the Flow Ratio Controller. The Koch PLC dictates the opening and closing of the Concentrate Flow Control Valve, 7230FV, to meet the concentrate flow set point based upon the concentration ratio factor setpoint of 350X. If the concentrate flow experiences a deviation of 10% from the intended set point for 5 minutes, the HMI will prompt the technician to lower the requested set point or initiate a cleaning to restore the flux.

Dual pumps transfer the concentrate to Concentrate Accumulation Tanks. One pump functions as a spare. The operation and speed of these pumps are controlled by the Koch PLC. The pumps may be started from the HMI of the Koch PLC. All signals from the KOCH PLC are made available and transmitted to the DCS for monitoring and alarming purposes. The transfer pressure on the concentrate header to the concentrate accumulation tanks is monitored by 7230PT.

## 4.0 EQUIPMENT DESIGN BASIS

### 4.1 Koch Ultrafiltration Stage Specification:

| | |
| --- | --- |
| Supplier: | KMS |
| Model: | 7 Konsolidator™ 736 Ultrafiltration Stages-In-Series |
| Materials: | Frame: carbon steel painted with Sherwin Williams Carbide Black Hydralon B Paint<br>Process Piping: 304 SS, sch 10; Flange connections: SStype A stub ends and 304 SS back up flanges with 150lb ASA drilling.<br>Permeate Piping: Sch 80 PVC<br>Gaskets and Elastomers: Buna, Teflon or Viton<br>Nuts, Bolts and Washers: Zinc coated carbon steel |
| Stage circulation pumps: | Flowserve model 3K 6x4 – 16RV horizontal, end suction VFD centrifugal pump<br>MOC: 316 SS<br>HP: 100<br>RPM: 1780<br>Capacity: 1380 gpm<br>Total Generated Head: 198Ft<br>Impeller diameter: 14.38" (min/max = 12"/16")<br>Motor: VFD Rated; 460V-3PH-60HZ, 405 T frame electric motor<br>Performance Curve Number: MIII8410V |
| Membranes: | FEG™ Plus-10-HFP-276-PVI (KPN#0711650) |

5,152 nominal 1" diameter x 10' long, tubular UF Membranes

### *4.1.1. UF Building Sump Pumps*

| | |
| --- | --- |
| Max operating flow | 72 gpm |
| Total generated head | 61 Ft |
| HP | 1.14 |
| Speed | 1750 rpm |
| Pump casing and impeller M.O.C. | Not Specified |
| Impeller Diameter | 8.88" (min 7"/max 10") |
| Supplier | Flowserve |
| Model | MK3 Self Primer 2K2X1.5US-10ARV |
| Motor: | 460V/3 phase/60 Hz<br>L18T frame electric motor |
| Performance Curve Number: | MII8062V |

### *4.1.2. Rinse Tank:*

| | |
| --- | --- |
| Capacity Volume | 507 gallons |
| Working Volume | 456 gallons |
| Tank Dimensions | 48" inside diameter x 60" straight shell height |
| Pressure Rating | Atmospheric |
| Temperature Range | Ambient |
| Configuration | Vertical, domed top and dished bottom, 3 legs, 18" manway with side ladder |
| Material of Construction | FRP; resin corrosion barrier and structural layer, Hetron 922; liner reinforcement 1 Ply C Glass; Outer surface layer – translucent with UV-9 inhibitor. |
| Insulation | none |
| Heat tracing | none |

### *4.1.3. CIP/Rinse Tank Pumps:*

| | |
| --- | --- |
| Max operating flow | 250 gpm |
| Total generated head | 70 Ft |
| HP | 15 |
| Speed | 1750 rpm |
| Pump casing and impeller M.O.C. | 316 SS |
| Impeller Diameter | 8.81" (min 6"/max 10") |
| Supplier | Flowserve |

| | |
| --- | --- |
| Model | 2K 4x3 – 10RV M3 ST |
| Motor: | VFD Rated; Reliance<br>460V/3 phase/60 Hz<br>245T frame electric motor |
| Performance Curve Number: | MIII7902DV |

### *4.1.4. CIP Tank:*

| | |
| --- | --- |
| Capacity Volume | 507 gallons |
| Working Volume | 456 gallons |
| Tank Dimensions | 48" inside diameter x 60" straight shell height |
| Pressure Rating | Atmospheric |
| Temperature Range | Ambient |
| Configuration | Vertical, domed top and dished bottom, 3 legs, 18" manway with side ladder |
| Material of Construction | FRP; resin corrosion barrier and structural layer, Hetron 922; liner reinforcement 1 Ply C Glass; Outer surface layer – translucent with UV-9 inhibitor. |
| Insulation | none |
| Heat tracing | none |

### *4.1.5. CIP Tank Electric Immersion Heater*

| | |
| --- | --- |
| Model | Chromalox # TMIS-18-075-E4XX |
| Rating | 75KW at 480 V/3 phase |
| Immersion Length | 36 7/8" with a 6" cold zone |
| Watt density of elements | 45 Watts/in$^2$ |
| Additional details | contactor panel has a safety disconnect<br>BPF 361077, sheet 92 |

### *4.1.6. CIP Chemical Transfer Pumps – Caustic and Detergent*

| | |
| --- | --- |
| Max flow | 4.8 gpm |
| Max pressure | 125 PSI |
| M.O.C. | PP wetted parts, air chambers, center section and air valve; Teflon® diaphragms and valve balls, PVDF valve seat and Teflon® encapsulated Viton o-ring. |
| Supplier | Wilden |
| Model | Air Operated Double Diaphragm<br>P.025-PPPP-TX-TF-K-TV |

| | |
| --- | --- |
| Additional Details | supplied with muffler, 1/8" filter, regulator and 316SS needle valve to control pump speed and discharge pressure, along with a two-way ASCO8262G006, normally closed, 304SS body, 24 VDC solenoid valve with class F coil installed at the air supply inlet using 316SS fittings |

### *4.1.7. CIP Chemical Transfer Pumps – Bleach and Acidic Cleaner*

| | |
| --- | --- |
| Max flow | 4.8 gpm |
| Max pressure | 125 PSI |
| M.O.C. | PVDF wetted parts, PP air chambers, PP center section and PP air valve; Teflon® diaphragms and valve balls, PVDF valve seat and Teflon® encapsulated Viton o-ring. |
| Supplier | Wilden |
| Model | Air Operated Double Diaphragm P.025-KPPP-TX-TF-K-TV |
| Additional Details | supplied with muffler, 1/8" filter, regulator and 316SS needle valve to control pump speed and discharge pressure, along with a two-way ASCO8262G006, normally closed, 304SS body, 24 VDC solenoid valve with class F coil installed at the air supply inlet using 316SS fittings |

### *4.1.8. Spent CIP Tank:*

| | |
| --- | --- |
| Capacity Volume | 2080 gallons |
| Working Volume | 416 gallons |
| Tank Dimensions | 96" inside diameter x 76" straight shell height |
| Pressure Rating | Atmospheric |
| Temperature Range | Ambient |
| Configuration | Vertical, domed top and dished bottom, stainless steel support stand, 24" side manway with side ladder |
| Material of Construction | FRP; resin corrosion barrier and structural layer, Hetron 922; liner reinforcement 1 Ply C Glass; Outer surface layer – translucent with UV-9 inhibitor. |
| Insulation | none |
| Heat tracing | none |

### 4.1.9. Spent CIP Pump:

| | |
| --- | --- |
| Max flow | 155 gpm |
| Max pressure | 125 PSI |
| M.O.C. | PVDF wetted parts, aluminum air chambers, PP center section and air valve, PTFE diaphragms and valve balls, PVDF valve seat and PTFE encapsulated Viton o-ring. |
| Supplier | Wilden |
| Model | Air Operated Double Diaphragm P8-PPAPP-TNU-TF-K-TV |
| Additional Details | supplied with muffler, ½"filter, regulator and 316SS needle valve to control pump speed and discharge pressure, along with a two-way ASCO8210G037, normally closed, 304SS body, 24 VDC solenoid valve with class F coil installed at the air supply inlet using 316SS fittings |

### 4.1.10. Permeate Transfer Tank:

| | |
| --- | --- |
| Capacity Volume | 3230 gallons |
| Working Volume | 2907 gallons |
| Tank Dimensions | 98" inside diameter x 60" straight shell height |
| Configuration | Vertical, domed top and dished bottom, stainless steel support stand, 24" side manway with side ladder |
| Material of Construction | FRP; resin corrosion barrier and structural layer, Hetron 922; liner reinforcement 1 Ply C Glass; Outer surface layer – translucent with UV-9 inhibitor. |
| Insulation | none |
| Heat tracing | none |

### 4.1.11. Permeate Transfer Pumps:

| | |
| --- | --- |
| Max operating flow | 750 gpm |
| Total generated head | 46 Ft |
| HP | 15 |
| Speed | 1780 rpm |
| Pump casing and impeller M.O.C. | 316 SS |
| Impeller Diameter | 7.73" (min 6.5"/max 10") |

| | |
|---|---|
| Supplier | Flowserve |
| Model | 2K 6x4 – 10HRV M3 ST |
| Motor: | VFD Rated; Reliance<br>460V/3 phase/60 Hz<br>245T frame electric motor |
| Performance Curve Number: | MIII8387AV |

### *4.1.12. Permeate Recycle Tank:*

| | |
|---|---|
| Capacity Volume | 1100 gallons |
| Working Volume | 990 gallons |
| Tank Dimensions | 60" inside diameter x 84" straight shell height |
| Configuration | Vertical, domed top and dished bottom, 4 tank legs, 24" side manway |
| Material of Construction | FRP; resin corrosion barrier and structural layer, Hetron 922; liner reinforcement 1 Ply C Glass; Outer surface layer – translucent with UV-9 inhibitor. |
| Insulation | none |
| Heat tracing | none |

### *4.1.13. Permeate Recycle Pump:*

| | |
|---|---|
| Max operating flow | 250 gpm |
| Total generated head | 70 Ft |
| HP | 15 |
| Speed | 1750 rpm |
| Pump casing and impeller M.O.C. | 316 SS |
| Impeller Diameter | 8.81" (min 6"/max 10") |
| Supplier | Flowserve |
| Model | 2K 4x3 – 10RV M3 ST |
| Motor: | VFD Rated; Reliance<br>460V/3 phase/60 Hz<br>245T frame electric motor |
| Performance Curve Number: | MIII7902DV |

### *4.1.14. Concentrate Transfer Tank:*

| | |
|---|---|
| Capacity Volume | 155 gallons |
| Working Volume | 139 gallons |
| Tank Dimensions | 30" inside diameter x 48" straight shell height |

| | |
|---|---|
| Configuration | Vertical, flat top and dished bottom, 3 tank legs, hinged cover |
| Material of Construction | FRP; resin corrosion barrier and structural layer, Hetron 922; liner reinforcement 1 Ply C Glass; Outer surface layer – translucent with UV-9 inhibitor. |
| Insulation | none |
| Heat tracing | none |

#### *4.1.15. Concentrate Transfer Pumps:*

| | |
|---|---|
| Max operating flow | 15 gpm |
| Total generated head | 46 Ft |
| HP | 1.5 |
| Speed | 1750 rpm |
| Pump casing and impeller M.O.C. | 316 SS |
| Impeller Diameter | 6.25" (min 4"/max 8.2") |
| Supplier | Flowserve |
| Model | 1K 1.5x1LF – 82 M3 LF |
| Motor: | VFD Rated; Reliance<br>460V/3 phase/60 Hz<br>145T frame electric motor |
| Performance Curve Number: | MIII7067V |

## 4.2 Standards and Codes

Process Piping: All process piping is 304L stainless steel Schedule 10 ASTM A312, welded mill finish. No mitered fittings allowed.

Permeate Piping: All permeate piping is Schedule 80 PVC to ASTM D-1785 or Schedule 80 CPVC to ASTM D-1784.

Electrical Fabrication: Components and wiring methods done in accordance with the KMS Fabrication Specification A5099-8087

Mechanical Fabrication: Procedures in accordance with the KMS Fabrication Specification Industrial Grade Stainless Systems A5099-8147

Paint/Coatings: All carbon steel is painted in accordance with the KMS Paint Specification A5099-8149.

Hardware: Nuts, Bolts and Washers are zinc coated carbon steel per KMS standard hardware fabrication specification drawing number A5099-8114.