

**Republic of the Philippines**  
**METROPOLITAN NAGA WATER DISTRICT**  
40 J. Miranda Avenue, Naga City

**OPERATING SPECIFICATIONS/REQUIREMENTS**

**I. PUMP**

- 1) The pump must have a minimum capacity of 8 LPS (126.8 GPM) at a Total Dynamic Head design of 107.51 m (352.63 ft.) and with a minimum pump laboratory efficiency of 75% at the design head.
- 2) There shall be no point within the pump's operating range wherein the required horsepower exceeds the rated motor horsepower. In addition, the design point shall be located within the pump's best efficiency range. The efficiency range shall be within  $\pm 5\%$  of the pump's peak efficiency.
- 3) Constructed of a stainless steel shaft, SS 431.
- 4) Stainless steel inlet strainer prevents the entry of sand and other extraneous material.
- 5) Built-in with stainless steel jam-free check valve.
- 6) High wear resistance stainless steel impeller and diffuser ensuring optimal performance.
- 7) With stainless steel cable guard.
- 8) The impellers shall be of the enclosed type, made of stainless steel, accurately fitted, smoothly finished, and dynamically balanced at normal pump speeds.
- 9) They shall have removable stainless steel or rubber wear rings and lateral seal rings mounted in their companion cases.
- 10) The bowl cases shall be made of stainless steel.
- 11) Pump bearings shall be at least  $2 \frac{1}{2}$  times the diameter of the shaft.
- 12) The pump must be secured with a pump guard.
- 13) All other pump materials shall be made of stainless steel.
- 14) The pump must pass the laboratory testing in the presence of duly authorized representatives from MNWD before actual delivery.
- 15) All material requirements must be certified brand new and the Contractor/Supplier should provide **three (3) years warranty** against factory defects under normal operating conditions.
- 16) A Manufacturer's Standard Brochure with the pump performance curve must be provided to the MNWD.
- 17) All labor, tools, and equipment necessary for the complete, correct, and efficient installation of the pump shall be provided entirely.

**II. MOTOR**

- 1) The motor shall be a squirrel cage, submersible induction type, encapsulated and rewindable type rated at 15Hp, 460VAC, 3-phase, 3450 rpm, 60 hertz AC.
- 2) The motor should feature a Double-Flanged NEMA mounting design, along with a cable guard and motor pigtail.
- 3) The motor shall be designed for continuous duty operation and shall have a minimum service factor of 1.15.
- 4) Stainless steel splined shaft.
- 5) The product should be pre-filled with a non-toxic, water-soluble filling solution.
- 6) With an external sand slinger on the shaft.
- 7) Mechanical face seal at shaft exit.
- 8) Copper bar rotor.
- 9) The motor model should be compatible with the Variable Frequency Drive (VFD) operation.
- 10) The motor must pass the laboratory testing in the presence of duly authorized representatives from MNWD before actual delivery.



- 11) All materials must be brand new and come with a **three (3)-year warranty** against factory defects under normal operating conditions, provided by the Contractor/Supplier.
- 12) All labor, tools, and equipment necessary for the complete, correct, and efficient installation of the motor shall be provided entirely.

### III. COLUMN (RISER) PIPE

- 1) The column pipe shall be made of heavy-type uPVC pipe with rubber seals at the ends of the threads.
- 2) The column pipe shall be provided with square threads designed to ensure proper gripping and to withstand heavy load and vibration.
- 3) The column pipes must be connected using couplers equipped with a locking system and rubber rings between the joints and must be tightened using a belt wrench.
- 4) The column pipe shall have the following minimum technical load and permissible hydrostatic pressure capacities:
  - Safe pulling load with chain pulley : 12000 kgs.
  - Ultimate breaking load : 15,500 kgs.
  - Safe allowable hydrostatic pressure : 26 kgs/cm<sup>2</sup>
- 5) All the column pipes must be certified brand new and shall be covered by a warranty clause.
- 6) All labor, tools, and equipment necessary for the complete, correct, and efficient installation of the column pipes shall entirely be provided for.

### IV. FLOWMETER

- 1) The supplier shall provide and install one (1) flowmeter to be installed at the pump station as shown in the drawings.
- 2) The meter should be of the propeller type and suitable for a normal flow of 29 cubic meters per hour. It should register within ( $\pm 2\%$ ) of the actual flow in normal operation between its minimum and maximum flow rates.
- 3) The meter should be installed under the following pipe run requirements:
  - a) Upstream Requirement: The meter should be installed at a minimum distance of five (5) times the pipe diameter downstream of the immediate fitting.
  - b) Downstream Requirements: The downstream run should be a minimum of two (2) times the pipe diameter upstream of the subsequent fitting.
- 4) The register shall have at least six six-digit straight-reading type totalizer which shall indicate flows in cubic meters.
- 5) The flowmeter shall be designed to operate at 1.03 Mpa (150psi) working pressure and water temperature in the range of 0 to 60 degrees centigrade.
- 6) The meter shall operate on the principle of recording (through the register) the revolutions of the propeller as caused by the force of flowing water that strikes the blades.
- 7) The meter body (casing) shall be protected against corrosion with epoxy coating (or with approved equivalent), shall have the same inside diameter throughout its length, and shall be furnished with non-corrosive, non-toxic liners with flows straightening vanes equally spaced apart.
- 8) The propeller drive shall be magnetically coupled to the register drive by means of permanent-type ceramic magnets.
- 9) The propeller should be sufficiently rigid to retain its shape during high flow conditions throughout the life of the meter with a shaft made of stainless steel.
- 10) The propeller shall be designed for the easy removal of the operating assembly from the body as a complete unit without disturbing the connection to the pipeline.
- 11) Must pass the testing and calibration procedures, and results must be submitted to MNWD (with certification of testing and calibration).
- 12) The product must be ISO 4064 Certified. Certification shall be submitted to MNWD.



## Technical Data:

Size	Application	Standards	Max. Working Pressure	Max. Liquid Temperature	Body	Connection
100mm	Water Supply Network	ISO 4064, AWWA, EEC	16 bar (232 psi)	60°C	Cast iron or Ductile iron, (polyester coated)	Flanges to ISO, BS10, AWWA or others

## Performance Data

Size	Max. Flowrate (Q <sub>max</sub> )	Nom. Flowrate (Q <sub>n</sub> )	Trans. Flowrate (Q <sub>t</sub> )	Min. Flowrate (Q <sub>min</sub> )	Max. Register Capacity	Smallest Readable Unit	Accuracy bet. Q <sub>max</sub> & Q <sub>t</sub>	Accuracy bet. Q <sub>t</sub> & (Q <sub>min</sub> )
100mm	300 (m <sup>3</sup> /hr)	230 (m <sup>3</sup> /hr)	1.8 (m <sup>3</sup> /hr)	0.8 (m <sup>3</sup> /hr)	10 <sup>6</sup> (m <sup>3</sup> )	1/10 (liter)	±2%	±5%

## V. CONTROL PANEL

### Variable Frequency Drive (Main Controller)

#### A. GENERAL SPECIFICATIONS

The Variable Frequency Drive (VFD) shall act as the main starter, it shall be adequately sized and capable of handling the operations of the pump load with a minimum rating of 15Hp, 460VAC, 3-phase, 60Hz at different conditions of the day. The VFD must be installed indoors, wall-mounted type, with viewing glass, complete with Manual Transfer Switch (MTS), associated accessories, and cabling works (feeder and control cables including pipes and accessories from existing control panel to VFD panel) and shall be completely wired in NEMA enclosure.

The VFD and all associated equipment shall be UL listed according to UL 508C-Power Conversion equipment and UL approved for mounting in plenums and compartments handling conditioned air. It shall be designed, constructed, and tested in accordance with UL, NEMA, and NEC standards. A UL label shall be attached to the enclosure.

The VFD shall be able to respond accordingly with the signal transmitted in such a way that the needed pressure in the distribution system is attained and satisfied. The VFD shall be capable of operating or adaptable to MNWD's existing transformer connection (grounded secondary) as a standard of CASURECO II, the local power provider.

#### B. VFD MINIMUM TECHNICAL FEATURES:

- 1) Built-in electronic motor overload protection
- 2) Self-tuning to motor parameters
- 3) NEMA 12 enclosure from 10 to 200Hp
- 4) 200-240V or 380-480V three-phase input voltage
- 5) Detachable/Non-detachable smart keypad with 16-character backlight LCD with three-liner (minimum) screen, providing parameter identification using clear informative text. Parameter set-up should be performed quickly and easily.
- 6) Capable of pump control (start/stop) to reduce surges during starting and stopping of the centrifugal pump by smooth acceleration and deceleration of the motor, respectively.

- 7) Metering Devices:
  - a. Three-phase current
  - b. Three-phase voltage
  - c. Power in KW
  - d. Power consumption in kWh
  - e. Elapsed time/run time
  - f. Motor thermal capacity/temperature
- 8) Fault display indicator:
  - a. Ground/line fault
  - b. Power loss
  - c. Voltage/current/phase unbalance
  - d. Phase reversal
  - e. Over/under voltage
  - f. No/Under/Over load
  - g. Over temperature
  - h. Dry run detection
- 9) Protective features
  - a. Over / under voltage
  - b. Motor short circuit protection
  - c. Motor over-current
  - d. Instantaneous over-current
  - e. Phase loss/phase imbalance detection
  - f. Over / under load supervision
  - g. Stall protection
  - h. VFD over-temperature
  - i. External trip input
  - j. Motor thermistor input
  - k. Loss of reference/feedback (4 – 20 mA)
  - l. Built-in MOV (surge protection)
- 10) Control features
  - a. Local/remote control
  - b. DC braking
  - c. Torque boost
  - d. Adjustable V/Hz profile
  - e. Maximum/minimum adjustable motor speed limits
  - f. Adjustable output current limit
  - g. Jog start and PID regulator
- 11) Display readings
  - a. Motor speed
  - b. Frequency
  - c. Voltage
  - d. Current and torque
  - e. Input/output power (Kw)
  - f. Fault identification
  - g. Elapsed time/run time
- 12) Ambient: 14° F (-10° C) to 113° F (45° C), 330 ft. (1,000m) altitude, 90% humidity, non-condensing.
- 13) Energy-saving flow compensation
- 14) User-friendly for quick and easy operation

### C. MCCB AND OTHER COMPONENTS

- 1) Enclosure shall be powder-coated based on NEMA 12 (minimum), gasket-type, with viewing glass, wrinkled beige finish using epoxy powder paint, oven-baked.
- 2) 1 unit MCCB rated in amperes (capacity depending on the size of the motor).





- 3) 1 unit rotary-type manual transfer switch (MTS) rated in specified amperes.
- 4) 1 unit control transformer rated in volt-ampere (VA).
- 5) 1 unit phase and voltage protection relay.
- 6) Pilot lights: 1 unit green LED light (RUN)  
1 unit red LED light (STOP)  
1 unit yellow LED light (FAULT/RESET)
- 7) Push button switches: 1 unit push button (RUN)  
1 unit push button (STOP)  
1 unit push button (FAULT/RESET)
- 8) Equipped with exhaust fans as a cooling device.
- 9) Equipped with water level relay or floatless relay.
- 10) Equipped with a manual selector switch for HAND/OFF/AUTO (HOA) selections.

#### D. FIELD WIRING

- 1) Includes wires to and from the tapping point of splicing (sizes and lengths of wires may vary).
- 2) Includes uPVC pipes and flexible hose as enclosure of wirings (sizes and length of conduits may vary).
- 3) Includes terminal blocks/lugs, straps, wrap, and markers for proper termination.

#### E. FIELD INSTRUMENTATION

- 1) Pressure transmitter should be provided complete with the following specifications:
  - Pressure ratings : 0 – 10 bars or 0 – 16 bars
  - Output signal : 4 – 20mA
  - Input Voltage : 7 – 33 VDC
  - Process connection : ½" National Pipe Thread (NPT)
  - Wirings : Stranded wire (size and length may vary)  
uPVC pipe or flexible hose for wire enclosure
- 2) Installation manual should be provided.

#### F. ENGINEERING WORKS

- 1) Assembly of the motor control panel as specified from the scope of work
- 2) Delivery and installation
- 3) Testing and Commissioning
- 4) Training of MNWD personnel on the operation and handling of equipment
- 5) As-built plan

#### G. WARRANTY

- 1) Contractor/Supplier should provide one (1) year warranty against factory defects under normal operating conditions.

#### Soft Starter (Back-Up Controller)

##### A. GENERAL SPECIFICATIONS

The Soft Starter (SS) shall act as the backup starter in cases when the VFD is not operational. The SS shall be adequately sized and capable of handling the operations of the pump load with a rating of 15Hp, 460V, 3-Phase, 60 Hz at starting and stopping conditions. The pump load shall be able to operate at soft starting and soft stopping following the programmed acceleration and deceleration times, the soft starter shall be able to respond accordingly with the programmed parameters and shall be able to detect

all standards protections as set therein, the soft starter controller shall be provided with all standard accessories such as breakers, relays, current transformers, protective devices, meters, push buttons, pilot lights and other standard accessories and shall be completely wired in NEMA enclosure.

B. STANDARD TECHNICAL FEATURES:

- 1) 200-240V or 380-480V, 50/60 Hz input power supply
- 2) Programmable auxiliary contacts
- 3) Three-phase SCR controller
- 4) Built-in bypass SCR
- 5) Three-phase current transformer
- 6) Built-in Electronic Motor Overload Protection
- 7) Ground fault protection
- 8) Capable of pump control (Start/Stop)
- 9) Pump control module with built-in anti-backspin timer
- 10) LCD : Minimum three-line 16-character backlit LCD provides parameter identification using clear and informative text.
- 11) Metering devices:
  - a. Three-phase current
  - b. Three-phase voltage
  - c. Power in KW
  - d. Power Factor
  - e. Elapsed time / Run time
  - f. Motor thermal capacity
- 12) Fault display:
  - a. Ground / Line fault
  - b. Power loss
  - c. Voltage / Current / Phase imbalance
  - d. Phase reversal
  - e. Over / under voltage
  - f. No / under / over load
  - g. Over temperature
  - h. Number of start/stop
  - i. Shorted SCR
  - j. Bypass failure
  - k. Dry run detection
- 13) Protective features:
  - a. Motor overload
  - a. Under and over current
  - b. Power supply phase loss
  - c. Motor phase loss
  - d. Phase reversal
  - e. Soft starter over temperature and external fault
  - f. Built-in MOV (surge protection)
  - g. Under / over voltage
  - h. Over temperature
- 14) Control features:
  - a. Local / remote control
  - b. Acceleration and deceleration independently adjustable ramps
  - c. Bypass relay
  - d. JOG
  - e. DC breaking
  - f. Energy saving
  - g. Auto-reset and fault history

- 15) Display readings:
  - a. Motor speed
  - b. Frequency
  - c. Voltage
  - d. Current and torque
  - e. Input/output power (Kw)
  - f. Fault identification
  - g. Elapsed time/run time
  - h. Motor amps
  - i. Fault identification
- 16) Ambient : 14° F (-10° C) to 113° F (45° C), 300 m (1,000 ft.) altitude, 90% humidity, non-condensing.
- 17) Detachable/non-detachable keypad with LCD

#### C. MCCB AND OTHER COMPONENTS

- 1) Enclosure shall be powder-coated based on NEMA 12 (minimum) gasket-type, with viewing glass, wrinkled beige finished using epoxy powder paint, oven-baked.
- 2) 1 unit MCCB rated in amperes (capacity depending on the size of the motor)
- 3) 1 unit rotary-type manual transfer switch (MTS) rated in amperes
- 4) 1 unit control transformer rated in volt-ampere (VA)
- 5) 1 unit phase and voltage protection relay
- 6) Pilot lights: 1 unit green LED light (RUN)  
1 unit red LED light (STOP)  
1 unit yellow LED light (FAULT/RESET)
- 7) Push button switch: 1 unit push button (RUN)  
1 unit push button (STOP)  
1 unit push button (FAULT/RESET)
- 8) Equipped with exhaust fans as a cooling device.
- 9) Equipped with water level relays or floatless relays.
- 10) Equipped with a manual selector switch for HAND/OFF/AUTO (HOA) selections.

#### D. FIELD WIRING

- 1) Includes wires to and from the tapping point of splicing (sizes and lengths of wires may vary).
- 2) Includes uPVC pipes and flexible hose as enclosure of wirings (sizes and length of conduits may vary).
- 3) Includes terminal blocks/lugs, straps, wraps, and markers for proper termination.

#### E. FIELD INSTRUMENTATION

- 1) Pressure switch should be provided complete with the following specifications:
  - Pressure ratings : Diff : 0 – 10 psi and 0 – 350 Kpa  
Main : 0 – 2 Mpa and 0 – 300 psi
  - Process connection : ½" NPT
  - Wirings : Stranded wire (size and length may vary)  
uPVC pipe or flexible hose for wire enclosure
- 2) Installation manual should be provided.

#### F. ENGINEERING WORKS

- 1) Delivery and installation
- 2) Assembly of the motor control panel as specified from the scope of work
- 3) Testing, commissioning, start-up and monitoring

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- 4) Training of MNWD personnel on the operation and handling of equipment
- 5) As-built plan

#### G. WARRANTY

- 1) Contractor/Supplier should provide one (1) year warranty against factory defects under normal operating conditions.

#### VI. GATE VALVE

- 1) Must be a wheel-type butterfly gate valve.
- 2) Body and bonnet made of grey cast iron, CG-25 to DIN 1691.
- 3) Electrostatically coated with epoxy resin to DIN 30677, internally and externally.
- 4) Stainless steel stem with hand wheel.
- 5) Stem sealing of NBR wiper ring, 2 NBR, O-rings inside and 2 outside plastic bearing, NBR rubber manchette.
- 6) Wedge made of ductile iron, encapsulated with EPDM rubber with integral wedge nut and thrust collar of dezincification-resistant brass.
- 7) Bonnet bolts made of zinc-coated steel 8.8, hot melt sealed.

#### VII. CHECK VALVES

- 1) Check valves shall have flanged connections and shall be of the swing-type with outside lever and weight.
- 2) The valve body shall be cast iron.
- 3) The valve shall have bronze gate and seat rings and type 416 stainless steel ring pin.
- 4) The check valve shall be field repairable. Discs, seats, and other parts shall be replaceable without removing the valve from the line.

#### VIII. PRESSURE GAUGE

The pressure gauge shall have a 75mm (3 inches) dial 6mm (1/4 inches) threaded connections and shut-off cock, oil-immersed. The pressure element of the gauge shall be protected against excessive pulsations and surges by an external snubber (range is 0 -150 psi).

#### IX. PRESSURE SWITCH

The Contractor shall furnish and install a pressure switch of the required setting range. The actual setting shall be determined by the Engineer in the field during testing and commissioning. The switch shall be single pole, single throw spring-type for indoor and outdoor installation.

#### X. DYNAMIC/COMBINATION AIR VALVE

The Dynamic/Combination Air Valve shall be designed to effectively combine the functions of air release and vacuum valves. It is capable of expelling significant amounts of air during the filling process and allowing air to enter during drainage, thereby alleviating negative pressure conditions.

Technical Specifications:

Size : 1 inch (25 mm)

Pressure Range : Can handle pressure of up to 150 PSI (10.3 bar)

Temperature Range : Can handle temperatures up to 65°C (149°F)

Material : Reinforced PA or ductile iron, corrosion-resistant body and operating parts

Connection : External BSP thread or flanged



## XI. GENERATOR SET

The Generator Set unit shall have a digital Control panel with an automatic start/stop cranking system compatible with an automatic transfer switch with complete standard instrumentations protection controls and LED display, complete with the following control panel monitoring system such as:

1. Generator Frequency, voltage, current
2. Underspeed, overspeed
3. Engine oil pressure
4. Engine coolant temperature
5. Fuel level warning indicator
6. Running hours counter
7. Battery voltage indicator
8. Fail to start/stop indicator
9. Emergency stop button

### Enclosure:

1. Made of heavy-duty galvanized steel with polyester powder coating
2. Doors equipped with stainless steel locks and hinges
3. Designed with a control panel viewing window in a lockable access door

### Sound pressure level:

1. 80-85 decibels at 3 meters standard

### Accessories:

1. Equipped with battery charger system
2. Equipped with water/fuel separator
3. Equipped with battery switch
4. Equipped with generator exhaust rain cap
5. Complete set of standard tools

### Other Requirements:

- The Supplier/Contractor must provide the MNWD with a full set of maintenance manuals and circuit diagrams of the supplied GENSET.
- The Supplier/Contractor shall conduct free training of MNWD maintenance personnel on the commissioning and load testing of the unit at the project site.
- The GENSET must be compatible with the control panels (VFD/Soft starter/RVAT).
- Must conduct laboratory testing with MNWD representative at the expense of the Supplier/Contractor.
- Warranty: Two (2) Years against factory defect / 2000 running hours

### NOTE:

*All materials and equipment must be brand new. All materials and equipment including labor and appurtenances from the pump and electro-mechanical equipment to generator set, as specified in the provided technical specifications, operating requirements, and all details shown on the drawings shall be included in the supplier's/contractor's scope of work, including expenses prior to and after the delivery of the project. The supplier/contractor shall furnish, deliver, install, test, and commission all specified mechanical and electrical equipment at the project site. The supplier/contractor shall provide the necessary supervision, tools, materials, and supplies essential for the successful and comprehensive delivery of the entire project.*

