1. Manufacturers:
 - a. Waterous Model Series 500
 - b. Mueller Model A-2360
 - c. Kennedy Valve Model Ken Seal
 - d. Or approved equal
 - 2. AWWA C509 or C515, Iron body, bronze trim, two O-ring stem seals, non-rising stem with square nut, single wedge, resilient seated, flange or mechanical joint ends, extension stem, extension valve box, pressure rating of 200 psi
 - 3. Rotation: Counter clockwise to open with the word "OPEN" and an arrow indicating the direction to open cast on the valve body or operating nut

2.3 CHECK VALVES

- A. Clear water service, 3 inch through 12 inch, 200 psi working pressure or less:
 - 1. Long style (not wafer), 150/250 lb ANSI pipe flanges
 - 2. APCO Series 100 or approved equal
 - 3. Cast iron body and cover
 - 4. Rubber flapper swing check
 - 5. O-ring seating edge
 - 6. Buna-N elastomeric flapper, 70 durometer, internally reinforced with steel
- B. Water, or other liquid service, 2-1/2 inch and smaller:
 - 1. Bronze regrinding horizontal swing check valves
 - 2. Threaded end: Crane 36, Fairbanks 0605, Jenkins 762-A, Stockham B-345, or approved equal
 - 3. Soldered end: Crane 1342, Fairbanks 0680, Jenkins 1222, or Stockham B-309:
 - a. May be used on 3 inch copper tubing

2.4 BALL VALVES

- A. Application:
 - 1. Except as otherwise indicated or specified, provide ball valves for all 3 inch or smaller shutoff valves
 - 2. Provide additional ball valves as indicated on drawings or as specified

- B. Air and water service, 3 inch and smaller: Jamesbury A-211 or approved equal
- C. Chemical service, 4 inch and smaller:
 - 1. Full port, not smaller than I.D. of Schedule 80 PVC pipe
 - 2. PVC construction
 - 3. Teflon seats
 - 4. Chemtrol "True Union Ball Valve"; Hayward TBB series or approved equal
 - 5. Hayward "Z-ball" vented ball for sodium hypochlorite service or approved equal
- D. Valve fabrication:
 - 1. Handles showing direction of opening
 - 2. Ball design which does not allow media contact with stem
 - 3. Balancing stop for all applications
- E. Actuator: Valve manufacturers standard with manual override, position indicator, 115 VAC; NEMA 4X, Hayward EVR or approved equal

2.5 YARD HYDRANTS

- A. Manufacturers:
 - 1. Wade—W-8609
 - 2. Josam—71600
 - 3. Smith—5810
 - 4. Zurn—Z-1360
 - 5. Or approved equal
- B. Hydrant, 3/4 inch to 2 inch:
 - 1. Exterior locations
 - 2. Cast iron box and cover, brass valve, and casing for 4'-0" bury

2.6 AIR RELEASE VALVES

- A. General:
 - 1. Provide as indicated on Drawings
 - 2. Water working pressure: 200 psig
- B. Clear water service:
 - 1. Individual air release valves:
 - a. Inlet size as indicated on Drawings
 - b. GA "Figure AR," Val-Matic "Model 38," APCO "200A," or approved equal

2.7 CORPORATION ACCESSORIES

- A. Corporation stops:
 - 1. Bronze body, AWWA tapered threaded tap
 - 2. 200 psi maximum working pressure
 - 3. Ford #B-22 or approved equal

- B. Curb stops: Ball type (1 inch – 2 inch), Ford “B22” Series, or approved equal
- C. Curb stop box: 4 Ford arch base curb box, or approved equal
- D. Tapping saddles: Ductile iron with double stainless steel strap and rubber sealing gasket, 250 psi pressure rating, Mueller “#H-16100,” Rockwell “#323,” Superior Style “36,” or approved equal
- E. Service saddles (large diameter PVC): Wide stainless steel band or bands, bronze body, Ford “S-90” or approved equal

2.8 BEDDING MATERIALS

- A. Bedding: As specified in Section 02200

PART 3 EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install valves and accessories in accordance with the manufacturer's instructions
 - 2. Provide union or flanged connection within 2 feet of each threaded end valve unless valve can otherwise be easily removed from piping
 - 3. Set buried valves on solid bearing
 - 4. Center and plumb valve box over valve
 - 5. Set box cover flush with finished grade
 - 6. Evenly fill around box and thoroughly compact on all sides
 - 7. Extend stem to within 6 inches of final grade
 - 8. Provide spacers to center stem in valve box
- B. Backflow preventers: Install in an area not subject to flooding

3.2 ADJUSTMENT

- A. Check and adjust valves and accessories for smooth operation in accordance with manufacturer's instructions

END OF SECTION

U.S. Department Of Agriculture
Natural Resources Conservation Service
Nevada

**Operation and Maintenance Plan
Stockwater Pipeline (516)**

Landowner/Operator: DVIP
Project: Solar Stockwater Demonstration Projects
Location: See Drawings for Locations Sec. T. R.
NRCS Office: Elko Field Office Phone: 775-738-8431

A properly operated and maintained pipeline system is an asset to your operation. This pipeline was designed and installed as a permanent solution to stockwatering deficiencies. The estimated life span of the installation is at least 20 years and can be assured and usually increased by carrying out the following recommendations.

OPERATION AND MAINTENANCE CHECKLIST

- ✓
- ☐ The pipeline was designed for a maximum of 431 (number) of Cattle (livestock). If the numbers are increased, additional water supplies may be needed during peak use periods.
 - ☐ Inspect all drains to be sure that drain valves are closed.
 - ☐ Close all hydrants and valves slowly to prevent water hammer.
 - ☐ Open all manual air release valves.
 - ☐ Inspect all air-vac valves to see that the airway is open (stem pushed down) and the float ball and seat are in place and undamaged.
 - ☐ Visually inspect all pressure relief valves to be sure they are free to operate and have not been adjusted to a higher or lower pressure setting.
 - ☐ If there is a pressure reducer valve in your system, special operating procedures are necessary.
 - ☐ Check pipeline area for settlement and erosion and fill low areas.
 - ☐ Inspect the pipeline for sudden changes in quantity of water received from the source.
 - ☐ Maintain the design depth of cover over the pipeline.
 - ☐ Check pipeline area for leaks, settlement and erosion annually and repair deficiencies.
 - ☐ Drain all system components in areas subject to freezing. If parts of the system cannot be drained, an anti-freeze solution shall be added.
 - ☐ Leave drain valves, drain plugs and in line valves open during the winter.
 - ☐ Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity.
 - ☐ Immediately repair any vandalism, vehicular, or livestock damage to any outlets and appurtenances.

USDA-NRCS-Nevada
Section IV, Technical Guide
7/02

[illegible]

U.S. Department Of Agriculture
Natural Resources Conservation Service
Nevada

**Operation and Maintenance Plan
Pumping Plant For Water Control (533)**

Landowner/Operator: DVP
Project: Solar Stockwater Demonstration Projects
Location: See Drawings for locations Sec. T. R.
NRCS Office: Elko Phone: 775-738-8431

A properly operated and maintained pumping plant for water control is an asset to your property. The estimated life span of the installation is at least 15 years and can be assured and usually increased by carrying out the following recommendations.

OPERATION AND MAINTENANCE CHECKLIST



- ☐ Maintain pump, electrical and other related equipment within the electrical code and manufacturer's recommendations.
- ☐ Inspect metal surfaces for rust and other damage. Especially inspect sections in contact with earthfill and/or other materials. Repair or replace damaged sections and apply a protective covering.
- ☐ Maintain vigorous growth of desirable vegetative coverings in surrounding areas. This includes reseeding, fertilizing and application of herbicides when necessary. Periodic mowing may also be needed to control height.
- ☐ Maintain area around pump and other equipment. Remove all debris that hinders system operation. Provide and maintain adequate surface water drainage around the pumping plant area.
- ☐ Protect the pumping plant from freezing where needed. If parts of the system cannot be drained, a non-toxic antifreeze solution may be added.
- ☐ Remove rodents and/or burrowing animals that have or may damage any part of the facility. Repair any damage caused by their activity.
- ☐ Repair any vandalism, vehicular or livestock damage.

Other

- Keep area around well and solar panels fenced to protect from animal damage.

U.S. Department Of Agriculture
Natural Resources Conservation Service
Nevada

**Operation and Maintenance Plan
Watering Facility (614)**

Landowner/Operator: DVIP
Project: Solar Stockwater Demonstration Projects
Location: See Drawings for locations Sec. T. R.
NRCS Office: Elko Phone: 775-738-8431

A properly operated and maintained watering facility is an asset to your operation. This watering facility was designed and installed as a permanent solution to stockwatering deficiencies. The estimated life span of the installation is at least 10 years and can be assured and usually increased by carrying out the following recommendations.

OPERATION AND MAINTENANCE CHECKLIST

- ✓
- ☐ Tanks and troughs should be inspected periodically to assure that they are operating properly.
 - ☐ Check periodically to see if debris is restricting inflow or outflow to a tank or trough.
 - ☐ Check tank or trough overflow outlets. If the outlet is being damaged by livestock, or a bog is creating a problem, protect the outlet with rocks, fencing, or other protective material.
 - ☐ Periodically check tank or trough for leaks and cracks and repair immediately as necessary.
 - ☐ Repair eroded areas and construct water bars (diversions) or other protective measures to keep water from running down trenches or into the area around tanks
 - ☐ Check automatic water level devices to insure that they are operating properly. Adjust or repair as necessary.
 - ☐ Check the area adjacent to troughs or tanks for erosion and wear-and-tear by stock. Use gravel, scoria, concrete, compacted earth or other durable material to build the area back up.
 - ☐ If algae and iron sludge in tanks or troughs is a problem consider using chemicals such as chlorine, copper sulfate, or adding small fish to the tank to keep it clean.
 - ☐ Winter shutdown - when tanks or troughs are to be removed from service during periods of freezing weather, they should be completely drained. Drain valves should remain open to allow any water that may collect in the facility to escape.

Other _____

- Check troughs daily during the winter or times of freezing weather.

- Remove any ice that builds up in trough.

USDA-NRCS-Nevada
Section IV, Technical Guide

7/02

U.S. Department Of Agriculture
Natural Resources Conservation Service
Nevada

**Operation and Maintenance Plan
Well (642)**

Landowner/Operator: DVIP
Project: Solar Stockwater Demonstration Projects
Location: See Drawings for locations Sec. T. R.
NRCS Office: Eiko Phone: 775-738-8431

A properly operated and maintained well is an asset to your property. This well was designed and installed to provide beneficial use of subsurface water. The estimated life span of the installation is at least 20 years and can be assured and usually increased by carrying out the following recommendations.

OPERATION AND MAINTENANCE CHECKLIST



- ☐ Maintain the well cover securely in place.
- ☐ Protect the area from being damaged by machinery, vehicles, or livestock.
- ☐ All fences, railings, and/or warning signs must be maintained to provide warning and/or prevent unauthorized entry.
- ☐ Do not allow debris to accumulate in the immediate vicinity.
- ☐ Maintain soil and vegetation to the design conditions.
- ☐ Remove rodents or burrowing animals that have or may damage any part of the system. Repair any damage caused by their activity.
- ☐ Inspect metal surfaces for rust and other damage. Especially inspect sections in contact with earthfill and/or other materials. Repair or replace damaged material and apply a protective covering.
- ☐ Keep all surface water and all polluted materials from entering the well or accumulating near the well.
- ☐ Repair any vandalism, vehicular, or livestock damage.

Other
