



General Requirements for Development



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A. Policy

1. It is the policy of Lake Cities Municipal Utility Authority (LCMUA) that line extensions of water and sewer lines to facilitate development are made by the Developer. The Developer shall conform with the master plan in the determination of line sizes. Line sizes that exceed that necessary for service of the development may be eligible for LCMUA oversizing participation to achieve required size per master plan.
2. In no case will line extensions be permitted outside the Authority's service area without approval of the Board of Directors.
3. All installations of public water and sewer facilities shall require a "Facilities Agreement" to be executed between LCMUA and the Developer or installer of said facilities. LCMUA Board of Directors approval shall be required for LCMUA cost participation in projects, as necessary for installing facilities in accordance with water and sewer master plans.
4. As necessary, the LCMUA General Manager and LCMUA Engineer shall modify, update and/or keep current technical specifications for lift station construction, SCADA facilities and standard details and specifications for construction of public water and sanitary sewer facilities. It shall be the responsibility of the Developer to meet the latest technical requirements, standard specifications and details for construction when constructing water or sanitary sewer facilities that are to be owned and operated by LCMUA.

B. Plans

1. On all projects requiring installation of public water/sewer utilities, the Developer shall provide an aerial view of the proposed development with proposed utilities for Board of Directors presentation and discussion purposes.

2. The Developer shall submit two (2) complete 24"x36", bound sets of complete engineering plans to LCMUA for review to determine if the proposed construction is in general compliance with LCMUA's construction specifications, design criteria and master plan for water and sanitary sewer. Plans that do not include all the required sheets will be returned without a review and marked "Incomplete" for requirements.

3. Project plans that are submitted for review **must** include the original markups and any subsequently resubmitted plans. All submitted plans and markups are to be retained by LCMUA.

4. Plans submitted for review shall bear the seal of an engineer licensed in the State of Texas.

5. Plan set shall include a copy of the final plat with Denton County filing information.

6. Plans shall include utility contact information for the various utilities within the project area.

7. Where a construction project requires interruption of traffic on any existing roadway, a detailed traffic control plan in accordance with the Texas Manual on Uniform Traffic Control Devices shall be included in the construction plans.

A. If the project will, or has the potential to, interfere with traffic (ie street closures, lane closures, Right-of-Way work), notification and

approval from the affected municipality will need to be granted at least 7 days prior to the start of construction.

8. Plan sheet size shall be 24" x 36". Overall water and sewer layouts may be at a scale of 1" = 100', however, the scale for water and sewer plans shall be no smaller than 1" = 50'.

9. A signature block shall be provided on the cover sheet of the plans for approval by LCMUA's General Manager.

10. LCMUA shall have a minimum of 15 working days in which to review plans and return initial comments. On large sets of plans the Authority may require additional time for review.

11. Any request for exceptions to the criteria set forth in the LCMUA General Requirements for Development manual shall be submitted in writing and is subject to approval by the LCMUA General Manager, or his/her designated representative.

C. Developer Contract General Conditions

The contract documents between the developer and his utility contractor shall include the "Standard General Conditions of the Construction Contract" as prepared by the Engineers Joint Contract Documents Committee in its latest amended form or other as approved by LCMUA's Engineer.

D. Plan Approval

After the plans have been approved for construction, changes required in the design due to constraints encountered in the field shall be reviewed and approved by LCMUA's Inspector and/or Engineer prior to changes being made in the field.

E. Preconstruction Meeting

A preconstruction meeting will be held with LCMUA, the Developer and the Developers Engineer and Contractor after the plans have been approved for construction. At the meeting, the developer or developer's engineer shall provide two (2) half size and five (5) full-size copies of the final construction plans for the development to LCMUA for signature by the General Manager for use during construction of the project. Additionally, the developer shall provide two (2) copies of the filed plat with recording information, water/sewer layout and profiles as AutoCAD drawing files are also to be provided for updating LCMUA system maps.

F. Plan Approval Limitation

Utility construction must begin within six (6) months from the date of approval of the plans. Should construction not have commenced then the approval shall be rescinded. Plans will be resubmitted for approval to ensure compliance with LCMUA's latest rules and requirements.

G. Standard Specifications

Lake Cities Municipal Utility Authority has adopted the Standard Specifications for Public Works Construction (2017 version) as published by the North Central Texas Council of Governments (NCTCOG). These standard specifications shall govern the construction of the water and sewer utilities **unless modified by items contained herein**. The developer's engineer may use Division 1, General Provisions, of the NCTCOG documents or the Standard General Conditions as published by the Engineers Joint Contract Documents committee. In the event of a conflict between specifications on a project, the LCMUA Inspector and/or Engineer shall make the final determination on the governing specification or requirement for all projects undertaken on behalf of LCMUA.

If Contract Documents, Laws or Regulations of any public body having jurisdiction require any of the Work (or part thereof) to be inspected, tested, or approved beyond that of LCMUA's standards, the Contractor shall assume full responsibility for arranging and obtaining such independent inspections, tests, retests or approvals, pay all costs in connection therewith, and furnish LCMUA the required certificates of inspection or approval.

H. Special Specifications

Special Specifications are those construction specifications which are not covered by the Standard Specifications. Special Specifications shall be required for all projects having items of construction not adequately covered by the Standard Specifications. All Specifications shall be subject to review and approval by LCMUA's Inspector and/or Engineer.

I. Bonds

1. The Developer shall include in his contract documents a Two (2) year maintenance bond, payment bond and performance bond, for one hundred percent (100%) of the construction cost of all public water and sewer utilities.
2. A good and sufficient performance bond in an amount equal to one hundred percent of the total contract price (between Developer and the prime contractor), guaranteeing the full and faithful execution of the work and performance of this Agreement and for the protection of LCMUA against any improper execution of the work or the use of inferior materials. The performance bond shall guarantee completion of the Facilities within two years of execution of this Agreement.
3. A good and sufficient payment bond in an amount equal to one hundred percent of the total contract price (between Developer and prime contractor), guaranteeing payment for all labor, materials, and equipment used in the construction of the Facilities.
4. A good and sufficient maintenance bond in an amount equal to one hundred percent of the estimated total cost of the Facilities, guaranteeing the maintenance in good condition of the Facilities for a period of two (2) years from and after the date that a letter of acceptance is issued by LCMUA indicating that the Facilities have been completed by Developer and accepted by LCMUA.
5. The bonds shall be in the name of the Lake Cities Municipal Utility Authority.
6. A copy of the Maintenance Bond shall be provided prior to issuance of the Final Acceptance Letter for all public water or sewer facilities.

J. Insurance

A copy of the Contractors certificate of insurance shall be filed with LCMUA before construction is authorized. Coverage limits shall not be less than the following:

1. Workman's Compensation, As required by Texas State Law for payment of benefits

2. Contractors Public Liability

Bodily Injury \$500,000 Each Person

\$500,000 Each Accident

Property Damage \$500,000 Each accident

3. "Umbrella" Excess Liability Insurance, The Developer shall require the Contractor to obtain, pay for, and maintain a minimum of \$1,000,000 single limit bodily injury and property damage liability insurance, including death, in excess of the primary coverage.

K. Construction Observation

1. LCMUA's Utility Inspector (or authorized LCMUA representative) will observe the construction of all proposed public utility extensions and installations.

2. Regular working hours for the purposes of the contract shall be from 7:30am to 5:00pm. The contractor will need to request from the Authority permission to work on a different time schedule or longer hours. The cost of any additional observation hours shall be paid by the contractor at a rate of 1.5 times the Inspector's hourly rate, for a minimum of 4 hours.
3. Regular working days are Monday thru Friday. Should the contractor desire to work Saturday or Sunday or any legal holiday, the contractor will request permission from the Authority at least 48 hours in advance to do such work. The cost of observation for days other than regular working days will be paid by the contractor at the above rate.

L. Construction Staking and Erosion Control

1. Line and grade stakes for construction of all mains and laterals shall be furnished by the developer's Engineer or their designated representative. Property lines and corners must be properly staked to ensure correct alignment. LCMUA will not be liable for improper alignment or delay of any kind caused by improper or inadequate surveys by the developer or by interference of other utilities.
2. Every soil disturbing activity shall comply with ALL ordinances and erosion control requirements of the local municipality where soil disturbing activities will be taking place and must comply with all State and Federal regulations.
3. No soil disturbing activities will occur prior to the SW3P, ECP and associated Best Management Practices (BMP) being approved and fully implemented, then inspected by the local municipality's Stormwater Inspector.

4. The contractor shall employ measures as necessary to prevent dirt, mud, and debris from being trucked off site. Any dirt, mud, debris trucked offsite shall be cleaned up by the contractor immediately.
5. Contractor shall be responsible for any temporary irrigation or watering as needed. Areas adjacent to new residential lots, where the homebuilder will be disturbing this area, may be exempted from this requirement so long as adequate erosion control measures are installed and maintained behind the curb.
6. Contractor shall establish perennial vegetation on all other disturbed areas immediately upon completion of grading activities. An appropriate seed mix should be considered with respect to the season and the timing of final acceptance. A cool season seed mix should be used between September 15, and April 15. Final acceptance of a site shall be contingent upon perennial vegetation being fully established in all disturbed areas.
7. Concrete wash-out shall be maintained and shall have signage and shown on erosion control drawings.

M. Water for Construction

1. Unless otherwise specified in the contract, ALL water required for construction and testing, that is furnished from LCMUA's water distribution system, shall be paid and accounted for by the contractor.

N. Easements

1. All easements necessary for the construction of the utility shall be shown on the final plat.
2. Easements determined necessary after final plat approval shall be provided by separate instrument - with Denton County recording information provided on final plat.
3. If an easement is necessary to facilitate construction that is off-site from the development, the Developer is responsible for obtaining said easement in LCMUA's name, recording the easement at the County, and providing a copy of the easement to LCMUA. These easements will be specifically for water and/or sewer utility installation. No permanent facilities shall be constructed within easements dedicated to LCMUA. Any temporary facilities (fences, landscaping, storage sheds, etc.) shall be allowed, however, LCMUA is not responsible for the costs of relocating, restoring or replacement of said temporary facilities in the event that LCMUA is required to remove them from their easement for access, maintenance or replacement purposes.
4. Standard easements for either water or sewer lines shall not be less than twenty (20) feet in width for typical installation depths.
5. Easements containing both water and sewer lines shall not be less than twenty-five (25) feet in width.
6. Easements adjacent to dedicated public right-of-way and/or dedicated fire lanes may be ten (10) feet in width - subject to review by LCMUA's Engineer.
7. The need for temporary construction easements and their widths shall be determined by LCMUA's Engineer on a case by case basis.
8. Easements widths for deep sanitary sewer lines shall be as follows:

Manhole Depth (feet)	Easement Width (feet)
13-17	25
17-20	30
20+	35

9. All easements shall be provided before construction will be allowed to commence.

10. All easements shall be located adjacent to future right-of-way for roadways when practical or situated as necessary to ensure that LCMUA facilities end up 6.5' inside of future roadway right-of-way.

O. Trench Safety

1. On construction projects in which trench excavation exceeds a depth of Five (5) feet, the plans must include detailed plans and specifications for adequate safety systems that meet the Occupational Safety and Health Administration standards.

2. If trench safety is not provided in the engineering plans or the Contractor elects to use a different trench safety system than that specified,

the contractor shall provide a trench safety plan, sealed by a registered engineer in the State of Texas that complies with all OSHA requirements, to LCMUA for their records.

P. Annexation to Service Area

Any development that lies partially or wholly outside LCMUA's service area will be required to annex into LCMUA's service area prior to service availability.

Q. Utility Crossings

1. Water lines crossing under storm drains and sanitary sewer lines shall have a minimum of eighteen inches (18") clearance below storm drains and twenty-four inches (24") clearance below sanitary sewer lines or otherwise as governed by Texas Commission on Environmental Quality (TCEQ) Chapter 290 requirements. Parallel water lines shall be at least nine feet (9') clear horizontally to sanitary sewer lines and manholes. Where minimum clearance cannot be achieved, water lines shall be encased six inches (6") around in concrete to ten feet (10') either side of the utility crossing. Where water lines cross creeks or ditches the water line shall be protected by concrete encasement at least ten feet (10') past the embankment slope on each side.

R. Street Cuts & Boring

1. The crossing of streets with utilities shall be by dry auger boring and installed within steel casing. Where connecting to existing utilities requires a street cut, pre-approval of the cut from the appropriate jurisdictional authority (i.e. City/County/TxDOT) shall be obtained prior to the commencement of work. Developer is responsible for obtaining permission from the appropriate jurisdictional authority for all street cuts and/or bores. In most instances' street cuts will not be allowed.
2. It shall be the Developer's responsibility to adhere to the appropriate governing standard details for street repair details if a street cut is permitted.
3. All bore pits, trenches, and inspection holes shall be backfilled within 48 hours of the installation of utility lines. The method of compaction shall be such that a soil density equal to that existing prior to the start of construction will be required as verified by an approved testing laboratory. Any excess or surplus material resulting due to displacement of utility lines and conduits shall be disposed of in an acceptable manner to LCMUA.
4. The Contractor shall be required to install all necessary warning and safety devices that would protect the safety and health of the public until the work has been finished and accepted.
5. The use of a casing pipe will be based upon the specific project location and soil conditions. In general, the minimum casing thickness is 0.25 inch and the material shall be steel. Where more than one section is required, the casing ends shall be welded together. Raci spacers, or LCMUA approved spacer, shall be used to support the carrier pipe. The use of wood skids is no longer permitted.

S. Pre-Construction Digital Video Taping

1. On projects that require extensions within existing developed areas, the entire right-of-way or project work area (including temporary construction and permanent easements) within the existing developed area shall be videotaped, after all existing utilities have been located and flagged, in an approved digital format (MP4, MPEG, AVI).
2. The digital video file shall clearly identify all existing structures, improvements, and utility markers.
3. The digital video file will be turned over to the LCMUA prior to commencement of any work on the project and shall become the property of LCMUA.

T. Final Acceptance

1. The Developer shall require the Contractor, upon completion of the project, to provide LCMUA with a complete set of marked-up-as-constructed water/sewer plans indicating all deviations from the original contract plans for the work as actually constructed.
2. The following is a check list of conformation required for project final acceptance:
 - a. AutoCad "as built" drawing file of the water/sewer layout
 - b. AutoCad drawing file of the plat and sewer profiles
 - c. RPLS Signed SSMH rim/FL elevation shots
 - d. Air test results
 - e. Trench compaction/density test results

- f. "As-Built" construction drawings signed by Design Engineer
- g. TV run sheet of sewer mains and services in digital format
- h. Any required easements by separate instrument
- i. O&M manuals if appropriate.
- j. Copy of the Maintenance Bond

3. This information shall be submitted at one time and prior to the final acceptance of the project. The LCMUA Engineer will determine number/sizes of physical copies required for submittal for items listed in 2.a. through j.

U. Plan Review and Construction Fees

1. Plan Review Fee

a. The fee for plan review, meetings, coordination, construction observation and other services rendered on the project, through the 2-year maintenance period, shall be the actual cost incurred by LCMUA as charged by the LCMUA's Consulting Engineer. Copies of the consultant's billings will be made to LCMUA and provided to the Developer upon request for time required to be spent on the project. Reimbursement for all engineering review fees incurred by LCMUA shall be paid by the Developer prior to final acceptance of the public water and sewer facilities.

b. An initial submission fee in the amount of \$3,000.00 shall be payable prior to plan review. This \$3,000.00 fee shall be applied towards the consultant's billings.

2. LCMUA Inspection Fee

The fee associated with construction observation by LCMUA shall be three percent (3%) of the actual public water and sewer utility construction cost.

3. Water Line Flushing Fee

After acceptance of the utility construction by LCMUA, the Developer is responsible for payment of flushing of the water lines until 50% build out of the subdivision.

V. System Impact Fees

1. Prior to setting a meter, all applicable impact fees shall be paid to LCMUA.
2. Refer to the latest "LCMUA Master Fee Schedule" for impact fee amounts based on meter sizes.

W. Pro Rata Limitation

A developer shall have the opportunity to submit, within 30-days of final acceptance of any off-site utilities, a pro rata agreement, which shall include a cost apportionment calculation based on a potential service area or footage as measured adjacent to said utilities for LCMUA review and approval. Once approved by LCMUA any party seeking service connection to the utility is subject to a pro rata charge associated with such connection. Failure to provide the pro rata cost within the time stipulated will result in the loss of pro rata for that portion of the utility on which connections are made. The party, firm or corporations seeking a service connection to said main shall pay the pro rata to the original installer of the main, not LCMUA. It is the original installer's responsibility to keep on file with LCMUA, a current address and telephone number so that they may be contacted when a service connection is proposed to the main. Failure to have on file

current address and telephone number will result in a loss of pro rata. The maximum time period for a pro rata agreement is 10 years.

X. Third Party Agreement

Should the Developer and/or his contractor make any agreement with property owners adjacent to or near the proposed development for the purposes of facilitating the construction of any part of the project, the agreement is required to be in writing and a copy submitted to LCMUA.

Section II – Water System Improvements

- A. Water Line Requirements
- B. Fittings
- C. Water Line Location
- D. Thrust Blocking
- E. Fire Hydrants
- F. Water Services
- G. Fire Line to Commercial Building
- H. Density Testing
- I. Hydrostatic Pressure Testing
- J. Disinfection of Water Lines and Bacterial Testing
- K. Utility Markers
- L. Backflow Prevention

A. Water Line Requirements

1. Design criteria for all water systems shall comply with Texas Commission on Environmental Quality (TCEQ) Chapter 290 (Rules and Regulations for Public Water Systems), latest revision.
2. The Developer shall be required to install, at his own expense, all water lines and appurtenances necessary for the development of the project. All mains must extend to the borders of the development, to facilitate future extensions of the system. It shall be Developer's responsibility to determine the maximum daily potable demand, including fire protection of the subject development subject to the review and approval of LCMUA's Engineer. Off-site water mains required to provide the necessary service shall also be installed at the expense of the Developer.
3. Water lines shall normally be PVC meeting the requirements of AWWA C900 or C905, DR18, Class 150. The minimum water line size for development shall be eight-inches (8"). A maximum velocity of 7 feet/second is permitted in the calculation of water line sizes.
4. All mains to be installed under existing roadway should be installed by dry auger bore unless otherwise approved by LCMUA. Rust resistant steel casing shall be used with stainless steel casing spacers. No wood skids will be allowed.
5. Water lines shall be looped wherever possible. Water lines that are not looped shall terminate with a fire hydrant.
6. All water conduit installed shall be laid in accordance with NCTCOG's specifications (sec. 506.3).
6. Water lines must be extended to neighboring lot(s) to allow future looping of water system on future lots. LCMUA General Manager and/or

LCMUA Engineer has the final authority on location of extensions and stub outs for future use.

7. 8" diameter water lines shall be laid with a minimum of 42" cover. 12" diameter water lines (and larger) shall be laid with a minimum of 48" cover, subject to review and approval of waterline profile by LCMUA's Engineer.

8. All water lines (mains, services, etc.) will have a finder wire located on the sand cover. The finder wire will be poly-insulated No. 10 solid copper and will be terminated at each isolation valve.

9. Waterlines in cul-de-sacs shall terminate with a fire hydrant.

10. Waterlines crossings under existing/proposed sanitary sewer or storm drain lines require steel encasement a minimum 10' each direction as measured from the outside wall of the sanitary sewer line. No concrete encasement of water lines is permitted.

11. Adequate gate valves (as determined by the LCMUA's Engineer) shall be provided at all intersections and along pipe runs to minimize customer service and fire flow disruption for maintenance to the distribution system.

B. Fittings

1. Fittings shall be of the mechanical joint type, flanges where applicable, and be manufactured by US Pipe, American, or other as approved by the Authority – Class 250. All fittings shall be restrained by using Mega-Lug retainers, glands and concrete thrust blocking.

2. Bell restraint harnesses are required on all pipe joints a minimum of 40' each direction of a fitting installation.

3. A M.J. and flanged tee with a flanged end to M.J. gate valve is required at all fire hydrants so that the gate valve is anchored to the main.
4. All valves shall be M&H, Mueller, Clow or Waterous – 150 psi pressure rating.

C. Water Line Location

1. Water lines shall be located 6.5 feet inside of dedication public right-of-way. In no case shall "Prescriptive Road Right of Way" be utilized to install public waterlines.
2. All trees within an easement for a water line will be shown on the plans. Size and type of trees are also required.
3. Existing and proposed utilities are also required in construction plans for conflict analysis.

D. Thrust Blocking

Concrete blocking shall be placed at bends, tees, crosses and plugs in the pipelines. The concrete blocking shall be placed to rest against firm, undisturbed trench walls, normal to the thrust. The supporting area for each block shall be at least as great as that indicated on the Plans, and shall be enough to withstand the thrust, including water hammer which may develop. Each block shall rest on a firm, undisturbed foundation or trench bottom. When tie downs are required, concrete shall be constructed as specified in the Construction Details and/or noted on the Plans.

E. Fire Hydrants

1. Fire hydrants shall be M&H, Mueller, Clow or Waterous three-way national standard thread with valve in lead, alternative manufacturers of hydrants require written prior approval from LCMUA. All main steamer nozzles shall have a minimal inside diameter of four inches (4”).
2. In residential areas, fire hydrants shall generally be placed on block corners or near the center of the block to place every structure within a hose laying length of 500 foot (road accessible) from the fire hydrant.
3. Fire hydrants shall not be installed within 9 feet vertically or horizontally of any sanitary sewer main, manhole or service line regardless of construction.
4. In commercial areas, fire hydrants shall generally be placed so that every structure is within a hose laying length of 250 foot (road accessible) from the fire hydrant.
5. Developer shall submit fire hydrant coverage to Fire Department for approval.
6. Fire hydrant 6” lead shall not exceed twenty feet (20’) in length to decrease potential water quality issues.
7. Fire hydrant nozzle and base shall be painted as follows:
 - a. Hydrant bases shall be painted with Tnemec Series 530 Aluminum, two coats at 2.5 mils each.
 - b. Hydrant nozzle shall be painted with Tnemec Series 1028 Gloss, two coats at 2.5 mils each, as follows:

<u>Main Size</u>	<u>Color</u>
6"	Red
8"	Blue
10"	Yellow
12"	Yellow
14"	Green
16"	Green

F. Water Services

1. Water services shall be constructed in accordance with LCMUA Standard Details for Construction, subject to review and approval by the LCMUA's Engineer. All plans shall show location of proposed water services subject to review and approval by LCMUA's Engineer.
2. All water services crossing streets shall be installed inside a two-inch PVC sleeve.
3. Water service lines shall have a minimum cover of 42".
4. Water service lines crossing roadside ditches shall have a minimum cover of 30" as measured from the lowest point of the ditch to the top of the service.

G. Fire Line to Building

1. Contractor shall install a double check detector check and appurtenances on all fire lines to buildings.
2. The double check detector check is to be installed in an easement outside of the existing or proposed right-of-way per the Authority's specifications. Double Checks are to be tested annually by the customer.
3. In no case shall the double check detector exceed 20' in length as measured from the public water line.

H. Density Testing

1. Frequency of trench compaction tests shall not be less than one (1) for any pipe section and every two hundred linear feet (200') of main pipe per two feet (2') of lift until final grade, starting at two feet (2') above the top of pipe.
2. Each water service which crosses the proposed right-of-way shall be tested.
3. Every hydrant lead that crosses the existing or proposed street, alley, or fire lane shall also receive at least one set of density tests.
4. Trench backfill shall be placed in thin, loose lifts, moisture conditioned to a minimum of 3 percentage points above optimum moisture content, and shall be mechanically tamped and compacted to ninety-five percent (95%) standard Proctor (ASTM D 698) density at zero percent (0%) to four percent (4%) above optimum moisture.
5. Water jetting is not permitted.

I. Hydrostatic Pressure Testing

1. All pipe laid under this contract shall be tested by the Contractor with a hydraulic test pressure of 150 pounds per square inch at the lowest elevation. The pressure test shall be maintained for a continuous period of not less than four (4) hours. The section of pipe to be tested shall be gradually filled with water. All air shall be expelled before applying the required test pressure. Water required for testing shall be furnished by the Owner at the nearest line. At intervals during the test, the route of the main shall be inspected to locate any leaks or breaks. Any defective joints, pipes, fittings or valves discovered shall be removed and replaced at the Contractor's expense. In order to determine the quantity of water lost through leakage in a section of pipe with rubber gasket joints under the required test pressure, the Contractor will be required to make the leakage test, measuring by use of an approved meter, all water used in the test specified herein. The maximum leakage permitted shall not exceed twenty-five (25) gallons per inch of pipe diameter per mile of pipe in twenty-four (24) hours for sixteen (16) foot pipe lengths, for pipe with rubber gasket joints. For pipe with rubber gasket joints due allowance in computing the allowable amount of leakage shall be made for longer lengths of pipe if used, for additional joints, and for variation in pipe lengths. Individual sections of pipe may exceed the above amount up to ten (10) percent, but the total leakage for the entire contract shall not exceed the amount specified herein. The Contractor will be required to correct the defects and bring the leakage within the specified limits before the contract is accepted by LCMUA.

2. Permanent pavement shall not be placed over any pipe until all leakage tests of the section of pipeline involved have been completed. The cost of testing and finding the leaks and repairing defects, and retesting if necessary, shall be at the expense of the Contractor, and shall be included in the unit price bid for laying pipe of the various sizes shown in the

Contract Documents. After Hydrostatic Pressure Testing has been successfully completed, lines shall be chlorinated for disinfection.

J. Disinfection of Water Lines & Bacterial Testing

1. All potable pipelines except those appurtenant to hydraulic structures shall be disinfected in accordance with the requirements of ANSI/AWWA C651 using the continuous-feed method as modified herein. Preliminary and final flushing shall be done at the ends of mains, which have been hydrostatically tested.
2. Chlorination: A chlorine-water mixture shall be uniformly introduced into the pipeline by means of a solution-feed chlorinating device. The chlorine solution shall be introduced at one end of the pipeline through a tap in such a manner that as the pipeline is filled with water, the dosage applied to the water entering the pipe shall be approximately 50 mg/l. Care shall be taken to prevent the strong chlorine solution in the line being disinfected from flowing back into the line supplying the water
3. Chlorine Residual Test: Chlorinated water shall be retained in the pipeline for at least 24 hours. After the chlorine-treated water has been retained for the required time, the free chlorine residual at the pipeline extremities and at other representative points shall be at least 25 mg/l. The contractor shall make 24-hour chlorine residual tests in the presence of LCMUA's Inspector.
4. Repetition of Test: The disinfection testing procedure shall be repeated if the initial tests fail to produce satisfactory results. Two consecutive satisfactory test results shall be required after any unsatisfactory test. The tablet method shall not be used for repeated disinfection.

5. Chlorinating Valves: During the process of chlorinating the pipelines, all valves, flush points and other appurtenances shall be operated while the pipeline is filled with super-chlorinated water.
6. Final Flushing: Final flushing shall be done by the contractor after achieving a satisfactory chlorine residual test. After the applicable retention period, the heavily chlorinated water shall be flushed from the pipeline until chlorine measurements show the concentration in the water leaving the pipeline is no higher than that generally prevailing in the system or is acceptable for the intended use. If there is any question that the chlorinated discharge will cause damage to the environment, a reducing agent shall be applied to the water to neutralize thoroughly the chlorine residual remaining in the water will be considered subsidiary to the contract.
7. Disinfection of Connections: Pipe and appurtenances used to connect the newly installed water main shall also be disinfected in accordance with AWWA C651.
8. Neutralization of Chlorinated Water: When deemed necessary by LCMUA, neutralizing and disposing of chlorinated water shall be in accordance with Appendix "B" of the AWWA Standard C651.

Bacteriological Testing of Disinfected Pipelines

1. The contractor shall collect a minimum of 2 sets of samples and shall take samples from every 1,000 ft. of newly laid conduit, after completion of the final flushing as indicated above and by using one of the two options below. Samples will be taken at locations indicated in ANSI/AWWA C651 and will be tested for coliform organisms and heterotrophic plate count according to the latest edition of "The Standard Methods for the Examination of Water and Wastewater". Laboratory costs of testing will be the contractor's responsibility.

L. Backflow Prevention

1. Any residence or commercial property that has the potential for a “Cross Connection” to LCMUA’s water distribution system shall be required to install an approved backflow prevention device to protect LCMUA’s distribution system from backflow contamination.

2. A “Cross Connection” shall be defined as “Any physical arrangement where a potable water supply is connected, directly or indirectly (actual or potential), with any other non-potable water system, used water system or auxiliary water supply, sewer, drain conduit, swimming pool, storage reservoir, plumbing fixture, swap coolers, air-conditioner units, fire protection system or any other assembly which contains, or may contain contaminated water, sewage, or other liquid of unknown or unsafe quality which may be capable of imparting contamination to the public water system as a result of backflow. Bypass arrangements, jumper connections, removable sections, swivel or changeover assemblies, or other temporary or permanent assemblies through which, or because of which, backflow may occur are considered to be cross-connections.”

3. All backflow prevention devices shall be tested by a TCEQ certified backflow prevention assembly technician on a yearly basis to ensure they are operating properly.

4. Any unauthorized disconnection or bypassing of the backflow prevention device will result in the immediate disconnection of water service until the device has been properly reconnected. The property owner is also subject to possible “illegal connection” fines if deemed appropriate.

5. Backflow Prevention Assembly Installation Specifications

Backflow prevention assemblies shall be installed in accordance with Plumbing Code. The assembly installer shall obtain any required plumbing permits prior to installation and shall have the assembly inspected by a certified cross connection inspector and as required by the Plumbing Code.

1. No part of a reduced pressure principle backflow prevention assembly shall be submerged in water or installed in a location subject to flooding. All assemblies installed below grade shall have non-ferrous threaded plugs inserted in the test ports.
2. Assemblies shall be installed at the point of delivery of the water supply, before any branch in the line, and on private property located just inside the boundary of the City's right-of-way. An Inspector may specify other areas for installation of the assembly. The assembly shall be protected from freezing and other severe weather conditions.
3. All vertical installations shall be approved, in writing, prior to installation and all vertical installations must be of an assembly approved by TCEQ.
4. The assembly shall be readily accessible with adequate room for maintenance and testing. Assemblies two (2) inches and smaller shall have at least a six (6) -inch clearance on all sides of the assembly. All assemblies larger than two (2) inches shall have a minimum clearance of twelve (12) inches on the back side, twenty-four (24) inches on the test cock side, twelve (12) inches below the assembly and thirty-six (36) inches above the assembly.
5. If the LCMUA Engineer or Inspector grants written permission to install the backflow assembly inside of a building, the assembly shall be readily accessible between 8:00 a.m. and 5:00 p.m., Monday through Friday.
6. RP assemblies may be installed in a vault only if relief valve discharge can be drained to daylight through a bore sight type drain. The drain

shall be of adequate capacity to carry the full rated flow of the assembly and shall be screened on both ends.

7. An approved air gap shall be located at the relief valve orifice of RP assemblies. This air gap shall be at least twice the inside diameter of the incoming supply line as measured vertically above the top rim of the drain and in no case less than one (1) inch.
8. All assemblies installed in a vault that is 5 ft. from finish floor to top of lid must have a permanently installed ladder.

Section III – Sanitary Sewer Improvements

- A. General Requirements
- B. Sewer Line Location
- C. Sewer Line Materials
- D. Manhole Requirements
- E. Clean Outs
- F. Sanitary Sewer Services
- G. Grease Traps
- H. Sewer Flow
- I. Laterals
- J. Testing
- K. Utility Markers
- L. Phased Sewer Construction
- M. Lift Station and Force Main
- N. Finished Floor Elevations
- O. Manufacturing and Industrial Development

A. General Requirements

1. Design criteria for all sanitary sewer systems shall comply with Texas Commission on Environmental Quality (TCEQ) Chapter 317 (Design Criteria for Sewerage Systems), latest revision.
2. The Developer shall be required to install at his own expense all sewer lines necessary for the development of the project. All mains must extend to the borders of the development, to facilitate future extensions of the system. Off-site sewer lines required to provide the necessary service shall also be installed at the expense of the Developer.
3. No sanitary sewers, other than laterals and force mains, shall be less than eight-inch (8") in diameter. Smaller line sizes may be reviewed on a case by case basis.
4. Permits to agencies other than LCMUA must be submitted through LCMUA.
5. Where applicable, line sizes shall comply with the Sanitary Sewer Layout Master Plan or subsequent revisions.
6. Sewer lines shall be sized and extended through the limits of a development to serve adjacent properties. In phased construction of thoroughfares, the sewer lines shall be extended the entire length of the thoroughfare being constructed.
7. Approved plugs shall be installed at the open ends of the line at the end of each working day. All joints shall be assembled free of dirt and any foreign matter.
8. All mains to be installed under existing roadway should be installed by bore unless otherwise approved by LCMUA. Rust resistant steel casing shall be used with Raci/stainless steel spacers (as directed by the LCMUA Utility Inspector). No wood skids will be allowed.

9. Sewers should be designed with straight alignment whenever possible. Sewer lines may be laid with curvatures in the line provided that the radius of curvature is not less than that shown below for the size pipe indicated:

Pipe Size	Minimum Radius
6"	100
8"	125
10"	150
12"	175

When horizontal curvatures must be used, the maximum joint deflection should be in accordance with the pipe manufacturer's recommendations and comply with TCEQ requirements.

10. When PVC pipe is used, green marker tape with the wording "Buried Sanitary Sewer" shall be installed in the backfill material no more than twelve inches (12") above the top of the pipe.

11. All sanitary sewer lines shall be tested for infiltration and exfiltration in accordance with standard specifications and as shown on the plans. Video camera inspections, low pressure air testing, vacuum testing of the manholes and mandrel testing are required on all sewer lines and service lines. All testing shall be completed, reviewed and approved by the Authority. A follow up post construction TV inspection shall be performed at the cost of the contractor, prior to expiration of the 2-year maintenance bond for the project as directed and coordinated by the LCMUA Utility Inspector.

B. Sewer Line Location

1. Sewer lines shall be located 6.5 feet inside right-of-way.
2. All trees within an easement for a sewer line will be shown on the plans.

C. Sewer Line Materials

1. The material used for the sanitary sewer shall be designed for a minimum structural life cycle, of fifty (50) years. If the pipe material will deteriorate when subjected to corrosive conditions, the engineer shall provide, for an acceptable corrosion resistant liner or provide calculation and data that demonstrated that the design and operational characteristics will provide for the minimum life cycle.
2. All gravity sewer pipe shall be in green in color. Four-inch (4") to fifteen-inch (15") pipe shall be PVC SDR 35 or 26 (ASTM D3034). Eighteen-inch (18") and larger pipe shall be PVC ASTM F679. PVC fittings may be either green or white in color.
3. Ductile Iron Pipe, minimum class 51 or 52, shall be used for all aerial crossings. It may also be used on a case by case basis with written approval from LCMUA.

D. Manhole Requirements

1. In order to provide access for sewer lines for cleaning, manholes shall be so located that two hundred fifty feet (250') of sewer rod can reach any point in the line. Spacing between a manhole and an upstream manhole shall be limited to five hundred feet (500').
2. Manholes shall be located on property lines where possible.
3. Manholes on horizontal curves shall be located at the P.C. or P.T. of the curve and a maximum spacing of four hundred feet (400') along the curve, subject to approval by LCMUA's Engineer.
4. Drop manholes shall be required when the inflow elevation is more than twenty-four inches (24") above the outflow elevation. Drops are to be outside the manhole with its flowline elevation located between the centerline and top of sewer main.
5. Standard manholes shall be a minimum of four feet (4') in diameter. For sewer mains with diameters greater than twelve inches (12") or depths that exceed twelve feet (12'), the minimum diameter of the manhole is five feet (5'). For sewer mains greater than twenty-one inches (21") the minimum diameter of the manhole is six feet (6').
6. In floodplain areas, sealed manholes shall be used to prevent the entrance of storm water. Where more than three manholes in sequence are to be bolted and gasketed, every third manhole shall be vented two feet (2') above the one hundred (100) year floodplain elevation or ten feet (10') above the adjacent ground line, whichever is higher. Sealed manholes shall also be used in all areas subject to drainage flow or in drainage ways.
7. Where unequal size pipes enter a manhole, crown of pipes should be at the same elevation.

8. Manholes shall be poured-in-place or pre-cast concrete and constructed in accordance with "LCMUA Standard Details for Construction".
9. All manholes shall be epoxy coated to within 1" of ring and cover assembly. The epoxy coating shall be Raven 405, High Build Epoxy Coating with a DFT of 120 MIL.
11. Adjustment of existing manholes to grade, require installation of a new ring and cover set and epoxy coating to a depth of 48" below the new rim elevation.

E. Clean Outs

1. All sanitary sewer lines shall terminate at a manhole; however, a cleanout may be approved when the sanitary sewer line terminates within 250 feet of a manhole.
2. Cleanouts shall be located on property lines where possible.
3. All clean outs shall have a six-inch (6") expansion plug installed.
4. Cleanouts may be located at the end of the line or on a line that may be extended in the future.

F. Sanitary Sewer Services

1. No sanitary sewer service of less than four-inches (4") in diameter shall be connected to the sewer main.

2. Each sanitary sewer service must maintain a minimum 2% grade slope as measured from the sewer main to the clean out located at the property line.
3. Each lot shall have its own sewer service.
4. Sewer services of six-inches (6") in diameter or larger shall connect to the sewer main only at manholes.
5. A clean out shall be installed at the property line, unless directed otherwise by LCMUA Project Manager (see TYPICAL SERVICE LOCATION detail).
6. Sewer service lines shall have a minimum cover of 42". Sewer service lines which cross a barrow ditch shall have a minimum cover of 30".

G. Grease Trap

1. A grease trap will be required for all food service development.
2. Grease traps shall have the Authority's standard SSMH ring and cover.

H. Sewer Flow

Sewage daily flow shall be computed in accordance with the following table.

Land Use	Design Criteria			
Apartment	100 Gal. per Day			
	20 Units per Ac			
	3 Persons per Unit			
Residential	100 Gal. per Day			
	4.5 Units per Ac			
	3.5 Persons per Unit			
Patio Home	100 Gal. per Day			
	5 Units per Ac			
	3.5 Persons per Unit			
Town Home	100 Gal. per Day			
	10 Units per Ac			
	3.5 Persons per Unit			
Nursing Home	150 beds			
	90 Gal. per Bed			
Commercial/Office	3,100 Parking Spaces per 34.7 Ac			
	1 person per parking space			
	35 gallons per person per day			
1. Peak Factor of 3 shall be used in all calculations				
2. Infiltration and Inflow factor of 450 gal/day/Ac				

I. Laterals

1. In general, for single-family dwellings, the lateral size shall be a four-inch (4") minimum.
2. Multiple units, apartments, local retail and commercial – six-inch (6") minimum.
3. Manufacturing and industrial – eight-inch (8") minimum or larger as required.
4. Manholes will be required on six-inch (6") and larger laterals where they connect to the main line.
5. A minimum of one (1) lateral per building shall be required. Also, a minimum of one (1) lateral per residential lot shall be required. Duplexes shall have two (2) laterals that shall be independently attached to the main.

J. Testing

1. Density Testing
 - a. Frequency of trench compaction tests shall not be less than one (1) for any pipe section and every two hundred linear feet (200') of main pipe per two feet (2') of lift until final grade, starting at two feet (2') above the top of pipe.
 - b. Each sewer service which crosses the proposed right-of-way shall be tested.
 - c. Each manhole will receive a density test every two feet (2') of lift until final grade, alternating around all quadrants.

d. Every other main and stub-out that cross the existing or proposed street, alley, or fire lane subgrade shall also receive at least one set of density tests.

e. Trench backfill shall be placed in thin, loose lifts, moisture conditioned to a minimum of 3 percentage points above optimum moisture content, and shall be mechanically tamped and compacted to ninety-five percent (95%) standard Proctor (ASTM D 698) density at zero percent (0%) to four percent (4%) above optimum moisture.

f. Water jetting is not permitted.

2. Deflection Testing

Upon completion of sanitary sewer pipe installation, the contractor shall pull an appropriately sized mandrel through the pipe to test for a maximum 5% deflection, unless otherwise specified.

3. Video Inspection

Before acceptance of a subdivision or project by LCMUA, the contractor will be required to retain a qualified company to perform a video inspection of the sewer mains in the subdivision at the contractor's expense. Prior to video inspection, sewer mains shall be flushed. The video inspection shall be done no sooner than ten days prior to final acceptance of the project.

4. Low Pressure Air Testing

The contractor is required to furnish Low Pressure Air Testing on all sanitary sewer pipes installed in accordance to the specifications and procedures outlined in NCTCOG (507.5.1.3.2).

5. Vacuum Testing of Manholes

Vacuum testing of all manholes shall be performed by the contractor in accordance to the specifications and procedures outlined in NCTCOG (502.1.5.2).

K. Utility Markers

In curbed streets, the location of utility services and appurtenances shall be shown by notching the curb adjacent to the utility. Curbs shall be notched as follows:

Sewer Service	II
Manhole	M
Clean Out	C

L. Phased Sewer Construction

If the development is to be constructed in phases, an “as-built survey” will be conducted to verify that the location and flowline elevation of the connection point for the next phase of all sewer line was constructed in accordance with the plans.

M. Lift Station and Force Main

1. Lift Station and Force Main Requirements

a. The Developer shall be required to install at his own expense any Lift Station and Force Main necessary for the development of the project.

b. LCMUA will operate and maintain only those lift stations and force mains which serve the public.

c. Electronics to monitor the status of the lift station are required. The monitoring equipment shall be in accordance with LCMUA’s “Supervisory Control and Data Acquisition System Specification”.

d. Emergency on-site back-up generators are required to be included with each proposed lift station - at the expense of the Developer.

2. Lift Station Location

a. Lift Stations shall be located on the site such that no residence will be closer than fifty feet (50') to the lift station.

b. An affidavit will be required from all lot owners within 150' of the lift station which states that the lot owner acknowledges that there are occasional noises and occasional odors associated with the operation of any lift station. See attached affidavit example. The developer's plat will have notation that will identify the lots that are subject to the affidavit.

3. Lift Station Design

Lift Stations shall be constructed in accordance with LCMUA's Lift Station Specification "Lift Station Specification and Instructional Guide".

4. Force Main

a. Force main minimum size shall be 4" and shall be PVC meeting the requirements of AWWA C900.

b. Force Mains will have a finder wire located on the sand cover. The finder wire will be poly-insulated No. 10 solid copper.

c. All ductile iron force main fittings shall be epoxy lined to prevent corrosion.

d. Bell restraint harnesses are required on all pipe joints a minimum of 40' each direction of a fitting installation.

N. Finished Floor Elevations

1. The finished floor elevation for the purpose house/building/structure to be served by utilities shall be provided and shown on the plans for all lots.
2. The finished floor elevation shall be minimum of 4' above the flowing of the sewer main.

O. Manufacturing and Industrial Development

Manufacturing and Industrial development may require pretreatment prior to entering the LCMUA's sewage collection system.

Section IV – Lift Station Specification and Instructional Guide

- 1.01 Introduction
- 1.02 Volume and Hydraulic Provisions
- 1.03 Site Development
- 1.04 Wet Well Construction
- 1.05 Lift Station Access Cover
- 1.06 Lift Station Vent Pipe
- 1.07 Lift Station Control Valves
- 1.08 Valve Vault
- 1.09 Submersible Sewage Pump
- 1.10 Submersible Pump Motor
- 1.11 Submersible Pump Slide Rail Removal system
- 1.12 Submersible Pump Discharge Piping
- 1.13 Electrical Controls & Equipment
- 1.14 Electronic Monitoring Equipment
- 1.15 Initial Operation
- 1.16 Operator Training
- 1.17 Final Inspection
- 1.18 Warranty

1.01 INTRODUCTION

A. The following information is provided in order to establish minimum standards and specifications for the design and construction of submersible pump lift stations within LCMUA's service area.

1. Information contained herein is subject to change, update or revision by LCMUA at any time.

B. Information noted herein is in addition to the design criteria of the State of Texas as administered by the Texas Commission on Environmental Quality (TCEQ). It is the intent of these standards and specifications to establish a level of equipment and design provisions that are beneficial to operation, maintenance and public health.

1.02 VOLUME AND HYDRAULIC PROVISIONS

A. The design engineer shall submit information to LCMUA that clearly lists the operating conditions of the lift station. These operating conditions shall include the following:

1. Capacity of the lift station shall be based on the proposed developments peak flow and include enough capacity based for a fully developed service area.

2. Based on design flow, the wet well capacity should provide a pump cycle time of not less than six minutes or as required to meet TCEQ or manufacturer standards and recommendations, subject to the review and approval of LCMUA's Engineer.

3. The capacity of the wet well will be based on the storage volume (gallons) as measured between the lowest influent invert pipe elevation within the wet well to the automatic pump shut-off level at 18"

above the bottom of the wet well. The minimum vertical dimension between these two established set points shall be four (4) feet. A larger vertical depth may be required to insure proper storage and cycle rates.

4. The sewage pump start elevation shall be clearly shown on the construction drawing, together with incremental pumping levels, i.e., pump one, pump two, and pump three if applicable, indicated by a vertical distance between each respective start cycle.

5. Lift stations pumping more than 200 GPM or have the potential to pump more than 200 GPM based on a fully developed service area shall be triplex in design.

6. A duplex lift station may be allowed on a case by case basis.

7. Hydraulic Operating Conditions

The design engineer shall clearly list and compute all hydraulic calculations in a tabular format on the construction plans. Pertinent information to be listed shall include the following:

- o Size and type of force main (dia. Inches)
- o Length of force main (L.F.)
- o High point elevation of force main (elev. Ft.)
- o Pump start elevation “on” (elev. Ft.)
- o Pump shut-off elevation “off” (elev. Ft.)

The design engineer shall then compute the elevation differential or elevation head as shown.

High Point Elevation of Force Main
Pump Start Elevation "ON"
= (A) Minimum Elevation Differential

High Point Elevation of Force Main
Pump Shut-Off Elevation "Off"
= (B) Maximum Elevation Differential

$$(A)+(B) = \text{Elevation Head}$$

2

The design engineer shall incorporate the Elevation Head with the Friction Head to obtain and list the Total Dynamic Head (TDH).

The Friction loss per 100 feet of force main pipe should be provided based on the discharge rate of the lift station in gallons per minute. The design engineer shall also list the force main velocity in feet per second, based on the lift station discharge flow (GPM). This simple hydraulic computation shall be listed on the construction plans as follows:

Elevation Head	Ft.
	+
Friction Head	Ft.
Total Dynamic Head	Ft.

The design engineer shall submit to LCMUA the selected pump manufacture performance curve highlighted at the specific operating condition (TDH & GPM). The curve shall express the pump efficiency, horsepower, impeller size and R.P.M.

8. The minimum flow discharge for a non-clog submersible lift station other than a small grinder type station shall be 100 GPM. Likewise, the

minimum force main size shall be 4 inches. Only small grinder type lift stations, approved as a variance by special request to LCMUA, shall have allowable minimum flows of less than 100 GPM and a force main less than 4 inches in diameter.

1.03 SITE DEVELOPMENT

A. The design engineer shall clearly list on the construction plans, a site development plan. This plan shall show property lines, 30'x 30' lift station easement, easement lines, public street right-of-way's, curb and gutter locations and contiguous property lines. Pertinent elevations, spot elevations or contours shall be provided to address grading for drainage and finished slab top (station top slab/elevation). The design engineer shall establish the lift station top slab elevation two-feet (2') above the 100-yr. floodplain elevation, in order to ensure that the lift station will not be flooded.

B. The Station access drive shall be accessible during all times of flood conditions. The access drive shall match the street design of the subdivision (asphalt or concrete). The access drive shall be a minimum of 12 feet wide and contain a hammerhead or similar vehicular turn around provision.

C. The site development plan shall have sufficient dimensions to locate the wet well, station top slab, piping and valve vault locations in relation to the property line or right-of-way line as applicable.

D. The site shall clearly show all other utilities on the site, crossing the site or contiguous to the site.

E. The lift station site shall have a standard water service to the site and include a Reduced Pressure Zone (RPZ) valve to meet TCEQ requirements.

F. The entire area inside the fence shall be covered with 46" of concrete.

G. A photo sensitive yard light shall be provided. It shall be mounted to the control panel rack. The yard light shall illuminate the control panel.

H. The lift station site shall be intruder resistant. An eight foot high fence, constructed of concrete, masonry, or square metal pickets (14 gauge) with three strands of barbed wire extending outward from the top of the fence at a 45 degree angle and have the smooth side of the fence on the outside wall 6" square metal posts (11 gauge). In lieu of the barbed wire, the fence must be eight feet in height. The fence must be in good repair and close enough to surface grade to prevent intruder passage. An 18" reinforced concrete mow strip is required around the perimeter of the fence.

1.04 WET WELL CONSTRUCTION

A. Wet Well Size

The wet well shall be sized in accordance with the required storage volumes, cycle rates and the pump manufacturer's minimum required diameter. However, the wet well diameter shall not be less than five (5) feet square, unless the application is for a small, simplex grinder type pump installation, requiring special approval by LCMUA.

B. Wet Well Construction

1. The Wet well shall be square or rectangular depending on the volume of storage required and shall be constructed of poured in place concrete. No pre-cast wet wells unless authorized by LCMUA Project Manager and Engineer.

2. The vertical bottom joint of pipe shall be embedded a minimum of 6 inches into a concrete bottom slab.

3. The concrete bottom slab shall be a minimum of 16 inches thick and shall be Class "A" concrete, having an allowable compressive strength of 3,000 psi in 28 days.

4. The bottom slab shall rest on undisturbed soil. Over excavation of the wet well shall be filled with Class D concrete to the elevation shown on the plans for the bottom of the wet well foundation.

5. The bottom slab shall extend 18 inches beyond the outer periphery of the vertical wet well walls.

6. The interior bottom of the wet well shall be shaped with lean mix mortar to produce a conical slope from the vertical walls to the bottom of the station, with allowances for mounting submersible pumps and related pipes.

7. The wet well top slab shall extend above flood prone elevations at the site and shall be constructed with reinforced Class "A" concrete. The vertical top joint of pipe used to construct the wet well walls shall extend a minimum of 5 inches into the concrete top slab.

8. The design engineer shall provide buoyancy calculations if materials other than reinforced concrete pipe are used in the construction of the wet well. This calculation is required when a small simplex or small duplex grinder type package station is allowed by LCMUA, and the wet well is a fiberglass or plastic composite product.

C. Wet Well Coating

1. A 120-mil monolithic epoxy coating shall be applied to the interior of the wet well and increased to 240 mil thickness for the bottom portion of the wet well (i.e. floor to a point 2' above the crown of the influent gravity piping).

2. A 20 40 mil bituminous coating shall be applied to the exterior of the wet well. Additional coating may be required by LCMUA's Engineer or Inspector depending on subsurface conditions and existing water table.

1.05 LIFT STATION ACCESS COVER

A. A lockable simplex, duplex or triplex type, as applicable, heavy duty, H10 access cover shall be provided in traffic areas or areas subject to traffic. In non-traffic areas, the cover shall have the structural integrity to withstand a live load of 300 lbs. per square foot.

B. The access cover, complete with upper guide bracket and cable holder shall be furnished as one integral unit. The door will be fabricated from aluminum diamond plate with reinforcement to address specific live loads. The door shall incorporate a one-piece, mill finish, extruded aluminum frame and a continuous anchor system into concrete. The door shall open to 90 degree and automatically lock with a stainless-steel hold open arm with aluminum release handle and hydraulic openers. The door will incorporate a stainless-steel assist opener that will maintain the door in a fully open position. All hardware will be stainless-steel. The door frame will be placed in position for flush mount into and with concrete placement for the top slab. The door shall have a stainless-steel slam lock with key.

C. The access cover shall be positioned, when open, to not obstruct the nearby electrical control panel.

D. The size of the access cover will be based on pump manufacturer's recommendations.

E. The access cover shall be provided with a galvanized steel or fiberglass safety grate.

1.06 LIFT STATION VENT PIPE

A. The lift station shall incorporate a four inch (4") minimum diameter ventilation pipe that shall extend through the top slab of the wet well and shall terminate with a 180-degree screened turned down outlet. The outlet shall be located 12-inches above the top slab. The ventilation pipe shall be ductile iron flanged pipe with a non-corrosive heavy-duty insect type screen mounted between the flanges.

B. An odor control system shall be installed on the vent. The odor control system shall be a U.S. Filter Vent-Scrub, Model VSC-200 or approved equal.

1.07 LIFT STATION CONTROL VALVES

A. Check Valves

Each pump discharge line shall be equipped with a swing type check valve with external lever or a duckbill elastomer check valve. The check valves shall be in a common concrete vault outside the wet well in a horizontal position. The valves shall be equipped with epoxy coated flanged fittings (8 mils. min.) or adapted to flange fittings or brass compression fittings. All hardware shall be stainless steel. Adjustable pipe saddle supports (Anvil International Fig. 264 or approved equal) with steel stanchion and base plates secured with stainless steel anchor bolts and washers are required in a quantity and location required by LCMUA's Engineer.

B. Plug Valve

Each pump discharge line shall be equipped with a straightway eccentric plug valve, located in a common concrete valve vault outside the wet well in a horizontal position. The lever or hand wheel shall be cast iron. Valve

sizes shall be equipped with flanged fittings. The plug valves shall be located between the check valve and wet well within the same concrete vault. Open and closed indicators shall be on each valve.

C. Isolation Valve

A gate valve shall be installed on force main immediately after the valve vault.

D. Emergency Pumping Connection

An emergency pumping connection shall be installed on the force main after the isolation valve. See LCMUA standard details.

E. Air Release Valve

There shall be a properly sized air release valve installed on the force main prior to exiting the concrete valve vault. A min. 2" Sch. 80 PVC vent pipe back to the wet well is required.

F. Flow Meter

All proposed lift stations shall be equipped with an electromagnetic flow meter located within the common concrete valve vault.

1.08 VALVE VAULT

A. Structure

1. A concrete Valve vault shall be constructed adjacent to the wet well. The valve vault shall be constructed with reinforced Class "A" concrete, having a compressive strength of 3,000 psi in 28 days. The vault shall be rectangular with vertical walls. The bottom vault slab shall be concrete and shall have a minimum thickness of 2'. Vault shall be sized sufficiently as to ensure a minimum 2' clearance between interior walls and piping and valves.

2. The Valve vault depth will facilitate the lift station pump discharge lines. The center of said discharge lines shall exit the wet well and enter the valve vault at a horizontal elevation located no more than 48 inches nor less than 30 inches below the lift station concrete top slab.

3. The valve vault shall be bolted to the wet well with one-inch (1") stainless steel bolts.

4. Where pipes where the pipes pass thru the wall, a sleeve shall be installed 2" greater in diameter in dimension than the pipe. The pipe shall pass through a wall sleeve with link seal and grout finish.

5. The vault shall have a 2" drain line. The drain line shall terminate inside the wet well with a ball valve and a check valve.

6. The physical dimensions of the valve vault shall be based on size requirements of the valves and piping within the vault and allow for a minimum of 1' clear space on all sides of the interior piping and valves to facilitate future maintenance.

B. Piping

1. Valve vault piping shall be flanged epoxy lined ductile iron, size permitting, or schedule 40 stainless steel. Piping from the lift station thru the valve vault shall be a minimum of 4" in size. Pipe fittings will be flanged rated at 250 psi working pressure. All couplings shall be epoxy coated steel and shall be dresser, Smith-Blair 411, or approved equal. Couplings shall be restrained with a thrust harness designed in accordance with AWWA M-11.

2. A common discharge header that will manifold each valve pump discharge line into one (1) common force main discharge will be provided immediately downstream from the valve vault. The pipe manifold will be fabricated from the same type materials used for valve vault piping. The type and size of fittings shall be listed and shown on the construction drawings for all pipe used in the discharge line, valve vault and in the discharge header.

3. An 8" DR-14 PVC emergency pump down pipe shall be installed and securely fastened to the wall of the wet well at 4' intervals utilizing 316 stainless steel rod and adjustable stainless-steel pipe roll support Grinnel Fi. 171 or approved equal. The pipe shall terminate a min. of one foot below the flowline of the lowest influent gravity line in the wet well.

C. Valve Vault Access Cover

The access cover shall be identical in manufacture to that described in Section 1.05 of these specifications. The physical size of the unit will be based on specific size requirements of piping, valves and fittings within the vault.

1.09 SUBMERSIBLE SEWAGE PUMP

A. Each pump, motor, and cable assembly shall be furnished as one integral unit, as manufactured by ITT Flygt, KSB or approved equal as determined by LCMUA's Engineer.

B. The pump design shall be such that the pumping unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection. The discharge connection shall be permanently installed in the wet well. The pump shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be disconnected. Connection and disconnection of the pumping unit from the discharge piping shall not require personnel to enter the wet well.

C. Each pump shall be fitted with a stainless-steel chain of adequate strength and length to permit raising and lowering the pump for inspection or removal. The chain shall be long enough to extend from the pump in its operating position to 4' above the top of the wet well slab. A stainless-steel

hook at the top of the wet well shall hold the chain when the pump is in service.

D. All pumps shall have flushing valves on the discharge.

E. The pump assembly shall also be capable of running dry or partially submerged for extended periods without any damage to the pump, motor, seals, or accessories.

F. Major parts, such as the stator casing, oil casing, sliding bracket, volute, impeller, and base coupling shall be constructed of cast iron. Surfaces coming into contact with the pumped liquid shall be protected by a factory-applied epoxy coating or shall be stainless steel. External bolts, nuts, and fastening hardware shall be stainless steel.

1.10 SUBMERSIBLE PUMP MOTOR

A. The motor shall be housed in an air or oil filled, watertight casing and shall have moisture resistant Class F insulation with a Class B temperature rise at the service factor load. The motor shall be NEMA Design b, designed for continuous duty in a submerged environment, and shall be capable of operating in dry or partially submerged conditions for extended periods without damage. The motor service factor shall be at least 1.15. The motor shaft shall be stainless steel. The motors shall be 230 volt, 3-phase, 60 cycle. The motors shall not be more than 1,750 RPM at full load except in the case of simplex or duplex grinder stations where the motors shall not be more than 3,500 RPM at full load. Lead wires shall be suitable for operation in oil. The motor shall be provided with motor thermal switches embedded in the windings to protect the motor from the burnout due to excessive heating. The control current shall be connected through bimetallic switches, so the motor is shut down when a high temperature condition exists. The switches shall be self-resetting when the motor cools.

B. The electrical cable entranceway to the motor shall be provided with positive strain relief to prevent leakage or pull-out of the cable in the event that a force is accidentally placed on the cable during the raising or lowering of the pump.

C. Incoming lead wires shall be spliced in the motor terminal housing. The terminal housing shall be filled with epoxy to seal the outer cable jacket and the individual strands to prevent the possibility of water entering the motor housing or the terminal housing. A secondary elastomer compression grommet shall also be supplied. The combination of the epoxy seal and compression grommet shall provide complete sealing and strain relief. Enough cable shall be supplied to extend from the motors to the sealed junction box outside of the wet well near the access cover or to extend directly into the electrical panel.

D. The motor, cable, and electrical controls shall be sized, furnished, and installed so that the motor load shall never exceed the nameplate rating at any operating point on the pump characteristic curve.

1.11 SUBMERSIBLE PUMP SLIDERAIL REMOVAL SYSTEM

A. A stainless-steel single piece, sliding guide bracket shall be an integral part of the pumping unit or securely attached thereto. The guide bracket shall be designed such that no strain is placed on the pump or guide rails when the pump is in the operation position. The volute casing shall have a machined discharge flange to automatically and firmly connect with the discharge connection, which when bolted to the floor of the lift station and discharge line will receive the pump discharge connecting flange without the need of adjustment, fasteners, clamps or similar devices. Discharge base elbow guide rails, anchors, attachments and base plate shall be supplied by the pump manufacturer.

- B. The pump sliding coupling system shall be designed so that the downward force of the machined mating flanges shall shear away rags, hair, or other debris that would prevent a uniform watertight seal. No portion of the pump unit shall bear directly on the floor of the wet well. The pump body and slide coupling mating faces shall be stainless steel or cast iron.
- C. The 4" slide rails shall be continuous stainless steel designed to resist corrosion in sewage or sludge applications. If pipe is used it shall be minimum Schedule 40 stainless steel.
- D. The rail support system shall be furnished by the Pump Manufacturer, of adequate length to extend from the lower guide holders on the pump discharge connection to the top of the wet well. (Supply stainless steel hardware to anchor the rails to the structure and pump discharge connection).

1.12 SUBMERSIBLE PUMP DISCHARGE PIPING

- A. The discharge piping shall be a minimum of 4" in size. The discharge piping shall be flanged ductile iron (300 psi pressure rating). Flanged connections and/or fittings shall be ductile iron. All fasteners – bolts, nuts, washers, etc. – shall be ASTM A-316 stainless steel.
- B. All surfaces (except for the face of base elbow pump mating surface, power and control cables, and 316 stainless steel guide rails) shall be coated by the following coating system:
- a. 8 mils of Raven 155 epoxy primer and 120 mils of Raven 405 - 100% solids, solvent-free, ultra-high-build epoxy system or LCMUA Engineer approved equal.
- C. All ductile iron pipe, fittings, valves, and flanged adaptors outside the wet well shall be protected by the following coating system:

a. A two-part epoxy coating of TNEMEC Series 1 Omnithane 8.0 dry mils plus TNEMEC Series N69 Hi-Build Epoxoline II 8.0 dry mil or LCMUA Engineer approved equal.

1.13 ELECTRICAL CONTROLS & EQUIPMENT

A. General

A 230-volt, 3 phase control system shall be supplied by the pump manufacturer containing all of the mechanical and electrical equipment necessary to for the operation of a duplex or triplex lift station as applicable.

B. Enclosure

1. The control panel enclosure shall be NEMA 4X 304 Stainless Steel. The enclosure door shall be gasketed with a rubber composition material around the perimeter and shall be installed with a retainer to assure a positive weatherproof seal. A locking 3-point handle hasp shall be provided. An inner door, lockable type, shall be provided that encloses all electrical switches and components. The inner door shall be mounted on a continuous aircraft aluminum hinge and shall contain cutouts for the protrusion of the circuit breakers and provide protection of personnel from internal live voltages. All pump controllers, control switches, pilot indicators, elapsed time meters and other operational devices shall be mounted on the inner door. The inner door shall open a minimum of 150 degrees to allow for access to the equipment for maintenance. A $\frac{3}{4}$ " break shall be formed around the perimeter of the inner door to provide rigidity.

2. A back plate shall be manufactured from 12-gauge sheet steel and shall be finished with a primer coat and two (2) coats of baked on white enamel. All hardware shall be mounted using stainless steel machine thread screws. Sheet metal or self-tapping screws shall not be acceptable. All installed devices will be permanently identified with engraved legends.

3. The control panel will be mounted adjacent to, but not directly in, the wet well top slab. No electrical junction boxes are to be used within the wet well. All electrical equipment furnished and installed shall be in accordance with the National Electric Code (NEC) and local codes.

4. The control panel shall include, but not be limited to the following: individual pump circuit breaker/disconnect, ABS magnetic contactors with spare N.O. auxiliary contacts, thermal overload relays, solid state electronic alternating relay , primary phase failure monitor as manufactured by TimeMark with restart button, hand-off-auto selector switches, pump running lights, pump seal alarm lights, and individual pump failure (from overloads) sensor with a signal to the SCADA system. An elapsed time meter shall provide for each pump. A control circuit transformer shall be included for providing 120-volt power with the control panel. 1KW Primary (if power is 480 volt) and secondary fusing shall be included. Terminals shall be provided for connection of pumps, control, and alarm wiring. A main distribution type terminal block shall be provided for main power supply connection. The control panel shall also include a low voltage/surge arrester. The level controls shall automatically start, stop and alternate each respective pump based on set points of liquid levels within the wet well.

5. Control wiring in the Control Panel shall be no smaller than #14 and shall be properly labeled at each end. A print pocket shall be installed on the Control Panel door with control drawings.

6. The control panel shall have an outside 110-volt receptacle.

7. The control panel shall be UL508A Listed.

C. Power Distribution

1. The panel power distribution shall include all necessary components and be wired with stranded copper conductors rated at 90 degrees C. Conductor terminations shall be as recommended by the device manufacturer.

2. The power system shall contain incoming power terminals, motor circuit breakers control circuit breaker and convenience outlet breaker. All circuit breakers shall be heavy duty thermal magnetic Square D type FAL. Each breaker shall be sized to adequately meet the operating conditions of the load and have a minimum interrupting capacity of 10,000 amps at 230 volts. Breakers shall be indicating type, providing "on/off/tripped" positions on the handle. They shall be quick-make quick-break on manual and automatic operation and have inverse time characteristics. Breakers shall be designed so that tripping of one pole automatically trips all poles.

3. Motor starters shall be open frame, across the line NEMA rated with individual overload protection on each phase. Motor starter contacts and coil shall be replaceable from the front of the starter without removal of the starter from its mounted position. Overload heaters shall be block type, utilizing melting alloy spindles, sized for the full load amperage of the motor. Adjustable overloads, definite purpose contactors, fractional size starters and horsepower rated contactors or starters shall not be acceptable.

4. A lighting transit protector shall be provided. The device shall be a solid-state device with a response time of less than 5 nanoseconds with a withstanding surge capacity of 6500 amperes. Units shall be instant recovery, long life and have no holdover currents.

5. The following shall be supplied as standard equipment:

- i. 12 pin plug in phase/voltage monitor with two (2) sets of double pole double throw contacts.
- ii. NEMA 4 rated Hand Off Auto switches.
- iii. Pump Run/Failure pilot lights as required.

- iv. Elapsed Time meters for each pump.
- v. 50-watt condensation heater and thermostat.
- vi. Control Power transformer minimum of 2kVA.
- vii. GFCI Duplex convenience outlet on inner door.
- viii. Laminated wiring schematic adhered to the inside surface of the outer door.

ix. The lift station shall have the capability to be supplied electrical power by an on-site emergency back-up diesel generator, sized by the Developer's Engineer and subject to LCMUA's Engineer review and approval. The contactor shall install in the main power line to the lift station and an Automatic Transfer Switch sized for the loads of the lift station. The Automatic Transfer Switch shall be installed after the main line circuit breaker. Additional information regarding the emergency on-site diesel generators shall be provided by LCMUA during project development. All costs associated with the design and installation of the emergency back-up generator shall be the responsibility of the Developer.

D. Pump Protection Devices

Each Pump shall be protected by a solid-state relay to monitor winding temperature and seal leakage. The relays shall have and 11 pin octal base and shall be flanged for mounting on the inner door. The relay shall be flanged for mounting on the inner door. The relay shall be powered by 24VAC, 28VDC or 120VAC supply. LED indicators shall be provided on the relay for power on, over-temp and seal fail conditions. An over-temp reset pushbutton shall be mounted on the relay. The sensor input circuitry shall contain both hardware and software filters to provide noise immunity, as well as sensor input short circuit protection. The relay shall be MiniCas 120, model 12-407 129 by ITT Flygt or LCMUA Engineer's approved equal.

E. Pump Controller

1. General.

The pump controller shall consist of all the components, hardware and software to provide a trouble-free pumping station. The system shall be designed and specifically produced for the surveillance of the pump station. The system shall provide for interface to other RTU's and SCADA systems for remote control and data collection. The RTU shall control the pumps as a standalone unit in the event of a communications loss. The controller shall be an FMC 400 as manufactured by ITT Flygt or LCMUA approved equal.

2. Operation

i. Pump controller shall provide continuous monitoring of the wet well level via submersible pressure transducer. The pump controller shall start and stop pump based upon wet well level and operator programmed set points. The control system shall have provision for an independent, redundant float (four floats are required on a duplex station and five floats on a triplex station) switch backup in event of transducer failure. The pump controller shall alternate pump cycles to ensure equal run times. The pump controller shall monitor pump protection features to provide alarms in event of impending pump failure. It shall also monitor pump performance data to provide operations personnel the ability to evaluate station performance. The pump controller shall also include an uninterruptible power supply (UPS) to provide power in the event of electrical power failure.

ii. In the event one pump cannot address influent flows and the level continues to rise within the wet well until a second pump is activated, both pumps will remain online until the liquid level falls to

the shut-off level. The automatic alternator will automatically position the second pump for the next pumping cycle.

iii. In the event two pumps cannot address influent flows and the level continues to rise within the wet well until the third pump is activated, all three pumps will run in parallel until the level falls below the call for a second pump, then only two pumps will remain on line until the level falls to the shut off level.

iv. Level controls and pump alternator shall contain level control relays and high liquid alarm enclosed within a NEMA 4X enclosure. Level controls may also consist of 24-volt float type or displacement type level switches. Installation of the level control system shall be such that levels can be field adjusted without the need for special tools or equipment. Intrinsically safe barrier relays shall be utilized to reduce the amount of voltage being applied to the float switches.

v. A high-water alarm system shall be provided. The alarm shall be both audio and visual. A top of panel mounted red alarm light shall be provided. The light will glow until level recedes below the high liquid level. An alarm bell shall be provided for audible annunciation. An external silence push-button shall be provided to silence the bell and acknowledge alarm condition.

vi. Timing relays shall have the capacity to be set manually by an external adjustment and shall be pneumatic. Terminals shall be front mounted and readily accessible. The timing relays shall have both normally open and normally closed contacts rated at 10 amps continuous.

vii. Each starter shall be provided with a time meter. The meter shall be of a non-reset type, for totalizing hours for operation on 120V, 60 Hertz and for outdoor application.

viii. Conduits shall be sealed to prevent the infiltration of gas into the control panel.

F. Hardware

1. The pump controller shall be programmed via built-in operator interface. The interface shall consist of pushbuttons in combination with a 2-line LCD backlit display in English. The front panel shall also include LED indicators for controller operation, communication status, alarm status, pump operation status, and individual critical alarms.

2. The front panel operator interface shall be rated IP65 (applicable to NEMA 4 standard).

3. The pump controller shall contain a 486CPU, 32-bit 66 MHz processor, with a primary memory of 8 Megabytes D-RAM and a flash memory of 4 Megabytes. The memory shall be protected by a 3.6 VDC NiMH battery and have a watchdog function.

4. The pump controller shall provide 16 digital inputs, 8 digital outputs (6 relays normally open, 2 solid state normally open), and 4 analog inputs. The inputs/outputs shall meet the following:

- i. All inputs/outputs shall be optically isolated.
- ii. Digital inputs shall be 11-30vdc, selectable logic.
- iii. Digital outputs shall have a max load of 2A at 250VAC/DC (relay) or have an output capacity of 100mA at 250VAC/DC (solid state).
- iv. Analog inputs shall be 4-20mADC with 12bit resolution and inaccuracy of 0.1%
- v. In addition to the input/output features listed, the controller shall be expandable up to a total of 600 physical I/O points.
- vi. The pump controller shall operate from a supply voltage of 24VDC (-15% to + 20%) and have a current consumption

of 1A (no load). The controller shall be protected internally with a fuse rated at 2A.

vii. The pump controller shall include 3 communications ports. One port shall be RS-232 and dedicated to service functions (local programming of controller with laptop). The other two ports shall be RS-232 capable, and available for use as communication interface to dialup modem, leased line modem, GSM modem, or radio.

G. Level Transducer

The submersible transducer shall be a two-wire device operating on 10-30VDC supply with a 4-20mA DC level signal. The transducer shall have a measurement span of 0-10 meters, and a cable length of 30 meters. The transducer shall have a temperature range of -20 to 80 degrees C and have an inaccuracy of plus or minus 0.15 of total range. The transducer shall be cable suspended and not dependent upon position. The sensor shall be ceramic, with a 316 stainless steel sensor housing, Vitron O-ring and polyurethane vented cable. The transducer shall be LS 10, manufactured by ITT Flygt or LCMUA Engineer approved equal.

H. Functions

1. The pump controller shall operate the pumps in accordance with operator programmed set points, both locally and from SCADA network. The controller shall also be capable of remote start-stop functions via network. The following information shall be observed on the front panel display:

- i. Cross-section areas of the wet well
- ii. Start-stop pump levels
- iii. Alarm levels for low, high and overflow
- iv. Nominal capacities of the pumps

- v. Current flow and accumulated flow
- vi. Pumped volume for two days
- vii. Number of starts for each pump
- viii. Run time for each pump

2. Amp draws for each pump

i. The pump controller shall provide for local display, acknowledgement and remote notification of alarm conditions. The controller shall log up to 1000 alarm events. Alarm capabilities shall include:

- ii. Wet Well High Level
- iii. Wet Well Low Level
- iv. Wet Well Overflow
- v. Pump Overcurrent
- vi. Pump undercurrent
- vii. Pump Fail to Start
- viii. Pump Overtemperature
- ix. Pump Seal Fail
- x. Pump Service Alarm (when pump run time exceeds preset service interval)
- xi. Intrusion Alarm
- xii. Personnel Alarm (adjustable time-delay alarm if not acknowledged by on-site personnel)
- xiii. Communications Failure
- xiv. Test Alarm (periodic test alarm for communications)

3. The pump controller shall be capable, via network, of blocking up to five upstream stations should local conditions prevent pumping operations.

4. The pump controller shall provide flow calculations based on the geometry of the wet well. Five cross-sectional areas shall be used for inflow calculation, which shall be updated every pumping cycle. Pump capacity shall be calculated from wet well discharge time and inflow. Pumped volume (total) shall be calculated from current pump capacity.

5. The controller shall calculate station overflow. A level sensor shall be installed at the overflow point, and the controller shall register overflow time, number of overflows and accumulated volume.

6. The pump controller shall provide for an independent float backup system. A relay-based float backup system shall be included in the control panel. Supply power for the relay backup system shall be interface through a relay output on the FMC controller designated "watchdog". During normal operation, the watchdog contact shall de-energize the float backup system. When the level transducer or FMC controller fail, lose power, or malfunction, the watchdog contact will energize the float backup system, enabling the lift station to automatically continue to operate until normal operation can be restored.

7. The controller shall provide a sump cleaning function. At preset intervals the pumps shall be allowed to lower the wet well level to the bottom of the volute in order to remove built up solid debris in the sump. The controller shall also allow periodic timed pump cycles in low inflow stations to prevent the wet well from becoming septic.

8. The pump controller shall be capable of receiving an input from a rain gauge or tipping bucket. The controller shall log this data for piping analysis by operations personnel.

9. The pump controller shall calculate energy consumption from preset voltage level and motor current readings.

10. The pump controller shall contain a real-time clock, and shall time and date stamp all logged data. The controller shall store logged data for a period of up to 30 days.

I. Pump Controller Communications

1. The pump controller shall be able to communicate to LCMUA's existing SCADA system. It shall be the responsibility of the contractor to coordinate with LCMUA's SCADA system installer for determining requirements of the pump controller communications requirements to ensure compatibility with LCMUA's system.

2. The pump controller shall be capable of communicating to Wonderware HMI software (by others), via MODBUS protocol.

J. Electrical Equipment Identification

1. Identify electrical equipment in accordance with the NEC, the local authorities, and as specified.

2. Use laminated three-ply engraved plastic nameplates with black surface and white interior core, at least 1/16" thick. Attach plates to equipment with chromium plate screws. Identify the following items with engraved nameplates:

- i. Each switch/fuse unit or circuit breaker in each main panel and each distribution panel
- ii. Spares
- iii. Each branch circuit panel
- iv. Each relay cabinet
- v. Each motor starter
- vi. Outside light switches.

1.14 ELECTRONIC MONITORING EQUIPMENT

Electronics to monitor the status of the lift station shall be required at all lift station sites. Refer to LCMUA's Supervisory Control and Data Acquisition specification. Contractor shall ensure that the electrical transformer supplied to operate the pump station includes the electrical needs of the monitoring equipment.

1.15 INITIAL OPERATION

- A. Start, test, and place equipment and systems into operation for 30 days to allow LCMUA to observe the operation and overall performance of the equipment and to determine that controls function as intended.
- B. Have the Pump Manufacturer's representative present when the equipment is placed in operation.
- C. The Pump Manufacturer's representative is to be on site as often as necessary for proper and trouble-free operation.
- D. Equipment which operates on a limited or part-time basis shall be operated in the presence of LCMUA to demonstrate that controls function as specified.
- E. Perform acceptance test as specified in individual specification sections. Demonstrate that equipment and systems meet the specified performance criteria.
- F. Equipment and systems shall not be accepted prior to this initial operation period.

1.16 OPERATOR TRAINING

A. Provide instruction and demonstration of the care and operation of the equipment to LCMUA's personnel. Instruction is to include hands-on training.

B. The scope of the training program is to be in adequate detail to ensure that the trainees who complete the program will be qualified and capable of operating and maintaining the equipment, products, and systems installed under this contract.

C. The Pumps Manufacturer's representative is to instruct LCMUA's authorized personnel on operational procedures and maintenance requirements.

D. Training is to include but not be limited to:

- Pump Removal

- Pump Installation

- Electrical Controls, Function and Operation

- System Evaluation

- System Repairs

- System Controls

E. Final Operations and Maintenance Manuals shall be provided to LCMUA after all operator training has been completed. Three (3) manuals, each clearly marked for identification shall be provided.

1.17 FINAL INSPECTION

Upon completion of installation of the equipment, an acceptance test to verify the satisfactory operation of each unit shall be conducted. The test shall be conducted in a manner approved by and in the presence of LCMUA. The unit shall be checked for excessive noise, vibration, alignment, general operation, etc. The unit must perform in a manner acceptable to LCMUA before final acceptance will be made.

LCMUA shall inspect with the appropriate regulatory agencies to determine the status of completeness of the project, prior to the acceptance of the project. The date of the acceptance shall establish the date the warranty shall begin.

1.18 WARRANTY

A two (2) year parts and labor warranty shall be provided. Normal maintenance, such as fuse replacement, card substitution, etc., shall be performed by LCMUA with parts supplied by the equipment manufacturer. The warranty shall begin from the time of acceptance. Damages as a result of acts of God and/or vandalism are not covered by this warranty.

Section V – GRINDER PUMP STATIONS

- 1.0 General
- 2.0 Product
- 3.0 Execution
- 4.0 Operation and Maintenance

GRINDER PUMP STATIONS - INDIVIDUAL LOTS AS APPLICABLE

1.0 General

1.01 GENERAL DESCRIPTION:

The MANUFACTURER shall furnish complete factory-built and tested grinder pump unit(s), each consisting of a grinder pump core suitably mounted on an integral stand of stainless steel, tank, electrical quick disconnect (NEMA 6P), pump removal harness, discharge assembly/shut-off valve, anti-siphon valve/check valve assembly, electrical alarm assembly and all necessary internal wiring and controls. For ease of serviceability, all pump motor/grinder units shall be of like type and horsepower throughout the system.

1.02 SUBMITTALS:

The MANUFACTURER shall furnish a minimum of six sets of shop drawings detailing the equipment to be furnished including dimensional data and materials of construction. The ENGINEER shall promptly review this data, and return two copies as accepted, or with requested modifications. Upon receipt of accepted shop drawings, the MANUFACTURER shall proceed immediately with fabrication of the equipment.

1.03 MANUFACTURER:

Grinder pump stations, complete with all appurtenances, form an integral system, and as such, shall be supplied by one grinder pump station manufacturer. The CONTRACTOR shall be responsible for the satisfactory operation of the entire system. The equipment specified shall be a product of a company experienced in the design and

manufacture of grinder pumps for specific use in low pressure sewage systems. The company shall submit detailed installation and user instructions for its product, submit evidence of an established service program including complete parts and service manuals, and be responsible for maintaining a continuing inventory of grinder pump replacement parts. The MANUFACTURER shall provide, upon request, a reference and contact list from ten of its largest contiguous grinder pump installations of the type of grinder pumps described within this specification.

The MANUFACTURER of the grinder pump station shall be Environment One Corporation or Authority Engineer approved equal.

These specifications are intended to provide guidelines for standard equipment of a recognized manufacturer who already meets all the requirements of this specification.

1.03a ALTERNATE EQUIPMENT:

In the event that the CONTRACTOR or another supplier proposes an Alternate to the specified MANUFACTURER, the CONTRACTOR (supplier) must submit a complete a complete submittal package as outlined in Section 1.02 SUBMITTALS, a complete description of any changes that will be necessary to the collection system, a system hydraulic analysis based on the proposed pump (including pipe sizes, flows, velocities, retention times and number and location of recommended valves and cleanouts, if any), a list of exceptions to this specification, and demonstration of compliance to Section 1.04 EXPERIENCE CLAUSE of this specification. This information must be submitted to the ENGINEER for pre-approval of the alternate equipment being proposed and determination of compliance with these technical specifications. The CONTRACTOR (supplier) shall submit complete drawings showing elevations, dimensions, or any necessary changes proposed to these technical specifications for the

proposed equipment and its installation. Use of an Approved Equivalent, if granted, will be provided in writing by the ENGINEER to the CONTRACTOR (supplier).

1.04 EXPERIENCE CLAUSE:

The equipment furnished hereunder shall be the product of a company experienced in the design and manufacture of grinder pumps specifically designed for use in low pressure systems. All manufacturers proposing equipment for this project shall have at least 5 years of experience in the design and manufacture of units of identical size(s) and performance to the specified units. All manufacturers proposing equipment for this project must also have not less than 50 successful installations of low-pressure sewer systems utilizing grinder pumps of like type to the grinder pumps specified herein. An installation is defined as a minimum of 25 pumps discharging into a common force main which forms a low-pressure sewer system. The CONTRACTOR (supplier) proposing alternate equipment shall also submit, as part of the bid schedule, an installation list with contact person(s), phone number(s) and date(s) of at least 5 installations of the type of pump specified herein that have been in operation for at least 5 years.

1.05 OPERATING CONDITIONS:

The pumps shall be capable of delivering 15 GPM against a rated total dynamic head of 0 feet (0 PSIG), 11 GPM against a rated total dynamic head of 92 feet (40 PSIG), and 7.8 GPM against a rated total dynamic head of 185 feet (80 PSIG). The pump(s) must also be capable of operating at negative total dynamic head without overloading the motor(s). Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

1.06 WARRANTY:

The grinder pump MANUFACTURER shall provide a part(s) and labor warranty on the complete station and accessories, including, but not limited to, the panel for a period of 24 months after notice of OWNER'S acceptance, but no greater than 27 months after receipt of shipment. Any manufacturing defects found during the warranty period will be reported to the MANUFACTURER by the OWNER and will be corrected by the MANUFACTURER at no cost to the OWNER.

1.07 WARRANTY PERFORMANCE CERTIFICATION:

As a requirement, each manufacturer shall provide a Warranty Performance Certification statement executed by the most senior executive officer of the grinder pump MANUFACTURER, which certifies a minimum of a 24-month warranty. They must further detail any exclusions from the warranty or additional cost items required to maintain the equipment in warrantable condition, including all associated labor and shipping fees, and certify that the MANUFACTURER will bear all costs to correct any original equipment deficiency for the effective period of the warranty. All preventive maintenance type requirements shall be included in this form as exclusions. These requirements include, but are not limited to, unjamming of grinder mechanism, periodic motor maintenance, and periodic cleaning of liquid level controls.

2.0 PRODUCT

2.01 PUMP:

The pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with a single mechanical seal. Double radial O-ring seals are required at all casting joints to minimize corrosion and create a protective barrier. All pump castings shall be cast iron, fully epoxy coated to 8-10 mil Nominal dry thickness, wet applied. The rotor shall be through-hardened, highly polished, precipitation hardened stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. This material shall be suitable for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, excellent aging properties, and outstanding wear resistance. Buna-N is not acceptable as a stator material because it does not exhibit the properties as outlined above and required for wastewater service.

2.02 GRINDER:

The grinder shall be placed immediately below the pumping elements and shall be direct driven by a single, one-piece motor shaft. The grinder impeller (cutter wheel) assembly shall be securely fastened to the pump motor shaft by means of a threaded connection attaching the grinder impeller to the motor shaft. Attachment by means of pins or keys will not be acceptable. The grinder impeller shall be a one-piece, 4140 cutter wheels of the rotating type with inductively hardened cutter teeth. The cutter teeth shall be inductively hardened to Rockwell 50 – 60c for abrasion resistance. The shredder ring shall be of the stationary type and the material shall be white cast iron. The teeth shall be ground into the material to achieve effective

grinding. The shredder ring shall have a staggered tooth pattern with only one edge engaged at a time, maximizing the cutting torque. These materials have been chosen for their capacity to perform in the intended environment as they are materials with wear and corrosive resistant properties.

This assembly shall be dynamically balanced and operate without objectionable noise or vibration over the entire range of recommended operating pressures. The grinder shall be constructed to minimize clogging and jamming under all normal operating conditions including starting. Sufficient vortex action shall be created to scour the tank free of deposits or sludge banks which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

- A. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.
- B. The maximum flow rate through the cutting mechanism must not exceed 4 feet per second. This is a critical design element to minimize jamming and as such must be adhered to.
- C. The inlet shroud shall have a diameter of no less than 5 inches. Inlet shrouds that are less than 5 inches in diameter will not be accepted due to their inability to maintain the specified 4 feet per second maximum inlet velocity which by design prevents unnecessary jamming of the cutter mechanism and minimizes blinding of the pump by large objects that block the inlet shroud.
- D. The impeller mechanism must rotate at a nominal speed of no greater than 1800 rpm.

The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, wipes, rubber and the like, to finely-divided particles which will pass freely through the passages of the pump and the 1-1/4" diameter stainless steel discharge piping.

2.03 ELECTRIC MOTOR:

As a maximum, the motor shall be a 1 HP, 1725 RPM, 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, air-cooled induction type with Class F installation, low starting current not to exceed 30 amperes and high starting torque of 8.4-foot pounds. The motor shall be press-fit into the casting for better heat transfer and longer winding life. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor. This motor protector combination shall have been specifically investigated and listed by Underwriters Laboratories, Inc., for the application. Non-capacitor start motors or permanent split capacitor motors will not be accepted because of their reduced starting torque and consequent diminished grinding capability. The wet portion of the motor armature must be 300 Series stainless. To reduce the potential of environmental concerns, the expense of handling and disposing of oil, and the associated maintenance costs, oil-filled motors will not be accepted.

2.04 MECHANICAL SEAL:

The pump/core shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless-steel spring.

2.05 FIBERGLASS CONSTRUCTION:

The tank shall be a wet well design consisting of a single wall, laminated fiberglass construction. The resin used shall be of a commercial grade suitable for the environment. The reinforcing material shall be a commercial grade of glass fiber capable of bonding with the selected resin. The inner surface shall have a smooth finish and be free of cracks and crazing. The exterior tank surface shall be relatively smooth with no exposed fiber or sharp projections present.

The tank wall and bottom shall be of sufficient thickness and construction to withstand the imposed loading due to saturated soil at the specified burial depth for each available tank height. All station components must function normally when exposed to the external soil and hydrostatic pressures developed at the specified burial depth. The tank bottom shall be reinforced with a fiberglass plate extending beyond the tank walls to support concrete anchoring, as required, to prevent flotation.

The Fiberglass tank shall have a stainless-steel discharge bulkhead which terminates outside the tank wall with a 1-1/4" female pipe thread. The discharge bulkhead shall be factory installed and warranted by the manufacturer to be watertight. The tank shall be furnished with a field installed EPDM grommet to accept a 4.50" OD (4" DWV or SCH 40) inlet pipe.

The power and control cable shall connect to the pump by means of the provided NEMA 6P Electrical Quick Disconnect (EQD) and shall enter the tank through a field installed watertight strain relief connector supplied by the manufacturer. An electrical junction box shall not be permitted in the tank. Installation of the inlet grommet and cable strain relief shall require field penetration of the tank wall by the installing party. The tank shall also be vented to prevent sewage gases from accumulating inside the tank by means of a factory-provided, field-installed mushroom vent. The station cover shall be

factory drilled to accept the mushroom vent. The tank and stainless-steel discharge bulkhead shall be factory-tested to be watertight.

2.06 DISCHARGE HOSE AND DISCONNECT/VALVE:

All discharge fittings and piping shall be constructed of polypropylene, EPDM or PVC. The discharge hose assembly shall include a shut-off valve rated for 200 psi WOG and a quick disconnect feature to simplify installation and pump removal. The bulkhead penetration shall be factory installed and warranted by the manufacturer to be watertight.

2.07 ELECTRICAL QUICK DISCONNECT:

The grinder pump core shall include a factory installed NEMA 6P electrical quick disconnect (EQD) for all power and control functions. The EQD will be supplied with 32', 25' of useable, electrical supply cable (ESC) to connect to the alarm panel. The EQD shall require no tools for assembly, seal against water before the electrical connection is made, and include radial seals to assure a watertight seal regardless of tightening torque. Plug-type connections of the power cable onto the pump housing will not be acceptable due to the potential for leaks and electrical shorts. Junction boxes are not acceptable due to the large number of potential leak points. The EQD shall be so designed to be conducive to field wiring as required.

2.08 CHECK VALVE:

The pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve built into the discharge piping. The check valve will provide a full-ported passageway when open and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Moving parts will be made of a 300 Series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly

providing a maximum degree of freedom to assure seating even at a very low backpressure. The valve body shall be an injection molded part made of an engineered thermoplastic resin. The valve shall be rated for continuous operating pressure of 235 psi. Ball-type check valves are unacceptable due to their limited sealing capacity in slurry applications.

2.09 ANTI-SIPHON VALVE:

The pump discharge shall be equipped with a factory-installed, gravity-operated, flapper-type integral anti-siphon valve built into the discharge piping. Moving parts will be made of 300 Series stainless steel and fabric-reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A nonmetallic hinge shall be an integral part of the flapper assembly, providing a maximum degree of freedom to ensure proper operation even at a very low pressure. The valve body shall be injection-molded from an engineered thermoplastic resin. Holes or ports in the discharge piping are not acceptable anti-siphon devices due to their tendency to clog from the solids in the slurry being pumped. The anti-siphon port diameter shall be no less than 60% of the inside diameter of the pump discharge piping.

2.10 CORE UNIT:

The grinder pump station shall have an easily removable core assembly containing pump, motor, grinder, all motor controls, check valve, anti-siphon valve, electrical quick disconnect and wiring. The watertight integrity of the core unit shall be established by a 100% factory test at a minimum of 5 PSIG.

2.11 CONTROLS:

All necessary motor starting controls shall be located in the cast iron enclosure of the core unit secured by stainless steel fasteners. Locating motor starting controls in a plastic enclosure is not

acceptable. Wastewater level sensing controls shall be housed in a separate enclosure from motor starting controls. Level sensor housing must be sealed via a radial type seal; solvents or glues are not acceptable. Level sensing control housing must be integrally attached to pump assembly so that it may be removed from the station with the pump and in such a way as to minimize the potential for the accumulation of grease and debris accumulation, etc. Level sensing housing must be a high-impact thermoplastic copolymer over-molded with a thermo plastic elastomer. The use of PVC for the level sensing housing is not acceptable.

Non-fouling wastewater level controls for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air column connected to a pressure switch. The air column shall be integrally molded from a thermoplastic elastomer suitable for use in wastewater and with excellent impact resistance. The air column shall have only a single connection between the water level being monitored and the pressure switch. Any connections are to be radial sealed with redundant O-rings. The level detection device shall have no moving parts in direct contact with the wastewater and shall be integral to the pump core assembly in a single, readily exchanged unit. Depressing the push to run button must operate the pump even with the level sensor housing removed from the pump.

All fasteners throughout the assembly shall be 300 Series stainless steel. High-level sensing will be accomplished in the manner detailed above by a separate air column sensor and pressure switch of the same type. Closure of the high-level sensing device will energize an alarm circuit as well as a redundant pump-on circuit. For increased reliability, pump ON/OFF and high-level alarm functions shall not be controlled by the same switch. Float switches of any kind, including float trees, will not be accepted due to the periodic need to maintain (rinsing, cleaning) such devices and their tendency to malfunction

because of incorrect wiring, tangling, grease buildup, and mechanical cord fatigue. To assure reliable operation of the pressure switches, each core shall be equipped with a factory installed equalizer diaphragm that compensates for any atmospheric pressure or temperature changes. Tube or piping runs outside of the station tank or into tank-mounted junction boxes providing pressure switch equalization will not be permitted due to their susceptibility to condensation, kinking, pinching, and insect infestation. The grinder pump will be furnished with a 6 conductor 14-gauge, type SJOW cable, pre-wired and watertight to meet UL requirements with a FACTORY INSTALLED NEMA 6P EQD half attached to it.

2.12 ALARM PANEL:

Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic polyester to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The enclosure shall not exceed 10.5" W x 14" H x 7" D, or 12.5" W x 16" H x 7.5" D if certain options are included.

The alarm panel shall contain one 15-amp, double-pole circuit breaker for the pump core's power circuit and one 15-amp single-pole circuit breaker for the alarm circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

The alarm panel shall include the following features: external audible and visual alarm; push-to-run switch; push-to-silence switch; redundant pump start; and high-level alarm capability. The alarm sequence is to be as follows when the pump and alarm breakers are on:

A. When liquid level in the sewage wet-well rises above the alarm level, the contacts on the alarm pressure switch activate, audible and visual alarms are activated, and the redundant pump starting system is energized.

B. The audible alarm may be silenced by means of the externally mounted, push-to-silence button.

C. Visual alarm remains illuminated until the sewage level in the wet-well drops below the "off" setting of the alarm pressure switch.

The visual alarm lamp shall be inside a red, oblong lens at least 3.75" L x 2.38" W x 1.5" H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

The entire alarm panel, as manufactured and including any of the following options shall be listed by Underwriters Laboratories, Inc.

SENTRY SIMPLEX PROTECT

Provides protection from the following operating conditions:

- Low Voltage (Brownout) Protection – A lockout cycle will prevent the motor from operating and will illuminate an LED if:
 - o the incoming AC Mains voltage drops below a predetermined minimum, typically 12% of nameplate (211 volts for a 240-volt system) for 2 to 3 seconds, regardless of whether the motor is running
 - o the lockout cycle will end if the incoming AC Mains voltage returns to a predetermined value, typically 10% of nameplate (216 volts for a 240-volt system)

The system continues to retest the voltage every second indefinitely. If the lockout cycle has been initiated and the voltage comes back above the predetermined starting voltage, the system will function

normally. The LED remains illuminated during a Brownout condition and remains latched until the pump breaker is turned off and then on again (reset). The audible and visual alarm will not be activated unless there is a high wastewater level in the tank.

- Run Dry Protection – A 20-minute lockout cycle will prevent the motor from operating and will illuminate an LED when the wastewater level in the tank is below the pump inlet level. The condition is rechecked every 20 minutes. If the lockout cycle has been initiated and the condition is satisfied, the pump is not allowed to cycle normally but the LED remains latched. The LED will remain latched until the pump breaker is turned off and then on again (reset). If the condition is not satisfied after 3 consecutive attempts, the visual alarm will be activated until the pump breaker is turned off and on (reset) or until there is one cycle of normal operation. If a high-level condition is presented at any time, a pump run cycle will be activated.

- High System Pressure Protection – A 20-minute lockout cycle will prevent the motor from operating and will illuminate an LED when the pressure in the discharge line is atypically high (closed valve or abnormal line plug). The condition is rechecked every 20 minutes. If the condition is satisfied, the pump is allowed to cycle normally but the LED remains latched. If the condition is not satisfied after 3 consecutive attempts, the pump is locked out indefinitely until the condition is removed and power is reset. The LED will remain latched until the pump breaker is turned off and then on again (reset). The audible and visual alarm will be activated.

In all of the above cases, if more than one error condition is presented, the LED depicting the most recent error condition will be displayed.

Other included features:

- Alarm Activated Dry Contacts – Normally open relay contact closes upon alarm activation.

- Alarm Activated Contacts for Remote Indoor Alarm Module – Will work with or without power to the alarm panel and is designed to work with E/One's Remote Sentry.
- Includes Inner Door Dead Front
- Separate LED's for each condition

DUPLEX STATIONS

MOD T260 DUPLEX:

Each grinder pump station shall include a NEMA 4X, UL-listed alarm panel suitable for wall or pole mounting. The NEMA 4X enclosure shall be manufactured of thermoplastic to ensure corrosion resistance. The enclosure shall include a hinged, lockable cover with padlock, preventing access to electrical components, and creating a secured safety front to allow access only to authorized personnel. The standard enclosure shall not exceed 12.5" W x 16" H x 7.5" D.

The panel shall contain one 15-amp single pole circuit breaker for the alarm circuit and one 15-amp double pole circuit breaker per core for the power circuit. The panel shall contain a push-to-run feature, an internal run indicator, and a complete alarm circuit. All circuit boards in the alarm panel are to be protected with a conformal coating on both sides and the AC power circuit shall include an auto resetting fuse.

The visual alarm lamp shall be inside a red, oblong lens at least 3.75" L x 2.38" W x 1.5" H. Visual alarm shall be mounted to the top of the enclosure in such a manner as to maintain NEMA 4X rating. The audible alarm shall be externally mounted on the bottom of the enclosure, capable of 93 dB @ 2 feet. The audible alarm shall be capable of being deactivated by depressing a push-type switch that is encapsulated in a weatherproof silicone boot and mounted on the bottom of the enclosure (push-to-silence button).

The high-level alarm system shall operate as follows:

- A. The panel will go into alarm mode if either pump's alarm switch closes. During the initial alarm mode both pumps will run and the alarm light and buzzer will be delayed for a period of time based on user settings (default is 3-1/2 minutes). If the station is still in high-level alarm after the delay, the light and buzzer will be activated.
- B. The audible alarm may be silenced by means of the externally mounted push-to-silence button.
- C. The visual alarm remains illuminated until the sewage level in the wet well drops below the "off" setting of the alarm switch for both pumps.

The entire alarm panel, as manufactured and including any of the following options shall be listed by Underwriters Laboratories, Inc.

2.13 SERVICEABILITY:

The grinder pump core, including level sensor assembly, shall have two lifting hooks complete with lift-out harness connected to its top housing to facilitate easy core removal when necessary. The level sensor assembly must be easily removed from the pump assembly for service or replacement. All mechanical and electrical connections must provide easy disconnect capability for core unit removal and installation. Each EQD half must include a water-tight cover to protect the internal electrical pins while the EQD is unplugged. A pump push-to-run feature will be provided for field trouble shooting. The push-to-run feature must operate the pump even if the level sensor assembly has been removed from the pump assembly. All motor control components shall be mounted on a readily replaceable bracket for ease of field service.

2.14 OSHA CONFINED SPACE:

All maintenance tasks for the grinder pump station must be possible without entry into the grinder pump station (as per OSHA 1910.146 Permit-required confined spaces). "Entry means the action by which

a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.”

2.15 SAFETY:

The grinder pump shall be free from electrical and fire hazards as required in a residential environment. As evidence of compliance with this requirement, the completely assembled and wired grinder pump station shall be listed by Underwriters Laboratories, Inc., to be safe and appropriate for the intended use. UL listing of components of the station, or third-party testing to UL standard are not acceptable.

The grinder pump shall meet accepted standards for plumbing equipment for use in or near residences, shall be free from noise, odor, or health hazards, and shall have been tested by an independent laboratory to certify its capability to perform as specified in either individual or low pressure sewer system applications. As evidence of compliance with this requirement, the grinder pump shall bear the seal of NSF International. Third-party testing to NSF standard is not acceptable.

3.0 EXECUTION

3.01 FACTORY TEST:

Each grinder pump shall be submerged and operated for 1.5 minutes (minimum). Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge assembly and each unit's dedicated level controls and motor controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps is not acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two different points on its curve. Additional validation tests include integral level control performance, continuity to ground and acoustic tests of the rotating components.

The ENGINEER reserves the right to inspect such testing procedures with representatives of the OWNER, at the GRINDER PUMP MANUFACTURER'S facility.

All HDPE basins shall be factory leak tested to assure the integrity of all joints, seams and penetrations. All necessary penetrations such as inlets, discharge fittings and cable connectors shall be included in this test along with their respective sealing means (grommets, gaskets etc.). Fiberglass basins with stainless steel discharge bulkhead shall be factory tested to be watertight.

3.02 CERTIFIED SERVICE PROGRAM:

The grinder pump MANUFACTURER shall provide a program implemented by the MANUFACTURER'S personnel as described in this specification to certify the service company as an authorized

serviced center. As evidence of this, the MANUFACTURER shall provide, when requested, sufficient evidence that they have maintained their own service department for a minimum of 5 years and currently employ a minimum of three employees specifically in the service department.

3.03 DELIVERY:

All grinder pump core units, including level controls, will be delivered to the job site 100 percent completely assembled, including testing, ready for installation. Grinder pump cores will be shipped separately from the tanks. Installing the cores and discharge piping/hose into the tanks is the only assembly step required and allowed due to the workmanship issues associated with other on-site assembly. Grinder pump cores must be boxed for ease of handling.

3.04 INSTALLATION:

Earth excavation and backfill are specified under SITE WORK but are also to be done as a part of the work under this section, including any necessary sheeting and bracing.

The CONTRACTOR shall be responsible for handling ground water to provide a firm, dry subgrade for the structure, and shall guard against flotation or other damage resulting from general water or flooding.

The grinder pump stations shall not be set into the excavation until the installation procedures and excavation have been approved by the ENGINEER or OWNER.

Remove packing material. User instructions MUST be given to the OWNER. Hardware supplied with the unit, if required, will be used at installation. The basin will be supplied with a standard 4" inlet grommet (4.50" OD) for connecting the incoming sewer line.

Appropriate inlet piping must be used. The basin may not be dropped, rolled or laid on its side for any reason.

Installation shall be accomplished so that 1" to 4" of accessway, below the bottom of the lid, extends above the finished grade line. The finished grade shall slope away from the unit. The diameter of the excavated hole must be large enough to allow for the concrete anchor.

A 6"-inch (minimum) layer of naturally rounded aggregate, clean and free flowing, with particle size of not less than 1/8" or more than 3/4" shall be used as bedding material under each unit.

A concrete anti-flotation collar, as detailed on the drawings, and sized according to the manufacturer's instructions, shall be required and shall be pre-cast to the grinder pump or poured in place. Each grinder pump station with its pre-cast anti-flotation collar shall have a minimum of three lifting eyes for loading and unloading purposes.

If the concrete is poured in place, the unit shall be leveled, and filled with water, to the bottom of the inlet, to help prevent the unit from shifting while the concrete is being poured. The concrete must be manually vibrated to ensure there are no voids. If it is necessary to pour the concrete to a level higher than the inlet piping, an 8" sleeve is required over the inlet prior to the concrete being poured.

The CONTRACTOR will provide and install a 4-foot piece of 4-inch SCH 40 PVC pipe with watertight cap, to stub-out the inlet for the property owners' installation contractor, as depicted on the contract drawings.

The electrical enclosure shall be furnished, installed and wired to the grinder pump station by the CONTRACTOR. An alarm device is required on every installation, there shall be NO EXCEPTIONS. It will be the responsibility of the CONTRACTOR and the OWNER to

coordinate with the individual property owner(s) to determine the optimum location for the alarm panel.

The CONTRACTOR shall mount the alarm device in a conspicuous location, as per national and local codes. The alarm panel will be connected to the grinder pump station by a length of 6-conductor type TC cable as shown on the contract drawings. The power and alarm circuits must be on separate power circuits. The grinder pump stations will be provided with 32', 25' of useable, electrical supply cable to connect the station to the alarm panel. This cable shall be supplied with a FACTORY INSTALLED EQD half to connect to the mating EQD half on the core.

3.05 BACKFILL REQUIREMENTS:

Proper backfill is essential to the long-term reliability of any underground structure. Several methods of backfill are available to produce favorable results with different native soil conditions. The most highly recommended method of backfilling is to surround the unit to grade using Class I or Class II backfill material as defined in ASTM 2321. Class 1A and Class 1B are recommended where frost heave is a concern; Class 1B is a better choice when the native soil is sand or if a high, fluctuating water table is expected. Class 1, angular crushed stone, offers an added benefit in that it doesn't need to be compacted.

Class II, naturally rounded stone, may require more compaction, to achieve the proper density. If the native soil condition consists of clean compactible soil, with less than 12% fines, free of ice, rocks, roots and organic material, it may be an acceptable backfill. Soil must be compacted in lifts not to exceed one foot to reach a final Proctor Density of between 85% and 90%. Heavy, non-compactible clays and silts are not suitable backfill for this or any underground structure such as inlet or discharge lines.

If you are unsure of the consistency of the native soil, it is recommended that a geotechnical evaluation of the material is obtained before specifying backfill.

Another option is the use of a flowable fill (i.e., low slump concrete). This is particularly attractive when installing grinder pump stations in augured holes where tight clearances make it difficult to assure proper backfilling and compaction with dry materials. Flowable fills should not be dropped more than four feet from the discharge to the bottom of the hole to avoid separation of the constituent materials.

Backfill of clean, native earth, free of rocks, roots, and foreign objects, shall be thoroughly compacted in lifts not exceeding 12" to a final Proctor Density of not less than 85%. Improper backfilling may result in damaged accessways. The grinder pump station shall be installed at a minimum depth from grade to the top of the 1 1/4" discharge line, to assure maximum frost protection. The finish grade line shall be 1" to 4" below the bottom of the lid, and final grade shall slope away from the grinder pump station.

All restoration will be the responsibility of the CONTRACTOR. The properties shall be restored to their original condition in all respects, including, but not limited to, curb and sidewalk replacement, landscaping, loaming and seeding, and restoration of the traveled ways, as directed by the OWNER.

3.06 START-UP AND FIELD TESTING:

The MANUFACTURER shall provide the services of qualified factory trained technician(s) who shall inspect the placement and wiring of each station, perform field tests as specified herein, and instruct the OWNER'S personnel in the operation and maintenance of the equipment before the stations are accepted by the OWNER.

All equipment and materials necessary to perform testing shall be the responsibility of the INSTALLING CONTRACTOR. This includes, as a minimum, a portable generator and power cable (if temporary power is required), water in each basin (filled to a depth sufficient to verify the high-level alarm is operating) and opening of all valves in the system. These steps shall be completed prior to the qualified factory trained technician(s) arrival on site.

Upon completion of the installation, the authorized factory technician(s) will perform the following test on each station:

- A. Make certain the discharge shut-off valve in the station is fully open.
- B. Turn ON the alarm power circuit and verify the alarm is functioning properly.
- C. Turn ON the pump power circuit. Initiate the pump operation to verify automatic “on/off” controls are operative. The pump should immediately turn ON.
- D. Consult the Manufacturer’s Service Manual for detailed start-up procedures.

Upon completion of the start-up and testing, the MANUFACTURER shall submit to the OWNER the start-up authorization form describing the results of the tests performed for each grinder pump station. Final acceptance of the system will not occur until authorization forms have been received for each pump station installed and any installation deficiencies corrected.

4.0 OPERATION AND MAINTENANCE

4.01 MANUALS:

The MANUFACTURER shall supply four copies of Operation and Maintenance Manuals to the OWNER, and one copy of the same to the ENGINEER.

WARRANTY PERFORMANCE CERTIFICATION

Each manufacturer shall provide a Warranty Performance Certification executed by the most senior executive officer, which certifies a minimum of a two (2) year warranty. They must further detail any exclusions from the warranty or additional cost items required to maintain the equipment in warrantable condition, including all associated labor and shipping fees, and certify that the manufacturer will bear **all** costs to correct original equipment deficiency for the effective period of the warranty.

I, _____, by and through my duly authorized signature below as its most senior operating executive, certify that _____ will provide a two (2) year warranty on grinder pump equipment manufactured and supplied by _____ for the _____ installation at _____

(installation address). I further certify that, other than failure to install equipment in accordance with manufacturer's instructions, no exclusions and/or cost items to maintain said equipment in warrantable condition, including labor, travel and shipping fees, exist except as detailed immediately below:

- EXCLUSIONS: _____ 1.
 2. _____
 3. _____

COST ITEMS TO
 MAINTAIN EQUIPMENT
 IN WARRANTABLE CONDITION: Required Frequency (mos) Avg. monthly cost (\$) times warranty period

- | | | |
|----------|-------|----------|
| 1. _____ | _____ | \$ _____ |
| 2. _____ | _____ | \$ _____ |
| 3. _____ | _____ | \$ _____ |
| 4. _____ | _____ | \$ _____ |
| 5. _____ | _____ | \$ _____ |

Total labor/material cost to maintain equipment in warrantable condition for warranty period (\$): _____

For any items not identified as exclusions or additional cost items above, OR for additional labor & material costs required to maintain equipment in warrantable condition that exceed the Avg. monthly cost (\$) detailed above, _____ will bear all costs to correct such original equipment deficiency for the effective period of the warranty including all applicable labor, travel and shipping fees.

Signature

Date

Title

MANUFACTURER'S DISCLOSURE STATEMENT

Note: To be completed if proposing an alternate

1.0 GENERAL:

1.01 General Description

Describe all non-conforming aspects to the specification:

1.04 Experience

List 5 low pressure sewer system installations ***of the type of pump/station specified (progressive cavity type)*** that have been in operation for a period of no less than five with a minimum of 25 pumps pumping into a "common" low pressure sewer system. Provide Name and Location, Contact Name, Phone Number, Number of Pumps, and Install Date for each.

1.05 Operating Conditions

Describe all non-conforming aspects to the specification:

1.06 Warranty

Fully state the manufacturer's warranty:

2.0 PRODUCT:

2.01 Pump

Describe all non-conforming aspects to the specification:

2.02 Grinder

Describe all non-conforming aspects to the specification:

2.03 Motor

Describe all non-conforming aspects to the specification:

2.05 Tank

Describe all non-conforming aspects to the specification:

2.07 Electrical Quick Disconnect

Describe all non-conforming aspects to the specification:

2.08 Check Valve

Describe all non-conforming aspects to the specification:

2.09 Anti-Siphon Valve

Describe all non-conforming aspects to the specification:

2.11 Controls

Describe all non-conforming aspects to the specification:

2.15 Safety

Describe all non-conforming aspects to the specification:

3.0 EXECUTION:

3.01 Factory Test

Describe all non-conforming aspects to the specification:

I attest that all questions are answered truthfully and all non-conforming aspects to the specifications have been described where requested.

Manufacturer: _____

By: _____ Date: _____

Name of Corporate Officer Signature

Title of Corporate Officer

Witness: _____ Date: _____

Name

Signature

Section VI

Supervisory Control and Data Acquisition System Specification

SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM SPECIFICATION

A. It shall be the policy of LCMUA, that any Developer project requiring the installation of Supervisory Control and Data Acquisition System (SCADA) shall be done at the expense of the Developer. LCMUA will design and coordinate the installation of the SCADA system, the entire project cost of which shall be the responsibility of the Developer.

B. The new equipment shall be built in strict accordance with the latest published standards of NEMA, IEEE, and ANSI. In addition, wherever possible, components utilized in construction shall be Underwriters Laboratory listed. Equipment is to be completely factory assembled, wired and tested prior to shipment.

C. It shall be the responsibility of the Developer to pay for the design, and construction of SCADA system, to be performed by LCMUA.

D. The SCADA system paid for by the Developer shall allow for full integration into the existing SCADA system operated by LCMUA and it shall be the Developer's responsibility to provide a SCADA system that meets the latest technical requirements as provided by LCMUA.

SECTION VI - DETAILS

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