



# **SEWER AND PUMP STATION POLICIES AND PROCEDURES**

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## Section 1 | Purpose

The purpose of these Sewer and Pump Station Policies and Procedures are to provide guidelines and minimum design criteria for City of Hayden sewer or wastewater system infrastructure. These policies are referenced to by the Hayden Code of Ordinances 8-2-2(B)(6) and apply to the following:

- Existing systems being expanded, modified, upgraded, and rehabilitated.
- The construction of new mains and pump stations (lift stations) for either Capital Improvement Projects (CIP) or private development projects that will be dedicated to the City.

These policies are not intended as construction specifications.

Design plans and specifications for work constructing new or modifying existing sewer system infrastructure must be submitted to Idaho Department of Environmental Quality (IDEQ) for review and approval of wastewater infrastructure (Per IDAPA 58.01.16 - Wastewater Rules).

## Section 2 | Standards and References

### 2.1 Standards

The design and construction standards of the Wastewater Utilities shall be in accordance with the relevant requirements of the standards listed by priority within **Table 1 - Standards for Sewer or Wastewater Infrastructure**.

**Table 1 - Standards for Sewer or Wastewater Infrastructure**

Priority	Author or Agency	Title
1	IDAPA	Idaho Department of Environmental Quality Rules, IDAPA 58.01.16, "Wastewater Rules"
2	City of Hayden	Collection System Master Plan, Most Current Version

If there is any conflict in standards, the most stringent standard is required.

### 2.2 References

Use the references listed in **Table 2- References for Sewer or Wastewater Infrastructure** as supplementary guidelines for the design and construction of the water system utilities. These references have no established order of precedence.

**Table 2- References for Sewer or Wastewater Infrastructure**

<b>Author or Agency</b>	<b>Title</b>
Recommended Standards for Wastewater Facilities	A Report of the Wastewater Committee of the Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers
ISPWC	Idaho Standards for Public Works Construction
Metcalf and Eddy	Wastewater Engineering, Treatment and Reuse, Metcalf and Eddy
WEF	Water Environment Federation Manuals of Practice
AWWA	American Water Works Association
ASCE	Manuals and Reports on Engineering Practices
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
ETL	Electrical Testing Laboratory
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society of North America
NFPA	National Fire Protection Association
NFPA	70 National Electrical Code (NEC)
NFPA	820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities
UL	Underwriters Laboratories Inc.

## 2.3 Performance Requirements

The design and construction of the wastewater collection system must meet the following performance requirements:

- A. The design flow scenario for all pipes within the project work is the City's most current Collection System Master Plan future wet weather flow scenario, unless otherwise stated.
- B. Wastewater service shall be provided to all currently served parcels and to any parcel created by the project.
- C. All gravity wastewater mains shall be a minimum of 6-feet of cover and shall provide a minimum depth of 5-feet at the building envelope setback.

## Section 3 | Main Extension Policies and Procedures

### 3.1 General

The applicant shall pay fees outlined in City ordinances which are applicable to such extensions. Applicant shall construct all main extensions, service laterals, pump stations, “facilities”, “utilities” or related components to the wastewater collection system at their own expense, including labor, material and equipment. Sewer lines or collectors that serve more than one privately owned parcel shall be public sewers and shall be located in public rights-of-way or in approved easements. Collectors within private developments shall be located within streets or roads. Cross country alignments are not allowed. Any and all collector extensions located in public right-of-way or approved easements shall become public collectors and the property of the City only after City Council acceptance of the infrastructure and receipt of warranty surety. Upon acceptance of the public infrastructure, the operation and maintenance of these public collectors will be the City's responsibility. Should the City accept collectors within a private roadway, the roadway shall be in a separate tract with an easement to the City and the City shall have unlimited access to the sewer at all times.

Any and all changes to these policies and procedures and/or pre-approved equivalents contained herein shall be clearly brought to the City’s attention in a written transmittal attached to all preliminary, design, construction, and “As-Built” record drawings or plans.

### 3.2 Submittal and Review Requirements

Upon completion of design, a Professional Engineer (PE) licensed in the State of Idaho shall submit the following to the City for review:

- A. Construction Plans: An electronic copy (in pdf format) of the design.
- B. Details needed for construction and inspection.
- C. Technical Specifications: An electronic copy (in pdf format) of construction specifications, including electrical diagram and specific components.
- D. Design Calculations: An electronic copy (in pdf format) of complete design calculations, including the following:
  1. All design assumptions, calculations and parameters.
- E. Regulatory Agency Approval: Written approval for construction by the Idaho Department of Health and Welfare and the State of Idaho Division of Environmental Quality (IDEQ) received electronically (in pdf format) or via e-mail.

### 3.3 Basis of Design Report

A typewritten report outlining the scope of the project shall be submitted with the application. If the project is part of a subdivision (minor/major) or a building plan submittal, the report may be added to the narrative of the project submittals. The report related to the sewer infrastructure shall include, at a minimum, the following:

- A. Name, address, telephone number, and contact persons of Owner and Engineer of Record.

- B. Number of dwelling units and population for sewer system connections.
- C. Flow factors based on current City records. Proposed and ultimate service areas shall be presented on a map, including population densities. Commercial and industrial users shall be identified and sewer effluent characteristics presented.
- D. Construction schedule, including construction observation methods and City involvement relative to construction observation requirements. If phased development is planned for the project, show each phase of service area and the overall sewer facilities with contours and elevations.
- E. Acknowledge that the applicable fees for review and construction observation by City staff or representative will be paid by the developer.
- F. Steps included in the project to protect the public from injury and/or damage (i.e., insurance limits, signs and barricades, lights, detour routes and other related facilities).
- G. A copy of completed State of Idaho Department of Environmental Quality (IDEQ) Plan and Specification review cover sheet.

### **3.4 Specific Design and Construction Criteria**

- A. The developer shall, at his/her own expense, extend sewer to the subdivision boundaries on all streets adjacent to and within the subdivision unless otherwise approved by the City.
- B. The City shall require the developer to provide individual cost assessments for service connections for each parcel affected by the sewer project to include materials and labor. Those service connections outside of the development may be required to be placed as part of the project. This cost may qualify for reimbursement by the City.
- C. The City of Hayden's Vertical Datum is National Geodetic Vertical Datum of 29 (NGVD 29). The Vertical Datum is used in the City's Master Plan. All construction plans must clearly state the vertical datum used and the basis of calculation. Construction plans not on NGVD 29 shall include a conversion factor to NGVD 29.
- D. The minimum allowable pipe diameter for non-potable mains (the pipelines that collect and convey non-potable discharges from or to multiple service connections) shall be 8 inches in diameter. Any exceptions require written approval by the City of Hayden. Future or proposed pipes shall be sized appropriately to meet or exceed the City's Sewer Master Plan and meet the performance requirements listed above. Downstream pipe diameters shall remain the same size or larger, regardless of pipe slope.
- E. Match Crowns when joining different pipe sizes, not inverts.
- F. Slopes of sewer lines shall be installed in conformance with the Recommended Standards for Wastewater Facilities. The following are the minimum slopes which must be provided; however, slopes greater than these are desirable:



**Table 3 - Minimum Pipe Slope for Gravity Sewer (10-States Standards)**

Sewer Size inches	Minimum Slope Feet per 100'
8	0.40
10	0.28
12	0.22
15	0.15
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06
36	0.05

- G. Distance between manholes shall be limited to 400 feet maximum.
- H. All abandoned wastewater systems are to be removed. Any other method to be submitted and will require a variance to this policy.
- I. Sewer pipelines constructed across or alongside the ITD roadways shall be placed in casings designed to ITD standards wherever the pipelines will be permanently located within the road prism. ITD Utility Access Permits shall be required, prior to construction within the ITD right-of-way.
- J. All sewer placed with an existing city right-of-way shall require a right-of-way easement permit.
- K. All sewer placed in an existing right-of-way of an adjacent agency shall meet or exceed that agency's requirements as well as the City of Hayden.
- L. The City shall be notified 48 hours prior to the following steps for sewer pipeline extensions:
1. Pipe placement without bedding
  2. Pipe bedding in place and compacted
  3. Trench backfill in place to ½ of full depth and compacted
  4. Same as Item 3 but a full depth
  5. Base rock in place and compaction Testing
  6. Sewer line video submitted to City for review
  7. Asphaltic concrete, or finished surface, is being placed
- M. Sewer lines shall be located in public right-of-way and within the centerline of street wherever possible.
- N. All new sewer lines shall be inspected via CCTV and copies submitted to the City for review and approved prior to paving.
- O. All new infrastructure shall be isolated from existing infrastructure until final acceptance.

Prior to final connection, all new infrastructure shall be jetted and cleaned to eliminate all construction debris from entering the existing system.

### 3.5 Products

- A. All products shall conform to ANSI/AWWA standards.

### 3.6 Sewer Service

- A. Retain and protect service to all existing users. Service shall not be interrupted during any portion of design or construction without written notice to the property owner and all occupying tenant(s) a minimum of 48 hours prior to interruption of service. Written notice procedures shall be pre-approved by the City and may consist of door hangers or equivalent. Design and construction shall include work sequencing plans to minimize interruption service to all existing users.
- B. Sewer service shall be supplied to all parcels, including all parcels that may be created by the project, and locations outside of development. Coordinate location of sewer service with the City and the property owner. Route service from the sewer mainline to the existing sewer service or to 5 feet beyond the right-of-way line or 5 feet beyond utility easements (whichever is greater) for future services to currently unserved parcels, terminate and mark location with locate ball and post. Secure any and all necessary construction easements to complete work beyond Public right-of-way.
- C. If the developer is asked to install new service lines at locations outside of his or her development, the City may reimburse the developer his/her pre-approved costs for documented construction of these service lines. The cost for reimbursement must be negotiated and approved by the City prior to any costs being incurred. The City Engineer shall locate stubs and coordinate location with the applicant or developer's Engineer of Record.
- D. Service connections to existing sewers shall be "GPK" saddle tees or prior approved equivalent and shall be at a 90° angle to the sewer centerline and at a 45° (1:1) slope into the pipe. Connections shall be made so that no debris enters the pipelines. The Contractor may be asked to provide the cutout piece or "coupon" for each tap to the Public Works Director. No service line connectors shall project inside the collector pipeline.
- E. Pressure service connections shall not be directly to the gravity sewer piping.

### 3.7 Cross Connection Control/Non-Potable and Potable Water Separation

- A. Wastewater utilities (non-potable water systems) shall be separated horizontally and vertically from potable water utilities per Idaho Department of Environmental Quality Rules, IDAPA 58.01.08, "Idaho Rules for Public Drinking Water Systems."
- B. There shall be no connection between water utilities (potable water distribution system) and any pipes, pumps, hydrants, water loading stations, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into a public water system per Idaho Department of Environmental Quality Rules, IDAPA 58.01.08, "Idaho Rules for Public Drinking

Water Systems.”

### 3.8 Profile Drawing Requirement

- A. Minimum of 11"x17" paper size plan sets.
- B. Horizontal Scale: Not more than 1" = 50' scale on 11"x17" paper or 1" = 20' scale on 22"x34" paper.
- C. Vertical Scale: Not more than 1" = 5'.
- D. Stationing shall originate on south/west sides (Station 0+00) and continue to the north/east sides.
- E. The plan view is required to show the following:
  1. Centerline location and stationing of proposed sewer improvement reference to right-of-way and existing sewer system.
  2. Existing platting, property lines, right-of-way easements, etc. with appropriate dimensions.
  3. Existing utilities and improvements (i.e., water mains, gas mains, storm drains, communication, power conduits, pavement, streetlights, and street signs).
  4. Horizontal Curve Data. Radius, deflection angle, length of curve and tangent distance and stationing of Point of Curve (PC), Point of Tangent (PT), and Point of Intersection (PI).
  5. Curbs, gutters, sidewalks, bike trails, swales, green space, and landscaping.
  6. Construction zone limits.
- F. The profile view is required to show the following:
  1. Centerline profile and stationing of sewer flow line, existing ground and proposed street grade if applicable.
  2. All plans must clearly state the vertical datum used for calculations and survey data and provide a conversion factor to NGVD 29, if applicable. Elevations shall be shown at all stations for top of surface, at all manhole inverts, and for all pump stations.
  3. All pipeline shall have a flow line profile that indicates length of pipe (manhole to manhole), grades, pipe size and type, and station of tees.
  4. Types of manholes; stations of manholes.
  5. Elevations of lowest floor of all abutting homes or other structures to be served by the sewer.
  6. Vertical Curve Data: Length of curve (horizontal distance), elevations and stationing of Vertical Point of Curvature (VPC), Vertical Point of Intersection (VPI), and Vertical Point of Tangent (VPT).
  7. Existing utility crossings, including all water crossings and the approximate

elevations of the utilities. Gravity flow pipeline shall be designed to avoid conflict with other gravity flow systems.

- 8. If available, soil type and groundwater conditions.

### 3.9 Sewer Line Easements

- A. Easements for sewer lines shall be granted only in cases where there are no alternative routes available (existing public right- of-ways, roads, etc.). Easements shall include a Legal Description and Exhibit.
- B. Easements for sewer lines shall be as shown on table below.

**Table 4 - Minimum Easement Width for Gravity Sewer**

Sewer Depth (feet)	Minimum Easement Width (feet)
0-10	20
10-15	30
15-20	40
20-25	50
25-30	50
30+	60

- C. Sewer lines shall be installed in the center of the easement.
- D. Easements shall be clearly shown on the plat and both the recorded easement and plat shall include the following statement:
  - 1. “Manholes shall remain accessible at all times. No other utilities (longitudinal or parallel to) shall be constructed within the easement. No permanent or temporary structures (including eaves), trees, vegetation, or any other items that may impair accessing manholes or sewer system for City maintenance shall be placed within the easement. The necessity for the City to remove any items such as fences, landscaping and sprinkler systems within any part of the easement will be at no cost to the City and will not be replaced at the City's expense.
- E. Easements shall be marked as "Public Access" or "No Public Access" on the plat. Those easements marked as "No Public Access" shall be gated. Gates shall be double swing (20' minimum clear opening) and shall be installed by the developer. Locks will be provided by the City.
- F. Easements shall include a gravel access road along the entire length of easement. A minimum of 4 inches of compacted ¾-inch maximum crushed gravel surfacing shall be placed within the easement to a minimum width of 16 feet. Manhole or cleanout covers shall not be buried and be constructed with an 8” wide minimum concrete collar around them. Manhole or cleanout covers shall be a minimum of 2 inches above grade or have an inflow protection insert. If no manholes or cleanouts are located within an easement, a gravel road may not be required and compaction of 90% ASTM D1557 (modified proctor) shall be required.

- G. A Legal Description and Exhibit of the sewer line easement shall be attached to the building permit for those lots in which the easement lies.

### **3.10 Construction Observation Requirements during Construction**

- A. Construction observation is required per Idaho Wastewater Rules.
- B. The Engineer of Record or the Engineer's representative shall provide full-time construction observation of all work to ensure compliance with the design documents. Sufficient observation should be provided by the Engineer of Record or the Engineer's representative to certify that this project was installed in accordance with the approved plans and specifications. Examples of construction observation shall include, but not be limited to, excavation, bedding, backfilling, placing pipe or manholes, compacting, placing ballast, base rock, pavement, or any other work related to the installation of the sewer or building of the road, the Engineer of Record or the Engineer's representative shall be on-site to observe.
- C. The Engineer of Record or the Engineer's representative shall have his/her own level instrument to check the slope of the pipe at no less than 24-foot intervals.
- D. If, at any time work is being done, a representative from the City visits the site and finds no construction observation being done, all work shall be stopped until an Engineer of Record or Engineer's representative arrives at the site.
- E. Documentation of leakage testing, compaction testing, and inspection videos shall be provided to the City Engineer for review and be accepted prior to paving.
- F. Manholes shall be inspected, leak tested, and approved by the City following adjustment to final grade and prior to paving.

### **3.11 Final Acceptance by the City of Hayden**

- A. Prior to allowing any connection to the sewer and the City accepting Ownership of the sewer system infrastructure, the applicant must request an inspection of the system and must submit the following:
  - 1. Results of the testing, inspections, TV inspection, and Engineer of Record certification that the system passed the tests. Manholes tied to State Plane coordinate system. CCTV inspection shall be done manhole to manhole using accepted industry standard equipment.
  - 2. The applicant shall guarantee the constructed system, including pipe, fill, pavement, etc. for a period of eighteen (18) months from the date of written acceptance. Any repairs, replacement or system failures will be corrected by the applicant at his/her expense during the warranty period. Dedication of the ownership of the lines and appurtenances to the City shall be free and clear of all liens and encumbrances.
  - 3. Engineering Project Certification Reports- Certified by the developer's Engineer of Record. A plan view drawing showing lots, sewer lines, water lines, and all other utilities, section corners, and other pertinent information shall be submitted to the City as follows:
    - i. One electronic PDF file of including the Engineer's Certification Packet

- ii. One file PDF containing the Record Drawings only
    - iii. One 11x17 paper copy of the Record Drawings.
  - 4. All rights-of-way dedications and/or granting of easements for construction, operation, and maintenance (if not included in the final plat).
  - 5. Approval by the State of Idaho Department of Environmental Quality (IDEQ).
  - 6. All collection fees, charges, and administration, inspection and other costs are paid in full.
- B. Upon successful submittal of the above items, the City Staff will provide written Memo recommending final acceptance to City Council. Ownership of the system is not the City of Hayden's until the infrastructure is approved by City Council and the warranty surety is provided.

## Section 4 | Temporary Wastewater Infrastructure

- A. Temporary wastewater facilities are not included in the Master Plan.
- B. Temporary wastewater infrastructure may be considered with City Council approval only and will require a memorandum of understanding clearly outlining the following terms:
  - 1. Plan for Removal - The memorandum shall specifically address what design elements are provided to allow for simple removal of infrastructure in the future.
  - 2. Duration – The memorandum shall specifically address the duration infrastructure is intended to be in use and any trigger flows or durations for when the infrastructure shall be taken offline.
  - 3. Removal Costs – The memorandum shall address the cost for future removal.
  - 4. Surety Bond for Removal – Owner/Developer shall provide a surety bond to guarantee future removal at no cost to the City.
  - 5. The memorandum shall address who the property shall revert to upon removal.
  - 6. City Council Approval – The memorandum shall be approved by City Council.
  - 7. The memorandum shall address operation and maintenance cost of the system.

## Section 5 | Pump Station Civil Design Policies and Procedures

### 5.1 General

The following design policies and procedures are developed to provide guidelines for pump station (lift stations) designed and constructed by others for eventual acceptance by the City Council and operation and maintenance by the City of Hayden. Design plans and specifications shall be completed by a Professional Engineer licensed in the State of Idaho and a Professional Electrical Engineer licensed in the state of Idaho in accordance with these policies and procedures unless otherwise permitted by the City.

Several future Lift Stations are identified in the most current version of the sewer master plan, which will be required to serve a majority of the future service area. Several other lift stations will likely be required to serve individual development areas, or to supplement progress towards the master plan scenario. The application of temporary wastewater infrastructure is detailed above. All lift stations shall provide lift station firm capacity (lift station capacity with the largest pump out of service) that meets or exceeds the flow requirements predicted in the wet weather flow scenario of the most current version of the sewer master plan, or include provisions for future expandability to meet or exceed flows.

Lift stations fit into various size classifications based on future flow predicted in the master plan. The master plan details which features the various sizes of lift stations shall have. Regardless of their size, lift stations must meet or exceed the Standards and References detailed above.

Lift stations serving private developments will not be maintained or owned by the City.

All city lift stations shall be located on property dedicated to the City for ownership, operation, and maintenance of the lift station.

If the flow from the ultimate service area exceeds the needs of the particular area under consideration, the City may require lift station capacities greater than the size required for the area under consideration. The City may participate in the project to the extent of the incremental cost of materials for the lift station oversize as defined in the City's separate sewer reimbursement policy

Any and all changes to these policies and procedures and/or pre-approved equivalents contained herein shall be clearly brought to the City's attention in a written transmittal attached to all preliminary, design, construction, and "As-Built" record drawings or plans.

Geotechnical Engineering Report quantifying subsurface conditions is required and shall quantify the following:

1. Groundwater conditions
2. Backfill and Compaction for Structures
3. Backfill and Compaction for Utilities



## 5.2 Submittal and Review Requirements

- A. Upon completion of design, a Professional Engineer (PE) and Professional Electrical Engineer licensed in the State of Idaho shall submit the following to the City for review:
1. Construction Plans: An electronic copy (in pdf format) of the design showing the following:
    - i. Site layout and easements, public safety equipment in order that the public is protected from injury and/or property damage (i.e., insurance limits, signs and barricades, lights, detour routes, excavation limits and other related facilities).
    - ii. Section view of the station, valve vault and wet well showing design elevations, pipe, fittings, appurtenances, pump, controls, odor control, hatch locations, etc.
    - iii. Details needed for construction and inspection.
    - iv. Document that all control and electrical panels are accessible and that required working clearances are provided.
  2. Lift Station Layout: General site location outlining service area and point of connection to existing sewer line. All plans must clearly state the vertical datum used for calculations and survey data and provide a conversion factor to NGVD 29, if applicable. As a minimum, elevations shall be shown at the top of the entrance tube, top of finished surface, pump control stages, pump discharge invert, floor of pump station, wet well invert inflows and discharges, and top of support slab. The force main shall have elevations at all changes in grade and alignment and at the discharge point.
  3. Technical Specifications: An electronic copy (in pdf format) of construction specifications, including electrical diagram and specific components.
  4. Design Calculations: An electronic copy (in pdf format) of complete design calculations, including the following:
    - i. All design assumptions and parameters.
    - ii. Pump performance curves, operation and maintenance data, and electrical wiring schematic.
    - iii. force main performance curve (head loss and velocity data)
    - iv. conclusive data showing impact of discharge on existing system
    - v. calculations and plans stamped by a Professional Engineer licensed in the State of Idaho, signed, and dated
    - vi. storage capacity during pump failure, as well as storage capacity operation at firm capacity.
  5. Regulatory Agency Approval: Written approval for construction by the Idaho Department of Health and Welfare and the State of Idaho Division of Environmental

Quality (IDEQ) received electronically (in pdf format) or via e-mail.

### 5.3 General Design Requirements

- A. The following elevations must be detailed in a section view on the lift station:
  - 1. Pump suction invert elevations
  - 2. Pump discharge piping invert elevations.
  - 3. Critical pump control elevations
- B. All materials must be suitable for its intended use and environment.
- C. Access Hatches shall be aluminum hatches and frames manufactured by Halliday Products or equal. Standard features shall include either
  - 1. Hinged and lockable grating fall protection
  - 2. Single-leaf flood tight aluminum lid with continuous neoprene gasket, anti-lock stainless steel hold open arm with release handles stainless steel pressure lock with pad lock assembly, and with a minimum clear opening size of 34" x 48" or
  - 3. Double leaf aluminum lid with channeled frame set in concrete, anti-lock stainless steel hold open arm with release handles, and with a minimum clear opening space of 60" x 72".
  - 4. Hatches shall be designed for a H-20 traffic load when not protected from driving over with bollards or concrete curbs on structures.
- D. The exposed top slab of exterior concrete surfaces shall be broom finished.
- E. All nuts, washers, bolts and other steel hardware shall be stainless steel.
- F. All piping inside concrete structures shall be ductile iron pipe with Protecto 401 ceramic epoxy interior lined (or approved equivalent). Exterior coating of exposed piping shall be coated per High Performance Coatings, detailed below. Exterior coating of buried ductile iron shall be 1 mil of asphaltic coating.
- G. All fittings shall be ductile iron Protecto 401 ceramic epoxy interior lined (or approved equivalent). Exterior coating of buried ductile iron shall be 1 mil of asphaltic coating,
- H. All valves shall be eccentric plug valves. Buried valves shall have a 2-inch square operating nut located within 6-inches of finished grade. Valves located inside the valve vault shall be accessible from the surface and be capable of operating without entry into the valve vault with a 2-inch operator located within 5-feet of finished grade.
- I. Valve Number and Tags – Each valve shall be systematically numbered and have a corresponding number on a lift station figure (plan view figure showing all valve #'s, structures, and piping) and shall be demarked with the valve number marked on a 3" stainless steel cap adjacent to the valve. Provide a lift station drawing showing the valve numbers in plan view printed full scale and laminated for onsite use.
- J. Check valves shall be swing type with external levers. The external levers shall be able to be

opened from the surface of the valve vault.

- K. The following High Performance Coatings apply:
1. Approved Manufacturers – Paint
    - i. Tnemec
    - ii. Sherwin Williams
  2. Exterior metal and piping, non-submerged – Generic type primer of Modified Aromatic Polyurethane and finish of Acrylic Polyurethane. To be prepared and installed per the manufacturer’s recommendations specific to the environment.
  3. Interior metal and piping– Generic type primer of Modified Aromatic Polyurethane and finish of Polyamide Epoxy. To be prepared and installed per the manufacturer’s recommendations specific to the environment.
  4. Submerged and intermittently submerged metal (all items below 1-foot above max water level) - Generic type primer of Modified Aromatic Polyurethane and finish of Polyamidoamine Epoxy. To be prepared and installed per the manufacturer’s recommendations specific to the environment.
  5. Field-cutting or abrading of high performance coatings is not allowed without City of Hayden approval of coating re-application plan and procedure submittal. The plan and procedures shall be developed and approved by coating manufacturer.
- L. Interior Concrete Floors shall be coated with a floor hardener.
- M. Pump: The following pump manufactures are pre-approved based on experience by the City and operations staff. Other pump manufacturers may be approved by the City. The City will make the final determination on pump selection and will be considered site specific.
1. Flygt with N-Technology
  2. Gormann Rupp
  3. Hydromatic
  4. WEMCO Hidrostal Screw Centrifugal Pump with Prero Basins
- N. Protection: All pumps and piping shall be protected from freezing temperatures and the elements of local weather conditions.
- O. External Lift Station Bypass Connection:
1. All lift stations must have means to discharge flow into the force main via a cam-lock connection (Cam-lock per City requirements) at grade for emergency pump bypass for operations and maintenance of the lift station. A double-valved connection shall be provided to connect an emergency pump discharge directly to the force main. Provide a female aluminum cam-lock for emergency pump connection. Cam lock fitting shall be 4-inch diameter for all force mains less than 6 inches in diameter. Force mains greater than 6 inches in diameter shall be equipped with 6-inch cam lock fittings. Provisions for draining bypass connection when not used shall be included to avoid freezing damages. All pipe assemblies within manhole shall be

secured to inside wall of manhole with approved pipe supports/clamps. The Cam-lock shall be oriented so that the emergency pipe connection is parallel to the ground.

- P. Isolation Valves – All valves shall be eccentric plug valves with 2-inch square nut operators for buried applications. Provide a 2-inch operator for valves in the valve vault capable of operation from the surface without entry into the valve vault.
- Q. Magnetic Flow Meters shall be provided for all lift stations unless exempted by the City. Reference Section 6 for requirements.

#### **5.4 Wet Well Design Requirements:**

- A. Wet well design shall minimize solids accumulation by filling wet well dead zones with grout fill in order to avoid solids accumulation on the bottom of the wet well.
- B. Minimum wet well size shall be 72 inches in diameter.
- C. Wet wells shall be of adequate size for the existing and future pumps and be sized for existing conditions with expandability considerations to serve the ultimate flow projections.
- D. Submersible pump retrieval: Submersible pump retrieval shall occur from finished grade, without entry into the wet pit. Guide rails shall be provided by the pump manufacturer and shall consist of an independent non-corrosive stainless-steel rail for each pump. Non-sparking rail systems shall be provided and shall be approved for explosion-proof service. All rails shall be constructed to be true to line and vertically plumb.
- E. All wet wells shall have adequate fall protection gratings installed for operator safety
- F. Watertightness Testing – The Wet Pit shall be tested for watertightness as follows:
  - 1. Test 1-foot above the maximum water surface elevation.
  - 2. Provide a 3-day absorption period prior to running the test
  - 3. Track the water temp 5' below the surface. Water temperatures shall not change for underground tanks.
  - 4. Maximum allowable leakage is 0.1-percent of the water in the tank over a 24-hour period.
  - 5. Run the test on a 24-hour cycle for as many days as it takes to be able to measure a minimum of a ½ inch drop at the allowable leakage rate.

#### **5.5 Overflow Storage Design Requirements (if required by size):**

- A. Where required in the most current version of the Collection System Master Plan, overflow basins shall provide adequate storage volume for up to 30 minutes of response time during future wet weather peak hour flow scenario of the most current version of the City's master plan.
- B. All storage volume must contain flow to a water surface elevation below gravity collection system lines.

- C. All stored wastewater must gravity flow back into the wet well during normal pump operation.

## 5.6 Valve Vault Design Requirements for Submersible Lift Stations:

- A. Valve vault shall be sized to provide adequate space for control of flows into the force main. Minimum valve vault size shall be 72 inches in diameter or prior approved and shall be located no farther than 5 feet from the wet well.
- B. All drainage inside the valve vault shall drain back into the neighboring wet well. Drain line shall include a p-trap in a floor drain and employ a check valve or flapper valve.
- C. Pressure Gauge and Diaphragm Seal. A pressure gauge with dial face shall be tapped into ductile iron fitting in valve vault and placed downstream of isolation valves, unless otherwise required by the City. Gauge shall be glycerin filled with dial orientated face up so pressure readings can be seen from above through access hatch and attached to an oil-filled diaphragm seal. Reference Section 6 for high pressure switch requirements.
- D. Provide 18-inches minimum of clearance between piping and floor. Provide pipe supports.
- E. Provide means to disassemble piping and fittings between flanges.
- F. Provide restraint connection on pipes between wet pit and valve vault.

## 5.7 Odor Control Design and Requirements:

All lift stations shall include odor control infrastructure to suppress sewer odors. Options for odor control based on lift station size are as follows:

- A. Activated Carbon Media (Small and Medium lift stations) capable of removing other general acid gases and odors common to sewage lift stations.
- B. Biofilters (large and regional lift stations) – a New York (or equivalent) blower assisted subsurface biofilter system, unless otherwise required by the City. Biofilter media shall consist of rough compost installed in 6-foot diameter HDPE lined concrete basin well within lift station site. The concrete basin shall have perforated cast iron lid with no less than 36-inches clear opening space. Pipe configuration shall be oriented to permit gas discharge into compost at bottom of drywell with perforations at a 12:00 position. Dry well must have geo-grid secured to inside wall to contain compost.

## 5.8 Force Main Design and Requirements.

- A. Pipe and Fitting Size. All force mains should be 4 inches in diameter and greater, unless otherwise required by the City.
- B. Alignment and Grade. Uniform grade and straight alignment between high and low points, fittings, and appurtenances shall be maintained in all new force mains. In no case shall the force main be installed on less than 0.02 percent grade.
- C. Velocity. At projected peak pumping capacity, a minimum self-scouring velocity of 3.5 feet per second (fps) should be maintained or provided by automatically cycling two pumps simultaneously. Design velocity should not exceed 5 feet per second (fps). Parallel force mains may be required for phasing and expandability to maintain velocities for near-term

and long-term design flows.

- D. Pipe Material. Force mains shall be constructed of a minimum of DR-18 C-900 or C-905 PVC pipe or prior approved equal. Metallic warning tape shall be placed at a minimum 24" directly over all new pipe. Ten (10) gauge thick jacket direct bury copper insulated locating wire shall be placed taped directly to the top of all new pipe. Locator wire shall surface to finish grade every 1000 feet in either a valve or witness post with warning signs. Locating balls shall be placed directly over all new force main pipe at 500-foot intervals, abrupt deflections, and fittings within 4 feet of finish grade as approved by the City.
- E. Fitting Material. All elbows, tees, wyes, crosses, reducers, and other fittings shall be constructed of Ductile Iron (DI) with minimum pressure ratings as follows: 4"-24" fittings - 350 pounds per square inch (psi); 30"-48" fittings - 250 psi; 54"-64" fittings - 150 psi. Ductile iron fittings shall be Protecto 401 ceramic epoxy interior lined and exterior coating of buried ductile iron shall be 1 mil of asphaltic coating (or approved equivalent), All flanged fittings shall be installed with rubber gaskets and wrapped entirely in plastic. Mechanical fittings require joint restraints, and/or cast-in-place concrete thrust blocks, or as required by the City. Prior to pouring concrete thrust blocks, all fittings shall be wrapped and taped entirely in plastic. The use of field flanges or field manufactured pipe is encouraged to be minimized. If thrust blocks are eliminated, provide adequate length of restrained pipe.
- F. Drainage Assemblies. A minimum 3-inch cam-lock drain assembly shall be placed at all low points in the force main to permit drainage of sewer during isolation maintenance operations. Cam-lock drain assembly shall be placed in manhole and secured to manhole wall with approved pipe supports/clamps with provisions for excess sewer to drain into neighboring gravity collector or manhole where applicable.
- G. Air Relief Valve. An air relief valve shall be placed at all high points in the force main to relieve air locking. Air relief valves shall be placed in manholes and gases vented into a buried biofilter, odor control dry well or neighboring gravity sewer manhole. All air relief valves (air release, air vacuum, combination air/vacuum) shall be stainless steel conical body shaped assemblies for sewerage as manufactured by A.R.I. All fittings, pipe, and valves inside air relief manhole shall be stainless steel. Galvanized pipe will not be accepted. Provisions shall be made for vented wastewater to drain into neighboring gravity collector or manhole where applicable. All air relief assemblies shall be secured to inside wall or ceiling of manhole with approved pipe supports/clamps.
- H. Pressure Test. All force mains shall be pressure tested per the latest revision of the Idaho Standards for Public Works Construction (ISPWC)
- I. Isolation Valves. All valves shall be eccentric plug valves with 2-inch square nut operators for buried applications. An eccentric plug valve shall be installed in the force main at a minimum of 1000-foot intervals or as required by the City. Bypass fittings and cam-lock connections shall be provided adjacent to all isolation valves unless otherwise required by City.
- J. Repair Coupler. Two (2) stainless steel repair couplers sized for all new force mains shall be provided to the City and stored in lift station valve vault on completion of the project.

## 5.9 Lift Station Site Design and Requirements.

- A. Maintenance. Provisions shall be made for lifting pumps out of station without disassembling fittings or lift station structure.
- B. Lift Station Parcel – Lift Stations shall be located on parcels dedicated to the City for ownership, operation, and maintenance and shall be located with direct access from City right-of-way. Lift Stations accessed from roads classified as collectors and higher must provide access by forward travel of all maintenance vehicles. Minimum lot size shall be 100' x 100' or larger designed for maintenance crew equipment (40-foot long vactor truck) and access to the external FM bypass. To accommodate the vactor truck, provide a 25-foot minimum gate opening and adequately sized approach such that maintenance equipment does not have to back out on to collectors or arterials. Provide a second approach for access to the Bypass (External FM Bypass) with a trailer mounted pump on a trailer while retaining vactor truck access to the wet pit. Site design shall include provisions for snow removal and a snow push location.
- C. Lift Stations to be expanded in the future shall be designed with provisions for expansion.
- D. Domestic Water Supply. A 1-inch diameter, non-freeze, post water hydrant and lock with approved cross connection prevention device, 4 feet minimum bury and greater than 10 feet horizontal separation from wet well and control panels shall be required within lift station fence. Domestic water source shall be required all year. Irrigation water source will not be a suitable equivalent unless provided continuously year-round. Cross connection prevention device shall be reduced pressure principal backflow preventer installed in an above-ground (heated) hot box according to IDEQ and local water utilities' requirements. All underground water lines shall conform to minimum separation distances as outlined by the Division of Environmental Quality (DEQ).
- E. Access and Drainage. Lift station access road shall be paved in conformance to City Street Standards and have direct access to wet well and valve vault. All finish grade surfaces inside lift station fence shall be finished with a 4-inch layer of 3/4-inch minus gravel over an approved compacted in-place subgrade. Drainage facilities shall be constructed so that the access road and lift station are not subject to flooding from run off. All surrounding property shall mitigate a separate storm water management system conforming to the latest revision to the local storm water ordinance. Access location shall be approved by City and shown on all design drawings.
- F. Lighting. A down-light capable of providing adequate lighting to work on the lift station shall be provided. Overhead light shall have a manual switch and shall be wired into the standby generator so it can be used during power outages.
- G. Fencing. A minimum 6-foot-high fence with Privacy Slats (Hedge Link Privacy slats) at all lift stations, access shall be provided to the wet pit, with second for the trailer mounted pump. Access and gate locations shall be approved by City. Site design shall provide sufficient space for service equipment to be out of traffic. All fencing shall conform to the latest revision of the ISPWC. Chain link fabric shall be 9 gauge wire with 2" square mesh fabric (top and bottom shall have twisted and barbed selvages). Minimum Galvanized or Aluminum coated tubular member sizes as follows:

1. Brace and Top Rails – Tubular O.D. shall be 1 5/8” with 2.27 #/ft
2. Line Posts – Tubular O.D. shall be 2” with 2.72 #/ft
3. End/Corner Posts – Tubular O.D. shall be 2 7/8” with 5.79 #/ft
4. Gate Posts –
  - i. 0’ to 6’ Leaf Width - Tubular O.D. shall be 2 7/8” with 5.79 #/ft
  - ii. 6’ to 13’ Leaf Width - Tubular O.D. shall be 4” with 9.10 #/ft
  - iii. 13’ to 18’ Leaf Width - Tubular O.D. shall be 6 5/8” with 18.97 #/ft

## 5.10 Final Acceptance by the City of Hayden

- A. Prior to acceptance of the lift station, the applicant must submit the following:
  1. Testing: Results of testing, inspections, and certification by the Engineer that the system passed the tests and that the pumps pump at the rated capacity. Pumps must be tested continuously for minimum of one half hour. All alarm and control features shall also be tested and certified. The Pump Startup Reports included in Attachment D of the City of Hayden Sewer Policies should be used. Representatives of the City of Hayden shall be present for the pump testing procedure.
  2. Guarantee: Dedication of the ownership of the lift station and force main (if the force main goes to a gravity main) to the City shall be free and clear of all liens and encumbrances. Force main from the lift station directly to the HARSB treatment plant must be accepted by HARSB prior to the acceptance of the lift station by the City. The applicant shall guarantee the constructed system for a period of eighteen (18) months from the date of City Council acceptance. The guarantee shall include specific language stating that if odor problems occur at the lift station within the guarantee period, the applicant shall improve or modify the existing odor control at their expense. All improvements to the odor control system shall be approved by the City Engineer prior to installation. Any repairs, replacement, or system failures shall be corrected by the applicant at his expense during the warranty period.
  3. Warranty Surety: A warranty surety in the amount of 25% of the lift station value shall be provided. Surety shall remain in place for 18-months from the date of City Council Acceptance.
  4. Pump Manufacturer’s Warranty - A 2-year warranty from the date of City acceptance on the pumps must be provided by the pump supplier.
  5. As-Built Drawings. Reproducible record drawings and one set of as-built drawings with electrical, wiring diagrams, and pump data and approval by the City Engineer and Electrical Engineer shall be submitted to the City within thirty (30) calendar days of completion of the project and prior to City acceptance. All wires shall be tagged, and all programs submitted to the City on disc. As-Built drawings shall be placed in all Operation and Maintenance Manuals.
  6. Easements: All right-of-ways and/or easements for construction, operation and maintenance of the system shall be recorded with the Kootenai County Recorder



and copies placed in all Operation and Maintenance Manuals.

7. Regulatory Agency Approval: Written approval by Idaho Department of Environmental Quality (IDEQ).
8. City Costs: All fees and all City administration, inspection, and other costs have been paid in full.
9. O&M Manuals: Four copies and an electronic copy (in pdf format) of the Operation and Maintenance Manuals approved by the City. Operation and Maintenance Manuals as required per IDAPA shall contain operation and maintenance instructions, repair data, parts lists, manufacturer's warranty, As-Built documents (drawings), permits, easements, photo graphs, test results, schematics for all mechanical, electrical, and civil design components, and all other pertinent information. The O&M Manual shall specifically describe system operations of the entire system. The manual shall describe the procedures required to route flow for the various flow regimes and describe the valve operations (Open/Closed) required for the various operations. The O&M Manual shall include the following chapters:
  - i. General Facility Information
    - a. Design Contributing Flow Area
    - b. Design Criteria
  - ii. Wet Pit, Valve Vault, Overflow, Pumps
    - a. Wet Pit
    - b. Valve Vault
    - c. Emergency Overflow Storage
    - d. Discharge Piping
    - e. Lift Station Pumps and Motors
    - f. Primary Pump Control System
    - g. Secondary Pump Control System
    - h. Pump Maintenance
    - i. Pump Retrieval
    - j. Valve
  - iii. Common Lift Station Operating Procedures
  - iv. Overall System Maintenance
  - v. Control Building
  - vi. Odor Control System
  - vii. Lift Station Electrical
  - viii. Power Generation System

- ix. SCADA System and Controls
- x. Appendices
  - a. O&M Manual Figures
  - b. Preliminary Engineering Report (PER)
  - c. Record Drawings
  - d. Construction Photo Log

## Section 6 | Pump Station Electrical Design Policies and Procedures

### 6.1 Certification and Approval

- A. All equipment and materials utilized in the system shall be the products of reputable, experienced manufacturers with at least five (5) years' experience in the manufacture of similar equipment. Similar items in the system shall be the products of the same manufacturer. All equipment shall be of industrial grade and of standard construction, shall be capable of long, reliable, trouble-free service, and shall be specifically intended for control and monitoring of operation of motor-driven pumps and equipment. All equipment shall be of modular design to facilitate interchangeability of parts and to assure ease of servicing. All equipment, where practical, shall be of solid state, integrated circuit design
- B. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

### 6.2 Utility Service

- A. Service Configuration
  - 1. Individual pumps greater than 7.5 horsepower, shall be served by a 480Y/277V, 3-phase utility service.
  - 2. Individual pumps 7.5 horsepower or less, may be served by a 480Y/277V, 3-phase; or a 208Y/120V, 3-phase; or a 120/240V delta, 3-phase; or a 120/240V , 1-phase service utilizing variable frequency drives for phase conversion (3-phase pumps are required).
  - 3. For locations where individual pump horsepower is greater than 7.5 and only single-phase service is readily available, variable frequency drives may be used for phase conversion if approved by the City.
- B. Meter Enclosure
  - 1. Meter enclosures shall meet the requirements of the serving utility. Installation shall be in vandal proof NEMA 3R enclosure with a lockable hinged door.
  - 2. Coordinate with the serving Utility regarding the type of metering required.
- C. Current Transformer Enclosure
  - 1. Where CT metering is necessary, CT enclosures shall meet all requirements of the serving utility and shall be installed per utility company requirements.
- D. Service Entrance Rated Main Disconnect
  - 1. All lift stations must have a separate and clearly identified service entrance rated main disconnect.
  - 2. Service entrance rated disconnect shall be an adjustable LSI enclosed circuit breaker.

3. Transfer switches shall not be used as service entrance equipment, unless approved by the City.

## 6.3 Grounding

### A. Grounding System

1. System shall include a minimum of two ground rods separated by not less than (6) feet.
2. All equipment racks, vaults, concrete pads, antenna masts and metal fences shall be bonded to the grounding electrode system.
3. All bonds buried below grade or embedded in concrete shall be exothermically welded.
4. All ground rods shall be in ground rod boxes.

### B. Ground Rod Boxes

1. Ground rod boxes shall be concrete with traffic rated covers, Fogtite SP-1, or pre-approved equal.

### C. Ground Rods

1. Ground rods shall be a minimum of ¾" diameter by 10' long, steel core with 10 mil copper jacket (copper bonded). UL listed.

### D. Ground Clamps

1. Ground clamps for connecting grounding conductors shall be made of copper alloy. Clamps shall be designed to provide permanent and positive pressure and to avoid mechanical injury to the pipe. Use exothermic welds for connecting grounding electrode conductors to ground rods and for all below grade counterpoise grounds, grids, and elsewhere where connections are necessary.

### E. Exothermic Weld Connections

1. Use Cadweld or pre-approved equal system of exothermic welding for welded grounding connections. Use properly sized molds for each application.

### F. Power Distribution System

1. Molded case circuit breakers
  - i. Circuit breakers shall have a toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. The circuit-breaker handle shall be over center, be trip free, and reside in a tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon shall be clearly marked on and off in addition to providing international I/O markings.
  - ii. Circuit breakers shall have lugs UL listed for both copper and aluminum.
  - iii. Circuit breakers shall be capable of accepting conductors as required by NEC for the installation.

- iv. Comply with UL 489 with interrupting capacity to comply with available fault currents.
  - v. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250A and larger.
  - vi. Service entrance and standby power generator circuit breakers: Field replaceable rating plug, rms sensing, with field-adjustable instantaneous trip, long and short-time pickup levels, and long and short-time time adjustments (LSI) to mitigate arc flash hazards.
  - vii. Ground-Fault Circuit-Interrupter (GFCI) Circuit Breakers: Class A ground-fault protection (6-mA trip) with test button.
  - viii. Circuit breaker enclosures shall be NEMA 3R rated.
2. Panelboards
- i. Comply with UL 67 "Panelboards".
  - ii. Busing Assembly
    - a. Panelboard busing shall be tin-plated aluminum or copper.
    - b. Phase arrangement shall be per NEC Article 408.
    - c. Bus structure and mains shall have ampacity ratings to serve the load with 25% spare capacity.
  - iii. Panelboard Short-Circuit Current Rating:
    - a. Panelboards shall have a short-circuit current rating not less than the available fault current or as indicated below. The available fault current and date the calculation was performed shall be provided on the service entrance disconnect.
      - 1) Panelboards rated 240V or less shall have short-circuit ratings not less than 10,000 A rms symmetrical.
      - 2) Panelboards rated above 240V shall have short-circuit ratings not less than 14,000 A rms symmetrical.
    - b. Full Rated: All devices shall be fully rated; series rating is not permissible.
  - iv. Panelboard enclosures
    - a. Provide galvanized steel enclosures, NEMA 3R for outdoor locations, minimum 16 gauge thickness, minimum 20 inch width, with no knockouts. Provide doors with concealed hinges, spring-loaded door pulls, flush lock and key, all panelboard enclosures keyed alike, equipped with interior circuit directory frame, card and clear plastic covering for all lighting and appliance panelboards. Door and trim

shall be painted with manufacturers standard gray enamel finish over a rust inhibitor.

- b. All panelboards shall be provided with UL 1449, Type 1 surge protection fed from a branch circuit overcurrent protective device or provided with other disconnecting means.
- v. Surge protective devices (SPD)
  - a. Provide surge protection system for the protection of all AC electrical circuits from the effects of lightning-induced currents, substation switching transients, and internally generated transients resulting from inductive and/or capacitive load switching.
  - b. SPDs shall be installed at each voltage level, providing a cascading level of surge protection. At a minimum, SPDs shall be provided at the panelboard, pump control panel and at each control panel. A pump control panel fed downstream of a panelboard shall be considered protected by an SPD installed at the upstream panelboard.
  - c. SPDs shall be listed in accordance with UL 1449, Standard for Surge Protective Devices.
  - d. SPDs shall be provided with form C dry contacts output to monitor alarm status.
  - e. SPDs shall be provided with a surge counter which displays the combined total number of transient voltage surges detected.
  - f. Visible indication of SPD status shall be provided and shall be visible without removal of the panel dead front.
  - g. The mounting position of the SPD shall permit a straight and short lead length connection between the suppressor and the point of connection to the main bus or circuit breaker.
  - h. SPDs shall meet or exceed the following criteria:
    - 1) Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
    - 2) Protection modes for grounded wye circuits with 480Y/277V or 208Y/120V, 3-phase, 4-wire circuits shall not exceed the following:
      - Line to Neutral: 1200V for 480Y/277V; 700V for 208Y/120V.
      - Line to Ground: 1200V for 480Y/277V; 1200V for 208Y/120V.

- Line to Line: 2000V for 480Y/277V; 1000V for 208Y/120V.
- 3) Protection modes for center tapped ground 240/120V, 3-phase, 4-wire circuits shall be the same as 208Y/120V 3-phase systems.
- 4) Protection modes for 240/120V, 1-phase, 3-wire circuits shall not exceed the following:
  - Line to Neutral: 700V.
  - Line to Ground: 700 V.
  - Line to Line: 1000V
- 5) Short Circuit Current Rating (SCCR): Equal or exceed 100 kA.
  - i. Suppressors shall be solid-state and shall operate bidirectionally.

## 6.4 Standby Power System

### A. General

1. The generator set shall be a permanently mounted, natural gas fueled factory standard outdoor unit.
2. The generator system shall be manufactured by one of the following acceptable manufacturers:
  - i. Cummins Corporation.
  - ii. Caterpillar Incorporated.
  - iii. Kohler Company.
  - iv. Generac Holdings Incorporated.
3. The complete generator set assembly shall be listed UL 2200.

### B. Required Performance

1. Performance of the generator set shall be based on operation of the assembly with fan, battery charging alternator and all specified and required appurtenances.
2. The generator set shall be capable of starting and operating the lift station load without exceeding the temperature ratings of the engine or the generator. The load of the lift station includes all connected load.
3. The generator set shall be rated for continuous standby service, however the temperature rise of the generator shall not exceed 105°C above a 40°C ambient when producing full rated load for a continuous period of time.
4. Voltage Drop: The engine generator unit supplied must start the load with a sustained RMS voltage drop no greater than 15% of rated voltage during the pump starting period. The pump starting period shall be from zero up to 3 seconds. The instantaneous voltage dip may be greater than 15% but shall not cause motor

starter chatter or relay drop out or exceed a level which causes undesirable motor starting.

5. Steady-State Voltage Operational Bandwidth: 3% of rated output voltage from no load to full load.
6. Transient Voltage Performance: Not more than 20% variation for 50% step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
7. Steady-State Frequency Operational Bandwidth: 0.5% of rated frequency from no load to full load.
8. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
9. Transient Frequency Performance: Less than 5% variation for 50% step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
10. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5% total and 3% for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50%.
11. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250% of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator.

C. Engine

1. The engine shall be a water-cooled, in-line or V-type, four-stroke cycle, spark ignited, natural gas fuel unit. The engine shall be fully and completely capable of and equipped for driving electrical generators. The specific model of engine selected by the manufacturer of the generator set shall have an acceptable history of successful similar applications.
2. The engine shall be equipped with an electronic governor which shall control the speed of the engine and generator. The speed shall be controlled to maintain the generator output frequency within 0.25% of rated frequency from no load to full load.
3. The engine shall be equipped with a pressurized oil lubricating system which shall include threaded, spin-on type, full flow lubricating oil filters which are located for easy removal. The lubricating system shall be equipped with spring-loaded bypass valves which will allow oil circulation if the filters are plugged.
4. The engine shall be equipped with an electric starting system which includes a lead acid battery set, an engine-driven battery charging alternator and appropriate electrical controls. The batteries shall be mounted adjacent to the generator set on a fabricated steel housing. Batteries shall be rated minimum 225 ampere-hours.



5. The engine shall be equipped with a unit-mounted, radiator type cooling system which shall maintain the jacket water temperature at the level required for proper operation of the engine from no load to full load. The engine shall be equipped with one or two, as required, water jacket heater(s), which shall be thermostatically controlled to maintain the coolant temperature at 120°F. Operation of the heater(s) shall be stopped while the engine is turning.

D. Generator

1. The generator shall be brushless, revolving field-type, and shall be fully and completely capable of and equipped to be driven by a natural gas engine, and able to produce the starting and running kVA demanded by the connected load. The specific model of generator, selected by the manufacturer of the generator set, shall have an acceptable history of successful similar applications.
2. The generator shall utilize PMG excitation.
3. The generator shall be equipped with a solid-state type regulator (separate from exciter) which is compatible with both the engine and the generator.
  - i. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5% adjustment of output-voltage operating band.
  - ii. Maintain voltage within 15% on one step, full load.
  - iii. Provide anti-hunt provision to stabilize voltage.
  - iv. Maintain frequency within 5% and stabilize at rated frequency within 2 seconds.
  - v. The regulator shall be housed and mounted for protection of all components against moisture and vibration.
4. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125% of rating, and heat during operation at 110% of rated capacity.
5. Enclosure: Dripproof.
6. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.
7. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

E. Control Panel

1. The generator shall be equipped with a control panel. The control panel shall be readily accessible, visible and shall be mounted such that the top of the control panel is no higher than 6'-0" above the finished grade when installed.
2. The generator control panel shall include the following status displays:
  - i. Engine coolant temperature.
  - ii. Engine lubricating oil temperature.

- iii. Engine lubricating oil pressure.
- iv. Engine running time.
- v. Battery charge ammeter.
- vi. Engine/generator tachometer.
- vii. Voltmeter.
- viii. Ammeter.
- ix. Frequency.
- x. Voltage adjustment (minimum plus/minus 5%).
- xi. Emergency stop push button.
- xii. Indication for:
  - a. Selector switch in OFF position.
  - b. Selector switch in AUTOMATIC position.
  - c. High water temperature.
  - d. Low water temperature.
  - e. Low water level.
  - f. Low lubricating oil pressure.
  - g. Engine starting prohibited after three (3) cranking cycles.
  - h. High engine/generator speed.
  - i. Generator run failure.
  - j. High battery voltage.
  - k. Low battery voltage.
  - l. Battery charger failure.
- xiii. The generator control panel shall include the following dry contacts wired to a terminal strip for and extended to pump control panel I/O inputs:
  - a. Common remote "trouble" alarm.
  - b. Common remote "fail" alarm.
  - c. Generator in auto indication.
  - d. Generator running indication.
- xiv. Three position (automatic/off/test) selector switch which shall:
  - a. In the automatic position allow the engine to automatically start when contacts in the transfer switch control circuit close and stop after the control circuit contacts open.
  - b. In the off position prohibit starting of the engine.

- c. In the test position cause the engine to start and remain in operation until the selector switch is moved to either of the other positions.
  - d. Provide separate dry contact for each switch position.
- xv. An automatic starting system that shall cause and control operation of the engine starter motor until the engine has started. The starting system shall include manually adjustable timing circuits for control of the time of operation of the engine starter motor and the time from stopping of operation of the starter motor (after the engine has failed to start) to re-initiation of operation of the starter motor. The starting system shall enable the number of starting cycles to be manually selected and shall prohibit operation of the starter motor if the engine fails to start after three (3) starting cycles. The starting system circuitry shall include dry contacts for remote indication of generator set running and not running conditions.
- xvi. Engine emergency shutdown controls shall include sensors and control circuits which shall stop operation of the engine when the engine coolant temperature rises to a preselected value; when the engine coolant drops below a preselected level; the engine lubricating oil pressure drops to a preselected value; when the fuel level reaches the critical low level; and the engine speed rises to a preselected value. The controls shall prohibit subsequent restarting of the engine until a reset switch is manually engaged.
- xvii. Generator Protector: Control panel shall provide microprocessor-based protection that shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of the alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator main breaker shall open the breaker to disconnect the generator from load circuits. The protector shall perform the following functions:
  - a. Initiate a generator overload alarm when generator has operated at an overload equivalent to 110% of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
  - b. Under single or three-phase fault conditions, regulates generator to 300% of rated full-load current for up to 10 seconds.
  - c. As overcurrent heating effects on the generator approach the thermal damage point of the unit, protector switches the excitation system off, opens the generator main breaker, and shuts down the engine generator.
  - d. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

F. Main Circuit Breaker

1. Molded-case, LSI electronic-trip type; 100% rated; complying with UL 489.
  2. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
  3. Trip Settings: Selected to coordinate with generator thermal damage curve.
  4. Mounting: Adjacent to or integrated with control and monitoring panel in a NEMA 1 enclosure.
- G. Support Frame
1. Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.
- H. Fuel System
1. Diesel fuel generator systems are not acceptable without prior approval of the City, and only in the case where natural gas is not available.
  2. For Natural Gas fuel systems, the fuel delivery system shall include all necessary piping for the specific fuel requirements of the supplied generator and shall include written approval of the piping design parameters by the generator manufacturer's representative. Provide manual fuel shut-off valve. All piping shall be installed per application national and local codes.
- I. Generator Battery Charger
1. Provide fully automatic constant voltage, current limiting battery charger sized for the generator starting batteries.
  2. Charger shall have the following features: Protection fuses, DC ammeter, temperature compensating voltage regulator, and LED alarm lamps indicating AC power fail, low battery voltage, high battery voltage. Form C contacts for alarm indication, high and low battery alarm adjust pots, float voltage adjustment pot.
  3. Charger shall monitor the battery voltage and control the SCR to deliver the optimum current level to the battery. The battery shall be permanently connected and when the battery approaches full charge preset voltage, the charging current shall automatically taper to zero amperes or to the steady state load on the battery.
  4. The battery charger shall be mounted in the generator enclosure.
- J. Sound Attenuated Generator Enclosure
1. Generator shall be enclosed in a weather-proof sound attenuating housing. The unit shall be skid mounted and the walls and roof shall be adequately reinforced to carry all dead and live loads. The enclosure shall be sized to contain the generator set, control panel, main circuit breaker, battery charger, batteries, and to allow adequate room to service the entire unit.
  2. The enclosure shall be a manufacturer's standard vandal-resistant, sound-attenuating, weatherproof steel, wind resistant (up to 100 mph) protective housing; enclosure shall provide sound attenuation to adhere to all City, state and local noise

emission requirements.

3. Doors shall be provided on each side of the enclosure to provide adequate access to components requiring maintenance and a control panel access door shall be provided. All doors shall be equipped with handles and latches which are keyed alike.
  4. Provide manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.
  5. The operating louver assembly, including the louver, motor, and guard shall be completely factory assembled.
  6. Thermal Insulation: Manufacturer's standard materials and thickness selected in coordination with space heater to maintain winter interior temperature within operating limits required by engine generator components.
  7. Muffler Location: Within enclosure.
- K. Generator Pad and Clearances
1. A concrete pad shall be provided and installed per generator manufacturer's requirements. At a minimum, the pad shall have the following characteristics:
    - i. Size: Pad shall extend 12 inches beyond generator enclosure dimensions and provide positive drainage away from generator.
    - ii. Concrete: 4000 PSI, 6 inch thick minimum; sides and edges shall be chamfered.
    - iii. Rebar: #4 bar on 12 inch centers, both directions.
    - iv. Rebar shall be bonded to the grounding electrode system.
  2. Generator shall have 4 feet of clearance on all sides.
- L. Vibration Isolation Devices
1. Elastomeric Isolator Pads: Oil and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern, and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area and factory cut to sizes that match requirements of supported equipment.
  2. Material: Standard neoprene separated by steel shims.
  3. Minimum Deflection: 1 inch.

## 6.5 Manual Transfer Switch and Generator Receptacle

- A. Provide NEMA 3R double throw safety switch upstream of automatic transfer switch.
- B. Provide generator receptacle matching City or approved portable generator. The receptacle shall be Crouse-Hinds by EATON Arktite Model AR1042 or similar model sized to operate the lift station. Coordinate exact model with City during design.
- C. Prior to acceptance, the portable generator must be connected to the lift station and power

the lift station.

## 6.6 Automatic Transfer Switch

- A. The transfer switch shall be mechanically and electrically held and rated to 600V for all classes of load and continuous inductive duty.
- B. The transfer switch shall conform to UL 1008 (current revision) provisions for withstand current ratings and closing ratings.
- C. The switch shall be capable of enduring 6000 cycles of complete opening and closing at rated current and voltage at a rate of 6 cycles per minute without failure.
- D. The switch shall be double throw, inherently interlocked mechanically and electrically to prevent supplying the load from both sources simultaneously. The operating current shall be obtained from the source to which the load is to be transferred. The transfer mechanism shall be of the double break design with solid silver cadmium surface contacts and individual heat resistant arc chambers.
- E. Single break contacts will also be acceptable if arc barriers and magnetic blow-out coils are used. The contacts shall be capable of carrying 20 times the continuous rating for interrupting current.
- F. All contacts, coils, etc. shall be readily accessible for replacement from front of panel without major disassembly of associated parts.
- G. The transfer switch shall have UL 1008 label and listing.
- H. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.
- I. controls hardware
  - 1. All relays shall be provided with indicating LED lights for energized position indication.
  - 2. Time delay relays shall be provided with timing and timed out LED indicators.
  - 3. All fuses shall be provided with "blown fuse" indicators.
  - 4. All wiring shall be numbered at each end with basic wiring numbering scheme.
  - 5. All terminals shall be clearly labeled.
  - 6. All internal equipment shall be labeled.
  - 7. All external devices shall be clearly labeled.
- J. Controls Features
  - 1. The transfer switch shall include the following accessories:
    - i. Undervoltage Sensor: Adjustable solid-state low voltage sensing relays. Provide for each phase.
    - ii. Time Delay Start and Stop: Solid state adjustable time delay on start (0 to 15

- seconds).
- iii. Time Delay Stop: Solid state adjustable time delay (0 to 10 minutes) to allow generator to cool down after normal power is restored and retransfer occurs.
  - iv. Time Delay Transfer & Retransfer: Solid state, time delay, relay adjustable; 2 to 120 seconds for transfer to emergency and 0 to 30 minutes for retransfer to normal.
  - v. With or Without Load Selector Switch: Switch to select exercise with or without load.
  - vi. Normal-Test Switch: Switch such that in the "Normal" mode the transfer switch will operate automatically and in the "Test" mode the generator will start for test purposes. This switch shall work in conjunction with the "With" or "Without" load switch. An extra contact block shall be provided on the normal-test switch for wiring to the Programmable Controller if one is required.
  - vii. Exercise Clock: An exerciser clock shall be provided which shall be programmable to exercise the generator set. The exerciser shall be adjustable from 15 to 60 minutes once each week. The exercise shall be either with or without load. If power fails during the exercise cycle, the load shall automatically pick up.
  - viii. Programmed Transition: The load transfer control shall be capable of remaining in the neutral position for an adjustable time of .5 to 60 seconds, when transferring from one-line power source to the other, to allow residual voltages to decay before application of the source.
2. The transfer switch shall have dry contacts, each with terminals for field connection, 10A rated at 120VAC and extended to pump control panel I/O inputs.
    - i. Two, separate, normally open dry auxiliary contacts; one indicating transfer switch is in "Normal" position and one indicating switch is in "Standby" position.
    - ii. Four, separate, normally open, dry contacts; two indicating "commercial power / normal power" available, and two indicating generator / emergency power available.
    - iii. Normally open, dry contact indicating generator called to run.
  3. Individual indication lights for emergency power available, normal power available, normal position and emergency position.

## 6.7 Equipment Supports, Identification and Structures

- A. Electrical Equipment Supports
  1. Material requirements:
    - i. Galvanized steel: ASTM A123 or ASTM A153

- ii. Stainless steel: AISI Type 316
- 2. Wire markers
  - i. For all control panels, electrical gear, pull and junction boxes all wires shall be identified with a label corresponding to the appropriate electrical design schematic:
    - a. Material: Heat shrinkable polyolefin.
    - b. Colors: White background, black printing.
- 3. Vault/handhole labels
  - i. All vaults, handholes and exterior pad mounted electrical gear shall be identified:
    - a. Material: Aluminum or stainless steel.
    - b. Legend: Embossed.
    - c. Fasteners: Weld, nylon, urethane or polypropylene strap.
- 4. Conduit tags
  - i. All raceways shall include conduit tags related to a conduit and wire identification schedule.
    - a. ID Tag: Aluminum, 1/8 inch thick, embossed with conduit name.
    - b. Tie: Stainless steel, tensile strength 100 PSI min.
- 5. Lift station equipment rack
  - i. An outdoor equipment rack shall be installed to mount electrical equipment.
  - ii. The rack shall be single sided and covered with corrugated painted steel roofing material. Cover shall have a 1:12 roof pitch toward the back of the rack and extend 4 feet beyond the front of the rack, 2 feet beyond the back of the rack, and 1 foot beyond either side of the rack. Rack shall be sized so that all conduits are not required to bend around concrete footings. All fastening hardware shall be stainless steel. All structural components shall be prefabricated hot-dipped galvanized. On-site fabrication and welding is not permissible. The minimum sizes for rack structural components shall be as follows:
    - a. Rack Frame:
      - 1) Uprights: 4"x4"x1/4" square tube steel, length as required. If rack is longer than 8 feet add an upright structural member to the middle of the rack for additional support.
      - 2) Horizontal Cross-Members: 4"x4"x1/4" square tube steel, length as required.
    - b. Rack Cover Frame:



- 1) Cross-Members: 2"x4"x3/8" square tube steel, length as required.
  - c. Upright mounting flanges: 8"x8"x1/2" minimum square mounting flange.
  - iii. Rack shall be mounted plumb and level; existing grade shall be modified as required. The following rack base and mounting components are required:
    - a. Mounting Flange Anchor Bolts: 24" x 1/2" dia., provide stainless steel leveling washers and nuts as required.
    - b. Cast-in-place, Sonotube Concrete Footings: 4000-PSI concrete, 24" dia. x 48" deep.
    - c. Concrete Slab: 4000-PSI concrete, #4 Rebar on 12 inch centers each direction, extend 4 feet beyond rack frame front, 2 feet beyond rack frame back, and 1 foot beyond either side of rack frame. Slab shall be 6 inch thick; top of slab shall be sloped at minimum 1% grade to drain away from rack.
    - d. Rack shall be bonded to the grounding electrode system.
    - e. Provide grout as required to fill in the space in between the slab and the upright mounting flanges.
6. Lighting
- i. The electrical equipment rack shall include area lighting. The lighting shall illuminate all the rack mounted equipment.
  - ii. Luminaires
    - a. Luminaires shall be LED with frosted acrylic lenses.
    - b. Luminaires shall be dark sky compliant.
    - c. Luminaires shall include photocell control.
  - iii. Mounting: Install luminaires centered above equipment on the underside of the rack cover in accordance with the manufacturer's written instructions and recognized industry practices.
  - iv. Provide a weatherproof switch.

## 6.8 Submersible Motors

- A. General – In addition to other requirements, the following shall apply:
1. All motors shall be 3-phase.
  2. Motor shall be designed for service in a liquid temperature of 25°C. Set controls to permit operation only when fully submerged unless specifically rated for non-submerged duty.

3. Motor shall have two mechanical seals; the lower one outside the motor and protecting the upper one which shall be in an oil filled chamber.
  4. Provide (1) normally closed embedded thermostat in each phase winding for thermal alarm and motor cut-out.
  5. Provide moisture detector probes (seal fail) in oil chamber.
  6. Provide one or more multiconductor cables of approved construction and suitable length to extend from the motor to the indicated receptacle. Provide stainless steel strain relief for the cable.
  7. If separate cables are provided for power and alarm conductors, provide separate cord and plug connections.
  8. Motor cord connections shall be continuous to a location outside of the wet well where they are to terminate in a cord and plug connection to the pump control panel outside the Class 1, Division 1 area.
  9. Motor cords, both power and control shall not be spliced in the wet well and shall be installed to allow for disconnection and removal of the pumps.
- B. Motor Cord Plug and Receptacle
1. Motor cords
    - i. Motor cords, both power and control shall extend out of the wet well and terminate in a weatherproof plug/receptacle combination located outside of the classified area.
    - ii. The pump cords and plug shall be able to be removed with the submersible pump without any disconnection, damage or modification.
    - iii. Provide switch rated plug and receptacle. Horsepower rated with phase and ground as required for pump with (4) auxiliary contacts, NEMA Type 4X. Unit shall have the following options:
      - a. Plug: Handle with cord grip.
      - b. Receptacle: Poly angle (70 degrees) with aluminum wall box with NPT port.
    - iv. If a separate control cord is supplied with the pump, provide a separate plug and receptacle with connections as required.
    - v. Manufacture: Meltric DS series with options, or pre-approved equal.
  2. Ground fault circuit interrupter protection for personnel
    - a. For receptacles rated 150V or less to ground provide ground fault circuit interrupter protection for personnel acceptable to the AHJ per the National Electrical Code as adopted and amended by Idaho Code.

## 6.9 Pump Control Panel

- A. Packaged Pump Controller (Duplex and Triplex)

1. Provide a packaged Flygt MultiSmart Pump Station Controller as manufactured by Xylem US with the following features:
  - i. MultiSmart Controller
    - a. NEMA 3R/4X enclosure, lockable, Arc Flash Preventative enclosure, (Arc Armor), powder coated white.
    - b. Service entrance rated compartment.
  - ii. Motor Control Compartment
    - a. VFD Controllers.
    - b. Provisions and space for future odor control blower starter, NEMA size 1, Run and fault indicating lights, HOA switch and run time meter.
  - iii. Control Compartment
    - a. MultiSmart Pump Station Manager.
    - b. Ultrasonic or hydrostatic pressure level control.
    - c. Programable pump delay off ability.
    - d. Multitrode backup pump system.
    - e. Flow Calculation Module Enabled (MSUF).
    - f. MODBUS Module Enabled (MSUB).
    - g. Ethernet port.
    - h. Intrinsic safety barrier for backup level inputs.
    - i. Analog intrinsic barrier for primary level sensor – or transducer is Class 1, Div. 1 rated.
    - j. Controller Power Supply.
    - k. Backup Battery.
    - l. Backup Control system.
    - m. Backup Relay control system.
    - n. RTU.
    - o. Anti-condensation resistance heater with thermostat.
    - p. Generator and automatic transfer switch inputs.
    - q. Autodialer inputs.
      - 1) Pump controller fault (for each pump).
      - 2) High wet well.
      - 3) Low wet well

- 4) Generator common alarm (not in auto, fail, trouble, etc.; including anything that would inhibit automatic operation in the event of a power outage).
  - 5) Loss of utility power and generator not running (fail to start).
  - 6) Spare.
  - 7) Spare.
  - r. 4 port ethernet switch.
  - s. Space for telemetry radio and power supply.
  - t. Space for autodialer and power supply.
  - iv. Provide external alarm beacon.
  - v. Provide permanent labeling for all control components and displays per specifications.
  - vi. Other features as required.
  2. Programming of Pump Controller
    - i. Obtain Ethernet IP address from City.
    - ii. Programming provided by authorized manufacturer's representative.
      - a. Provide a copy of the program parameters to City.
- B. Level Instruments and Devices
1. All control sensors shall be rated for the environment in which they will be located. In general, devices mounted outdoors, or in wet or corrosive environments shall be NEMA 4X; devices located in hazardous areas (Class 1, Division 1; or Class 1, Division 2) shall be NEMA 7 or intrinsically safe.
  2. Wet well level transmitter
    - i. Primary lift station pump/level control shall be based on the analog wet well level from the transducer.
      - a. Level Transducer (LT Type 1): For use when Hidrostral style pumps are provided.
        - 1) Narrow beam transducer (Class 1, Division 1 rated): Siemens, XPS-15, or pre-approved equal.
        - 2) Transmitter: Siemens, SITRANS LUT400, or pre-approved equal.
      - b. Level Transducer (LT Type 2): For use with other submersible pump designs.
        - 1) The level sensor shall consist of a submersible level transducer suspended on 1/8 inch diameter SS cable with epoxy coated or stainless steel weight. The transducer shall

be connected via an unspliced cable to a NEMA 4X junction box with aneroid bellows. The system shall be intrinsically safe, 24 VDC loop powered with an output signal of 4-20mA DC.

- 2) The level sensor shall be as manufactured by Endress + Hauser, Waterpilot FMX21 series, or pre-approved equal. The exact manufacturer and model may be revised over time, contact the City for current model prior to design.
  - ii. Backup lift station pump/level control shall be based on the analog wet well level from a capacitance probe.
    - a. Level probe (LT Type 3)
      - 1) MultiTrobe Probe, 3 meter, 10 sensor, 12 inch separation, cable length as required.
- C. Level Instrument Installation
1. Level instrument cable installation
    - i. Cables for level instrumentation shall route to explosion proof junction boxes or NEMA 4X stainless steel junction boxes for intrinsically safe circuits on the equipment rack, separate from the pump control panel, to facilitate replacement of instruments without entering the wet well or disturbing conduit seals.
    - ii. Provide EYS conduit seals between junction boxes and the pump control panel.
  2. Wet well cable support
    - i. Provide a stainless-steel mounting bracket in an accessible location inside the wet well for suspending all control cables from stainless steel cord grips.
    - ii. Install individual color-coded tape on all float cords for ease of identification.
- D. High Discharge Pressure Switch
1. Provide a high discharge pressure switch between each pump and the check valve to disable the pumps and provide positive indication of no flow conditions. Pressure switches shall be installed with appropriate diaphragm seals to isolate the switch from process fluids and isolating ball valves to enable easy maintenance and replacement of switch.
  2. Pressure switches shall have NEMA 4X die cast aluminum enclosures with setpoint and dead band adjustable via calibrated external reference dials and listed for use in Class 1, Division 2 locations. Switches shall be as manufactured by United Electric Controls, 117 Series, Type H117 or pre-approved equal.

## 6.10 Autodialer

- A. Provide an autodialer installed in the MultiSmart control compartment.

- B. Autodialer shall be manufactured by Sensaphone, model 1800, or pre-approved equal. The exact manufacturer and model may be revised over time, contact the City for current model prior to design.

### **6.11 Telephone Service**

- A. Provide dial tone telephone service for alarm autodialer.
- B. Provide a NEMA 4, pad lockable, steel enclosure with internal telephone SPD protection.

### **6.12 Flow Meter**

- A. Provide a magnetic flow meter with remote mounted transmitter.
- B. Provide a NEMA 4, pad lockable, steel enclosure for the transmitter.
- C. The flow meter transmitter shall be provided with the following:
  - 1. 120 VAC input power.
  - 2. 4-20mA analog output.
  - 3. Dry contact totalized flow output.
- D. Flowtube
  - 1. The flow sensor liner shall be EPDM NBR hard rubber or Ebonite hard rubber.
  - 2. The housing shall be steel.
  - 3. Electrode: Hastelloy C
  - 4. End Connections: ANSI Class 150 suitable for mating with pipe specified. Meters of 4 inches and smaller may be flanged or wafer style. 6 inch and larger meters shall have flanged connections.

### **6.13 Site Yard Light and Pole**

- A. Provide an LED yard light to illuminate the wet well and valve vault.
  - 1. Provide a minimum of 25 foot candles illumination at wet well hatch (ground level).
- B. Lighting system shall be dark sky compliant and meet City standards.
- C. Coordinate location with City.
- D. Utilized the pole for telemetry antenna mounting.
- E. Provide 24" dia. concrete pole base extending 30" minimum above finished grade.

### **6.14 Telemetry Control Panel**

- A. Provide space on equipment rack for a 36" w x 42" h future telemetry control panel.

### **6.15 Telemetry System**

- A. General
  - 1. Provide a radio telemetry system.

2. Telemetry radio shall be installed in the MultiSmart control compartment.
3. Antenna system shall be installed using the site light pole.

B. Radio Propagation

1. Perform a software radio propagation study to determine and/or verify the following:
  - i. Antenna type and gain.
  - ii. Antenna/cable system losses.
  - iii. Calculated RSSI.
  - iv. Calculated fade margin and reliability.
  - v. Repeater requirements.
2. The propagation study shall be performed between the lift station site and the HARSB site (10789 N Atlas Rd, Hayden, ID 83835) unless otherwise directed by the City.
3. The minimum acceptable fade margin shall be 38dB. Adjust system parameters (Antenna gain, height) to achieve the minimum fade margin.
4. The radio system propagation study shall be submitted for City approval.
5. After approval of the software propagation study, perform field verification of radio paths using comparable radio and antenna equipment at the project site. This verification shall take place prior to placing the final equipment order. Submit results of field verification to City for approval and recommendation to proceed with equipment procurement.

C. Telemetry Radio Modem

1. ESTeem 210M or Horizon; using the ethernet connection; licensed or unlicensed radio selection will be based on propagation study and City preference. The exact model of radio may be revised over time, contact the City for current model prior to design.
2. If a licensed radio is required, provide FCC license revision coordination for expansion of the existing radio telemetry system.

D. Antenna

1. Antennas shall be unity gain, omni or yagi, ground plane, dBm as determined by radio propagation study.
2. All antenna cable shall be standard coax for lengths up to 50 feet. Cables longer than 50 feet shall be low-loss Heliac cable.
3. Contractor shall supply installation fixtures and any mounting equipment required for the applicable installation including, but not limited to, the following:
  - i. Cable ties.

- ii. Grounding.
    - iii. All other appurtenances as required by the manufacturer.
  4. All of the above telemetry comments shall serve as minimum guidelines. Final equipment sizes and types shall be based on a Contractor provided telemetry propagation study. Telemetry propagation study shall be submitted to the City for review and approval.
- E. Lightning/Surge Arrestor
  1. Lightning/surge arrestors shall be installed on every radio/antenna system installed. A ground conductor shall be run directly from the lightning/surge arrestor to a suitable ground rod via the shortest path possible in accordance with the NEC.
  2. Lightning arrestor ground connections shall be exothermically welded to the grounding electrode system.
  3. Lightning/surge arrestors shall be as manufactured by Polyphaser Corporation, or pre-approved equal.

## 6.16 Arc-Flash Hazard Risk Assessment

- A. Arc-Flash Risk Assessment shall be conducted per NFPA-70E utilizing the calculation method via IEEE 1584-2018. The risk assessment shall include the following studies:
  1. Short-circuit study.
  2. Selective coordination study.
  3. Arc-flash study.
  4. The study shall be performed from source down to all 120V panels.
  5. The "2-second" rule shall be utilized, where appropriate.
  6. Standard electrical distribution equipment conductor distances shall be used.
  7. Conductor orientations shall be analyzed and used.
- B. Report Format at a minimum include the following sections:
  1. Cover sheet.
  2. Professional engineer stamp sheet.
  3. Table of contents.
  4. Executive summary, assumptions, conclusions, and recommendations.
  5. Short-circuit study analysis, deficiencies, and results.
  6. Selective coordination study analysis, deficiencies, and results.
  7. Arc-flash study analysis, deficiencies, and results.
  8. Appendices:
    - i. One-line diagram displaying all analyzed electrical equipment, OCPD



- settings, conductor/conduit types, lengths, and sizes.
  - ii. OCPD cutsheets indicating product number and installed location.
  - iii. Individual OCPD TCC curves.
  - iv. Selectively coordinated OCPD TCC curves.
- C. All Data Collection and Imported Data
- D. Provide arc-flash hazard labels per NFPA-70E and City labeling standard.
- E. Analysis shall be performed using one of the following power system analysis software:
- 1. ETAP.
  - 2. EasyPower.
  - 3. SKM.

### **6.17 Operation and Maintenance Training (Owner Instruction)**

- A. Provide the appropriate factory-trained representatives to instruct the Owner's representative in the proper operation and maintenance of all electrical and control systems and equipment and explain all warranties.

*Note: Any or all of these policies and procedures may change without notice. The City may grant variances from the individual policies on a case-by-case basis. Approval of Plans by the City is independent of any other agency approval. It is the responsibility of the Owner to secure approvals and permits from all other regulatory agencies.*