



PHARMA DEVILS

PHARMA DEVILS
QUALITY ASSURANCE DEPARTMENT

PROTOCOL No.:

INSTALLATION QUALIFICATION FOR PURIFIED WATER GENERATION SYSTEM

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1.0 PROTOCOL APPROVAL:

Signing of this approval page of Protocol indicates agreement with the qualification approach described in this document. If modification to the qualification approach becomes necessary, an addendum shall be prepared and approved. The protocol cannot be used for execution unless approved by the following authorities.

This Installation Qualification protocol of purified water generation system been reviewed and approved by the following persons:

| FUNCTION | NAME | DEPARTMENT | SIGNATURE | DATE |
|-------------|------|------------------------|-----------|------|
| PREPARED BY | | QUALITY ASSURANCE | | |
| REVIEWED BY | | PROJECTS / ENGINEERING | | |
| REVIEWED BY | | PRODUCTION | | |
| APPROVED BY | | QUALITY ASSURANCE | | |



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2.0 OVERVIEW:

2.1 OBJECTIVE:

The objective of this protocol is to collect sufficient data pertaining to the purified water generation system and define the installation qualification verification procedure and acceptance criteria for the purified water generation system.

The installation qualification of purified water generation system has been completed on supplier documents.

2.2 PURPOSE:

The purpose of this document is to establish documentary evidence to ensure that the purified water generation system installed as per the design specification and also to ensure that it complies the design specification.

2.3 SCOPE:

This document is applicable to installation qualification of purified water generation system at services floor.

2.4 RESPONSIBILITY:

The following shall be responsible:

Quality Assurance officer/ Executive-Preparation of protocol its execution and support

Execution team –for execution of protocol

Projects / Engineering Head – For execution support and review of protocol/report

Production Head – For execution support and review of protocol/report

Quality Assurance Head – For adequacy and final approval



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2.5 EXECUTION TEAM:

The satisfactory installation of the purified water generation system shall be verified by executing the qualification studies described in this protocol. The successfully executed protocol documents that the purified water generation system is installed satisfactorily.

Execution team is responsible for the execution of installation of purified water generation system, Execution team comprises of:

| NAME | DEPARTMENT | DESIGNATION | SIGNATURE | DATE |
|------|--------------------------|-------------|-----------|------|
| | PROJECTS/ ENGINEERING | | | |
| | PRODUCTION | | | |
| | QUALITY ASSURANCE | | | |

3.0 ACCEPTANCE CRITERIA:



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- 3.1 The Purified water generation system shall meet the system description given in design qualification.
- 3.2 The Purified water generation system shall meet with the acceptance criteria mentioned under the topic "Identification of major components"
- 3.3 The Purified water generation system shall be operated by PLC.
- 3.4 All material of constructions of the contact parts to be verified with test certificate as per the specifications.
- 3.5 The RPM of motor should be in the range of $\pm 5\%$.

4.0 REQUALIFICATION CRITERIA:

The purified water generation system shall be re qualified if

- ☞ There are any major changes in system components which affect the performance of the system.
- ☞ After major breakdown maintenance is carried out.
- ☞ After change in the location
- ☞ As per revalidation date and schedule

5.0 INSTALLATION QUALIFICATION PROCEDURE:

5.1 SYSTEM DESCRIPTION:

| | | |
|-----------------------|---|----------------------------------|
| Equipment Name | : | Purified water generation System |
| Supplier/Manufacturer | : | |
| Capacity | : | 3500 LPH |
| Location | : | |

Water is fed in Reverse Osmosis system with the help of RO Feed Pump at the rate of 6.0 m³/hr. with the help of RO feed Pump.

Sodium Meta bi sulphate (Na₂S₂O₅) is then dosed in the chlorinated water to neutralize the free chlorine (excess chlorine) present in the water.

Anti scalent Dosing System is then dosed in the soft water to avoid scale formation on the RO Membranes.

Auto pH Correction Dosing System is provided to adjust the feed pH of RO feed water as 7.0 - 8.2. Reverse Osmosis Pass-I System removes dissolved solids and decreases conductivity. ORP Analyzer is provided so as to check the absence/presence of chlorine in the feed water to the RO System. If free chlorine is sensed in the feed water it will give an indication on the panel & open the dumping valve and dump the high ORP water for 300 secs. & Even if the ORP value is not below the set point it will trip the system.

Water is then fed to the Reverse Osmosis Pass-I System by means of a High Pressure Vertical multistage Pump with SS 316 wettable parts of M/s. Grundfos, Denmark. The Reverse Osmosis System will generate 3600 liters/hr water with an overall recovery of 70 %. The generated water will have Conductivity < 150 µs/cm. The



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Reverse Osmosis membrane acts as positive barrier to remove dissolved solids, organic compounds & bacteria. The Reverse Osmosis System consists of thin film composite type Reverse Osmosis membrane of Dow. The material of construction of the RO membrane is Polyamide. The RO membrane is housed in the High Pressure SS 316L Wettable Parts Housing having TC end connection and hot water Sanitizable. Purity level of Water will be as per WHO & Drinking Water Standards at the outlet of Reverse Osmosis Pass – II.

Water is then fed to the Reverse Osmosis Pass-II System by means of a High Pressure Vertical multistage Pump with SS 316 wettable parts of M/s. Grundfos, Denmark. The Reverse Osmosis System will generate 3900 liters/hr water with an overall recovery of 80%. The generated water will have Conductivity < 15-20 $\mu\text{s/cm}$. The semi-permeable

reverse osmosis membrane has molecular weight cut off less than 150 MWCO. The Reverse Osmosis membrane acts as positive barrier to remove dissolved solids, organic compounds & bacteria.

The Reverse Osmosis System consists of thin film composite type Reverse Osmosis membrane of Dow. The material of construction of the RO membrane is Polyamide. The RO membrane is housed in the High Pressure SS 316L Wettable Parts Housing having TC end connection and hot water Sanitizable. The Permeate water from RO System will be fed to the Electro Deionization Unit (EDI) having designed capacity of 3500 LPH. The EDI system has a recovery of 90%. The Permeate water from EDI is stored into UF feed tank of capacity 0.5 KL. The stored water is transferred by UFFP of capacity 7.0 m³/hr, part of water is re circulated into UF feed tank & remaining is fed to UF system. The water generated from the outlet of UF will be as per USP 34 Standards for Purified Water.

- ❖ RO Feed Pump
- ❖ SMBS Dosing System
- ❖ ADS Dosing System
- ❖ Auto pH Dosing System
- ❖ Cartridge Filter
- ❖ ORP Analyzer along with auto dumping valve
- ❖ RO High Pressure Pumps for first pass
- ❖ Reverse Osmosis Membranes along with High Pressure Housings for first pass
- ❖ Conductivity Analyzer with auto dumping valve for first pass
- ❖ RO High Pressure Pumps for second pass
- ❖ Reverse Osmosis Membranes along with High Pressure Housings for second pass
- ❖ Conductivity Analyzer with auto dumping valve for second pass
- ❖ EDI Unit
- ❖ Conductivity Analyzer with auto dumping valve for EDI unit

❖ **ULTRA FILTRAION SYSTEM**



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- ❖ UF Feed Tank
- ❖ UF Feed Pump
- ❖ UF Membranes along with the Housing

5.2 INSTRUCTION FOR FILLING THE CHECKLIST:

- 5.2.1 In case of identification of major component actual observation should be written in specified location.
- 5.2.2 In case of the compliance of the test actual observation should be written in specified location.
- 5.2.3 For identification of utilities actual observation should be written in specified location.
- 5.2.4 Give the detailed information in the summary and conclusion part of the installation Qualification report.
- 5.2.5 Actual observation of the component should be written in specified location
- 5.2.6 Whichever column is blank or not used 'NA' shall be used.

5.3 INSTALLATION CHECKLIST:

System shall be installed as following general Installation checklist:

| S.No. | Statement | Method of Verification | Actual Observation | Checked By Sign/Date |
|-------|---|--|--------------------|----------------------|
| 1. | Verify the purchase order and note down the PO no. In observation. | PO number verified with PO copy. | | |
| 2. | Verify that the "As Built" drawing is complete and represents the design concept. | As built drawing shall be verified with design specification. | | |
| 3. | Verify that major components are securely anchored and shock proof. | All major component squirrelly anchored shall be verified by visual & heavy touching the components. | | |
| 4. | Verify that there is sufficient room provided for servicing. | Sufficient space shall be verified by moving the area. | | |
| 5. | Verify that all piping and electrical connections are done according to the drawings. | Piping electrical connection shall be verified with P&ID diagram. | | |



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| S.No. | Statement | Method of Verification | Actual Observation | Checked By Sign/Date |
|-------|--|--|--------------------|----------------------|
| 6. | All access ports are examined and cleared of any debris. | Shall be verified by visual observation. | | |
| 7. | Safe electrical connections. | Electrical connection shall be verified by Visual / Physical observation. | | |
| 8. | Equipment/instrument/components identification nameplate visible. | Equipment identification shall be verified by Visual / Physical observation. | | |
| 9. | Units installed on foundation are secure in place as per manufacturer's recommendations. | All units shall be verified with skid & P& ID drawing. | | |
| 10. | Verify that there is no physical damage of the system. | physical damages shall be verified by Visual / Physical observation | | |

Inference: -----

Reviewed by
(Sign/Date)



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5.4 IDENTIFICATION & VERIFICATION OF MAJOR COMPONENTS:

Each major component shall be verified as per following procedure and same shall be recorded in respective column.

| System Parameters | Specification | Method of Verification | Actual Observation / Reference docs. | Checked by Sign/Date |
|---------------------------------|---------------------------|---|--------------------------------------|----------------------|
| [1.0] RO FEED PUMP | | | | |
| Make | Grundfos | Pump make shall be verified from pump name plate. | | |
| Model No | CM10-2A-R-A-V-AVBV | Pump model no. shall be verified from name plate. | | |
| Serial Number | To be recorded | Serial number shall be verified & recorded from name plate. | | |
| Flow Rate | 6.0 m ³ /hr. | Flow rate shall be verified with test certificate. | | |
| MOC of Impeller | SS 304 | MOC of pump shall be verified with test certificate. | | |
| MOC of Housing | CI | MOC of pump shall be verified with test certificate. | | |
| Rated Power | 1.2 kW | Rated power shall be verified with name plate. | | |
| Quantity | 01 | Quantity shall be verified with visual observation | | |
| Location | Before SMBS dosing system | Location shall be verified with visual observation | | |
| [2.0] SMBS Dosing System | | | | |
| Make | Prominent | Pump make shall be verified from pump name plate. | | |



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| System Parameters | Specification | Method of Verification | Actual Observation / Reference docs. | Checked by Sign/Date |
|--------------------------------|--------------------|---|--------------------------------------|----------------------|
| Model | CC30803 | Pump Model shall be verified from name plate. | | |
| Pump Capacity | 0-2.88LPH @ 8 BAR | Pump Model shall be verified from name plate. | | |
| Quantity | 01 Nos. | Quantity shall be verified by visual observation & same mentioned in P&ID. | | |
| S.No. | To be recorded | Sr. No. of pump shall be verified from pump name plate. | | |
| Location | After RO feed pump | location shall be verified by visual observation and same mentioned in P & ID | | |
| Dosing tank | Hydro Pure system | dosing tank shall be verified with supplier documents | | |
| Capacity | 25 L | capacity shall be verified by measuring with water | | |
| MOC | SS304 | MOC shall be verified with test certificate. | | |
| [3.0] ADS Dosing System | | | | |
| Make | Grundfos | Pump make shall be verified from pump name plate. | | |
| Model | DMB 5.0,0.6 | Pump Model shall be verified from name plate. | | |
| Pump Capacity | 0-5 LPH @ 6 bar | Pump capacity shall be verified from name plate. | | |
| Quantity | 01 Nos. | Quantity shall be verified by visual observation & same mentioned in P&ID. | | |



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|-------------------|--------------------|--|--------------------------------------|----------------------|
| S.No. | To be recorded | S.No. of pump shall be verified from pump name plate. | | |
| Location | After SMBS dosing | location shall be verified by visual observation and same mentioned in P &ID | | |
| Dosing tank | Hydro Pure systems | dosing tank shall be verified with supplier documents | | |
| Capacity | 25 L | capacity shall be verified by measuring with water | | |
| MOC | SS304 | MOC shall be verified with test certificate. | | |

[4.0] AUTO pH CORRECTION DOSING PUMP

| | | | | |
|---------------|-------------------------|--|--|--|
| Make | Prominent | Pump make shall be verified from pump name plate. | | |
| Model | CC3 0803 | Pump Model shall be verified from name plate. | | |
| Pump Capacity | 0-2.88 LPH @ 8 bar | Pump capacity shall be verified from name plate.. | | |
| Quantity | 01 No. | Quantity shall be verified by visual observation & same mentioned in P&ID. | | |
| Sr. No. | To be recorded | Sr. No. of pump shall be verified from pump name plate. | | |
| Location | After ADS Dosing System | Location shall be verified by visual observation and same mentioned in P &ID | | |



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| System Parameters | Specification | Method of Verification | Actual Observation / Reference docs. | Checked by Sign/Date |
|---|-----------------------------|---|--------------------------------------|----------------------|
| Dosing tank | Hydro pure Systems | Dosing tank shall be verified with supplier documents | | |
| Capacity | 25 Ltrs. | Capacity shall be verified by measuring with water | | |
| MOC | SS 304 | MOC shall be verified with test certificate. | | |
| [5.0] CARTRIDGE FILTER / HOUSING | | | | |
| Make | Hydro pure Systems | Cartridge filter housing shall be verified with supplier documents. | | |
| Flow Rate | 6.0 m ³ /hr. | Flow rate shall be verified with test certificate. | | |
| Size | 40" long x 2 Elements | Size of housing shall be verified by measurement with scale/vernier caliper. | | |
| MOC | SS 316L | MOC of housing shall be verified with test certificate. | | |
| Cartridge | Pratham Filter | Cartridge shall be verified with test certificate. | | |
| Size | 40" long | Size of cartridge shall be verified by measurement with scale/vernier caliper | | |
| Description | Spun Bounded, 5 Micron, DOE | Discription shall be verified with test certificate. | | |
| Quantity | 02 Nos. | Quantity shall be verified by visual observation. | | |
| MOC | PP | MOC of cartridge shall be verified with test certificate. | | |
| [6.0] CARTRIDGE FILTER / HOUSING | | | | |



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| System Parameters | Specification | Method of Verification | Actual Observation / Reference docs. | Checked by Sign/Date |
|-------------------|-----------------------------|---|--------------------------------------|----------------------|
| Make | Hydro pure Systems | Cartridge filter housing shall be verified with supplier documents. | | |
| Flow Rate | 6.0 m ³ /hr. | Flow rate shall be verified with test certificate. | | |
| Size | 40" long x 2 Elements | Size of housing shall be verified by measurement with scale/vernier caliper. | | |
| MOC | SS 316L | MOC of housing shall be verified with test certificate. | | |
| Cartridge | Pratham Filter | Cartridge shall be verified with test certificate. | | |
| Size | 40" long | Size of cartridge shall be verified by measurement with scale/vernier caliper | | |
| Description | Spun Bounded, 1 Micron, DOE | Description shall be verified with test certificate. | | |
| Quantity | 02 Nos. | Quantity shall be verified by visual observation. | | |
| MOC | PP | MOC of cartridge shall be verified with test certificate. | | |

7.0 RO HIGH PRESSURE PUMP (Pass-I)

| | | | | |
|-----------|-------------------------|---|--|--|
| Pump Make | Grundfos | Pump make shall be verified from pump name plate. | | |
| Model No. | CRN 10-12 A-P-G-V-HQQV | Pump model no. shall be verified from name plate. | | |
| Flow Rate | 8.5 m ³ /hr. | Pump flow rate shall be verified with test certificate. | | |



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|-------------------|------------------------|--|--------------------------------------|----------------------|
| Quantity | One | Quantity shall be verified by visual observation & same mentioned in P&ID. | | |
| MOC of Impeller | SS 316 | MOC of impeller shall be verified with test certificate | | |
| MOC of Housing | SS 316 | MOC of impeller shall be verified with test certificate | | |
| Rated Power | 4 kW | Rated power shall be verified from name plate. | | |
| Sr. No. | To be recorded | Sr. No. of pump shall be verified from pump name plate. | | |
| Motor Make | Grundfos | Motor make shall be verified from pump name plate. | | |
| Type | MMG1112M-2-2BFT130-E1 | Motor Type shall be verified from name plate. | | |
| Model No. | 81N15313 | Motor Model shall be verified from name plate. | | |
| RPM | 2900 | Motor RPM shall be verified from pump name plate. | | |
| Sr. No. | To be recorded | Sr. No. of motor shall be verified from pump name plate. | | |
| Location | After Cartridge filter | Location shall be verified by visual observation and same mentioned in P &ID | | |

8.0 REVERSE OSMOSIS HOUSING (Pass-I)



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| System Parameters | Specification | Method of Verification | Actual Observation / Reference docs. | Checked by Sign/Date |
|---|---------------------------------|--|--------------------------------------|----------------------|
| Housing-I Make | Hydro pure Systems | Housing shall be verified with supplier documents. | | |
| Quantity | One | Quantity shall be verified by visual observation. | | |
| Size | 8" Dia. X 40" Long (3 Elements) | Size of housing shall be verified by measurement with scale/tape | | |
| MOC | SS 316L | MOC shall be verified with test certificate. | | |
| Location | After ROHP-101(Pass-I) | Location shall be verified by visual observation and same mentioned in P &ID | | |
| Housing-02 Make | Hydro pure Systems | Housing shall be verified with supplier documents. | | |
| Quantity | One | Quantity shall be verified by visual observation. | | |
| Size | 8" Dia. X 40" Long (2 Elements) | Size of housing shall be verified by measurement with scale/tape | | |
| MOC | SS 316L | MOC shall be verified with test certificate. | | |
| Location | After ROHP-101(Pass-I) | Location shall be verified by visual observation and same mentioned in P &ID | | |
| 9.0 REVERSE OSMOSIS MEMBRANES (Pass-I) | | | | |
| Make | Dow | Make of RO membrane shall be verified with test certificate & label affix on membrane. | | |



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| System Parameters | Specification | Method of Verification | Actual Observation / Reference docs. | Checked by Sign/Date |
|-------------------|-----------------------|---|--------------------------------------|----------------------|
| Model | HSRO-390-FF | Model of RO membrane shall be verified with test certificate & label affix on membrane. | | |
| Type | Hot Water Sanitizable | Type of membrane shall be verified with test certificate. | | |
| Size | 8" Dia. X 40" Long | Size of housing shall be verified by measurement with scale/tape | | |
| Quantity | 05 Nos. | Quantity shall be verified by visual observation. | | |
| MOC | Polyamide | MOC shall be verified with test certificate. | | |
| Serial No. | To be recorded | Sr. No. of membrane shall be verified from label affix on membrane. | | |

10.0 RO HIGH PRESSURE PUMP (Pass-II)

| | | | | |
|-----------------|-------------------------|--|--|--|
| Pump Make | Grundfos | Pump make shall be verified from pump name plate. | | |
| Model No. | CRN 5-24 A-P-G-V-HQQV | Pump model no. shall be verified from name plate. | | |
| Flow Rate | 6.9 m ³ /hr. | Pump flow rate shall be verified with test certificate. | | |
| Quantity | One | Quantity shall be verified by visual observation & same mentioned in P&ID. | | |
| MOC of Impeller | SS 316 | MOC of impeller shall be verified with test certificate | | |



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|-------------------|------------------------|--|--------------------------------------|----------------------|
| MOC of Housing | SS 316 | MOC of impeller shall be verified with test certificate | | |
| Rated Power | 4.0 kW | Rated power shall be verified from name plate. | | |
| Sr. No. | To be recorded | Sr. No. of pump shall be verified from pump name plate. | | |
| Motor Make | Grundfos | Motor make shall be verified from pump name plate. | | |
| Type | MMG1112M-2-2BFT130-E1 | Motor Type shall be verified from name plate. | | |
| Model No. | 81N15313 | Motor Model shall be verified from name plate. | | |
| RPM | 2900 | Motor RPM shall be verified from pump name plate. | | |
| Sr. No. | To be recorded | Sr. No. of motor shall be verified from pump name plate. | | |
| Location | After RO Pass-I System | Location shall be verified by visual observation and same mentioned in P &ID | | |

11.0 REVERSE OSMOSIS HOUSING (Pass-II)

| | | | | |
|----------|---------------------------------|--|--|--|
| Make | Hydro pure Systems | Housing shall be verified with supplier documents. | | |
| Quantity | One | Quantity shall be verified by visual observation. | | |
| Size | 8" Dia. X 40" Long (3 Elements) | Size of housing shall be verified by measurement with scale/tape | | |



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| MOC | SS 316L | MOC shall be verified with test certificate. | | |
| Location | After ROHP-102 (Pass-II) | Location shall be verified by visual observation and same mentioned in P &ID | | |
| 12.0 Reverse Osmosis Membranes (Pass-II) | | | | |
| Make | Dow | Make of RO membrane shall be verified with test certificate & label affix on membrane. | | |
| Model | HSRO-390-FF | Model of RO membrane shall be verified with test certificate & label affix on membrane. | | |
| Type | Hot Water Sanitizable | Type of membrane shall be verified with test certificate. | | |
| Size | 8" Dia. X 40" Long | Size of housing shall be verified by measurement with scale/tape | | |
| Quantity | 03 | Quantity shall be verified by visual observation. | | |
| MOC | Polyamide | MOC shall be verified with test certificate. | | |
| Serial No. | To be recorded | Sr. No. of membrane shall be verified from membrane name plate. | | |
| 13.0 ELECTRO DE-IONIZATION UNIT | | | | |
| Make | Ion pure | EDI Make shall be verified from EDI name plate/label affix on system. | | |



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| Model No. | IP-LXM30HI-3 | EDI Make shall be verified from EDI name plate/label affix on system. | | |
| Type of Sanitization | Hot Water Sanitizable | Type of sanitization shall be verified with supplier documents/certificate. | | |
| Quantity | One | Quantity shall be verified by visual observation & same mentioned in P&ID. | | |
| Sr. No. | To be recorded | Sr. No. of EDI shall be verified from EDI name plate. | | |
| Location | After RO Pass-II System | Location shall be verified by visual observation and same mentioned in P & ID | | |
| 14.0 UF FEED TANK | | | | |
| Make | Hydro pure Systems | Tank make shall be verified from name plate/label affix on system | | |
| Quantity | One | Quantity shall be verified by visual observation. | | |
| Capacity | 500 Ltrs. | Tank capacity shall be verified by geometrical calculation ($\pi r^2 h$) | | |
| Type | Half Jacketed Vertical Tank with Cladding | Type of tank shall be verified with supplier documents and drawing. | | |
| Tank Internal Diameter | 800 mm | Dimensions of tank shall be verified by measurement with scale/tape. | | |



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|--|--------------------------|--|--------------------------------------|----------------------|
| Tank Height | 1000 mm | Dimensions of tank shall be verified by measurement with scale/tape. | | |
| MOC | SS 316L | MOC of tank shall be verified with test certificate. | | |
| 15.0 UF FEED PUMP | | | | |
| Make | Grundfos | Pump make shall be verified from pump name plate. | | |
| Model no. | CM10-2 A-R-G-V-AQQV | Pump model no. shall be verified from name plate. | | |
| Flow rate | 7 m ³ /hr. | Pump flow rate shall be verified with test certificate. | | |
| Rated power | 1.2 kW | Rated power shall be verified from name plate. | | |
| Quantity | 01 Nos. | Quantity shall be verified by visual observation & same mentioned in P&ID | | |
| Sr. No. | To be recorded | Sr. No. of pump shall be verified from pump name plate. | | |
| MOC of Impeller | SS 316 | MOC of impeller shall be verified with test certificate | | |
| MOC of Housing | SS 316 | MOC of impeller shall be verified with test certificate | | |
| Location | After UF feed tank T-101 | Location shall be verified by visual observation and same mentioned in P &ID | | |
| 16.0 POST ULTRA FILTRATION SYSTEM | | | | |



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| System Parameters | Specification | Method of Verification | Actual Observation / Reference docs. | Checked by Sign/Date |
|----------------------|-------------------------|---|--------------------------------------|----------------------|
| Make | Daicem membrane | UF make shall be verified from UF name plate/label affix on system | | |
| Size | 5" x 43" | Size of housing shall be verified by measurement with scale/tape | | |
| Type | Hollow Fiber membrane | Type of membrane shall be verified with test certificate. | | |
| Quantity | Two | Quantity shall be verified by visual observation. | | |
| Model No. | FS10-FC-FUST653 | Shall be verified with name plate. | | |
| Type of Sanitization | Hot Water | Type of Sanitization shall be verified with test certificate. | | |
| MOC of housing | Polysulfone | MOC of housing shall be verified with product technical specification | | |
| Membrane material | Polyethersulfone | MOC of membrane shall be verified with product technical specification | | |
| Permeate flow rate | 3.3 m ³ /Hr. | Permeate flow rate shall be verified with test certificate. | | |
| Location | After UFFP-101 | Location shall be verified by visual observation and same mentioned in P & ID | | |
| Sr. No. | To be recorded | Sr. No. of membrane shall be verified from membrane label. | | |

17.0 Vent Filter



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|---|-----------------------------|---|--------------------------------------|----------------------|
| Housing Make | Hydro pure Systems | Vent Filter make shall be verified from supplier documents. | | |
| Quantity | One | Quantity shall be verified by visual observation. | | |
| MOC | SS 316L | MOC of tank shall be verified with test certificate. | | |
| Location | Purified Water UF feed tank | Location shall be verified by visual observation. | | |
| Vent Filter Cartridge | Sartorius | Cartridge shall be verified with test certificate | | |
| Model | VFH-10 | Model of vent filter shall be verified with name plate | | |
| Size | 10" long | Size of housing shall be verified by measurement with scale/tape | | |
| Pore size | 0.2 μ | Pore size shall be verified with test certificate & label at cartridge. | | |
| 18.0 Control panel with PLC operated | | | | |
| PLC Digital input/output Make | Mitsubishi | Make shall be verified with system operating mentioned on same | | |
| Model No. | FX3U 80MR+FX2N8EX | Model shall be verified with tag. | | |
| Digital Input | 48 Nos.,24 VDC input | Digital input shall be verified by counting manually. | | |
| Digital output | 40 Nos.,24 VDC output | Digital output shall be verified by counting manually. | | |



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| System Parameters | Specification | Method of Verification | Actual Observation / Reference docs. | Checked by Sign/Date |
|--|-----------------------------------|--|--------------------------------------|----------------------|
| Analog input/output card Make | Mitsubishi | Make shall be verified with system operating mentioned on same | | |
| Model No. | FX2N8AD+FX2N8AD+FX2N-2AD+FX2N-4DA | Model shall be verified with tag. | | |
| Analog input | 18 No. | Analog input shall be verified by counting manually. | | |
| Analog output | 4 No. | Analog output shall be verified by counting manually. | | |
| HMI Make | Mitsubishi | Make shall be verified with system operating mentioned on same | | |
| Catalog No. | E1061 | Model shall be verified with HMI name plate. | | |
| Display | Touch Screen | Display shall be verified with supplier document | | |
| Size | 5.5 inch | Size of display shall be verified by measurement with scale/tape | | |
| VFD For RO High pressure pump (pass-I) Make | Mitsubishi Electric | VFD make shall be verified from VFD name plate | | |
| Model | FR-D740-080-EC | VFD model shall be verified from VFD name plate | | |
| Sr. No. | To be recorded | S.No. of VFD shall be verified from name plate | | |
| VFD For RO High pressure pump (pass-II) Make | Mitsubishi Electric | VFD make shall be verified from VFD name plate | | |



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| System Parameters | Specification | Method of Verification | Actual Observation / Reference docs. | Checked by Sign/Date |
|-------------------------------------|---------------------|---|--------------------------------------|----------------------|
| Model | FR-D740-080-EC | VFD model shall be verified from VFD name plate | | |
| Sr. No. | To be recorded | S.No. of VFD shall be verified from name plate | | |
| VFD For UF Feed pump Make | Mitsubishi Electric | VFD make shall be verified from VFD name plate | | |
| Model | FR-D740-080-EC | VFD model shall be verified from VFD name plate | | |
| Sr. No. | To be recorded | S.No. of VFD shall be verified from name plate | | |

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5.5 IDENTIFICATION & VERIFICATION MEASURING COMPONENTS:

The measuring components has been identified by visual observation with their location and same shall be recorded as per given table.

| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|--------------------|---|----------------------------|---|--------------------------------------|------------------------|
| 1. | Pressure gauge | 0 to 7 kg/cm ² , 100 mm Dial Size | Discharge line of ROFP-101 | Component shall be verified by visual observation on system | | |
| 2. | Pressure gauge | 0 to 7 kg/cm ² , 100 mm Dial Size | Outlet of CF-101 | Component shall be verified by visual observation on system | | |
| 3. | Pressure gauge | 0 to 7 kg/cm ² , 100 mm Dial Size | Outlet of CF-102 | Component shall be verified by visual observation on system | | |
| 4. | Pressure gauge | 0 to 21 kg/cm ² , 100 mm Dial Size | Inlet of RO Pass-I | Component shall be verified by visual observation on system | | |
| 5. | Pressure gauge | 0 to 21 kg/cm ² , 100 mm Dial Size | Reject of ROH-101 | Component shall be verified by visual observation on system | | |
| 6. | Pressure gauge | 0 to 21 kg/cm ² , 100 mm Dial Size | Reject of ROH-102 | Component shall be verified by visual observation on system | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|--------------------|---|--------------------------------------|---|--------------------------------------|------------------------|
| 7. | Pressure gauge | 0 to 21 kg/cm ² , 100 mm Dial Size | inlet of RO Pass-II | Component shall be verified by visual observation on system | | |
| 8. | Pressure gauge | 0 to 21 kg/cm ² , 100 mm Dial Size | Reject of ROH-103 | Component shall be verified by visual observation on system | | |
| 9. | Pressure gauge | 0 to 7 kg/cm ² , 100 mm Dial Size, | Inlet of EDI-101 | Component shall be verified by visual observation on system | | |
| 10. | Pressure gauge | 0 to 7 kg/cm ² , 100 mm Dial Size, | UF Feed | Component shall be verified by visual observation on system | | |
| 11. | Pressure gauge | 0 to 7 kg/cm ² , 63 mm Dial Size, | In safety valve ass. of UF feed tank | Component shall be verified by visual observation on system | | |
| 12. | Pressure gauge | 0 to 7 kg/cm ² , 100 mm Dial Size, | UF Permeate | Component shall be verified by visual observation on system | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|--------------------|--|---------------------------|---|--------------------------------------|------------------------|
| 13. | Compound gauge | -1 to 9 kg/cm ² , 100 mm Dial Size, SS internals, | On top of T- 101 | Component shall be verified by visual observation on system | | |
| 14. | Flow meters | DN 25, SS 316, TC End | Discharge of ROFP-101 | Component shall be verified by visual observation on system | | |
| 15. | Flow meters | DN 25, SS 316, TC End | Reject line of RO Pass-I | Component shall be verified by visual observation on system | | |
| 16. | Flow meters | DN 25, SS 316, TC End | Reject line of RO Pass-II | Component shall be verified by visual observation on system | | |
| 17. | Flow meters | DN 25, SS 316, TC End | Discharge of UFFP- 101 | Component shall be verified by visual observation on system | | |
| 18. | Flow meters | DN 40, SS 316, TC End | UF Permeate UF101,102 | Component shall be verified by visual observation on system | | |
| 19. | Rota meter | 600 – 6000 LPH, magnetic Float, With Limit Switch | Feed of EDI-101 | Component shall be verified by visual observation on system | | |
| 20. | Rota meter | 50 – 500 LPH, magnetic Float, | Concentrate of EDI-101 | Component shall be verified by | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|-----------------------|---|-----------------------------|---|--------------------------------------|------------------------|
| | | With Limit Switch | | visual observation on system | | |
| 21. | Rota meter | 63-630 LPH, SS 316, TC End | Reject of UF System | Component shall be verified by visual observation on system | | |
| 22. | Low Level Switch | Magnetic Type, ABS, White | SMBS Dosing Tank (DT-101) | Component shall be verified by visual observation on system | | |
| 23. | Low Level Switch | Magnetic Type, ABS, White | ADS Dosing Tank (DT-102) | Component shall be verified by visual observation on system | | |
| 24. | Low Level Switch | Magnetic Type, ABS, White | pH Dosing Tank (DT-103) | Component shall be verified by visual observation on system | | |
| 25. | Pressure Switch | 0.2 - 6 kg/cm ² , SS 316, Diaphragm Seal TC End Connection, Relay output | Feed line of post UF System | Component shall be verified by visual observation on system | | |
| 26. | Low Pressure Switches | 0.2 - 6 kg/cm ² , SS 316, Diaphragm Seal TC End Connection, Relay output | Suction line of ROHP-01 | Component shall be verified by visual observation on system | | |
| 27. | Low Pressure Switches | 0.2 - 6 kg/cm ² , SS 316, Diaphragm Seal TC End | Suction line of ROHP-102 | Component shall be verified by visual observation on system | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|---------------------------------------|---|-----------------------------------|---|--------------------------------------|------------------------|
| | | Connection, Relay output | | | | |
| 28. | Low Pressure Switches | 0.2 - 6 kg/cm ² , SS 316, Diaphragm Seal TC End Connection, Relay output | Feed line of EDI-101 | Component shall be verified by visual observation on system | | |
| 29. | High Pressure Switches | 4 - 17 kg/cm ² , SS 316, diaphragm Seal TC End Connection, Relay output | Discharge line of ROHP-101 | Component shall be verified by visual observation on system | | |
| 30. | High Pressure Switches | 4 - 17 kg/cm ² , SS 316, diaphragm Seal TC End Connection, Relay output | Discharge line of ROHP-102 | Component shall be verified by visual observation on system | | |
| 31. | Level transmitter | 1300 mm, Capacitance Rope type, SS 316, 4 to 20 mA | On top of UF Feed Tank (UFFT-101) | Component shall be verified by visual observation on system | | |
| 32. | ORP Transmitter | -1500 to +1500 mV, SS 316, 4 to 20 mA output | Feed line of First Pass RO | Component shall be verified by visual observation on system | | |
| 33. | Conductivity Indicator Cum Controller | 0 to 200 μ s/cm, SS 316, Relay output | Permeate of RO First Pass | Component shall be verified by visual observation on system | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|---------------------------------------|--|---------------------------------|---|--------------------------------------|------------------------|
| 34. | Conductivity Indicator Cum Controller | 0 to 100 μ s/cm, SS 316, Relay output | Permeate of RO Second Pass | Component shall be verified by visual observation on system | | |
| | | 0 to 10 μ s/cm, SS 316, 4 to 20 mA output, Sanitary type | Permeate of EDI-101 | Component shall be verified by visual observation on system | | |
| 35. | Temperature Transmitter | 0 to 200 C, PT 100 RTD, SS 316, 50 mm, TC End | For EVF-101 at T-101 | Component shall be verified by visual observation on system | | |
| 36. | Temperature Transmitter | 0 to 200 C, PT 100 RTD, SS 316, 50 mm, TC End | For Outlet line of T-101 | Component shall be verified by visual observation on system | | |
| 37. | Safety Valve | 3/4", SS 304 | On Jacket of UF feed tank | Component shall be verified by visual observation on system | | |
| 38. | Actuated diaphragm valves | 40 mm, SS316 +EPDM, TC end connection, pneumatic actuator | Permeate line of post UF system | Component shall be verified by visual observation on system | | |
| 39. | Manual ball valve | 8 mm, SS304 +THD. end | In steam safety valve assembly | Component shall be verified by visual observation on system | | |
| 40. | Manual ball valve | 15 mm, SS304 +TC. end | In steam trap assembly | Component shall be verified by visual observation on system | | |
| 41. | Manual ball valve | 15 mm, SS304 +TC. end | In steam trap assembly | Component shall be verified by | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|--------------------|-------------------------|----------------------------|---|--------------------------------------|------------------------|
| | | | | visual observation on system | | |
| 42. | Diaphragm valves | 50 mm,SS316+EPDM,TC end | Suction line of ROFP-101 | Component shall be verified by visual observation on system | | |
| 43. | Diaphragm valves | 40 mm,SS316+EPDM,TC end | Discharge line of ROFP-101 | Component shall be verified by visual observation on system | | |
| 44. | Diaphragm valves | 40 mm,SS316+EPDM,TC end | Discharge line of ROHP-101 | Component shall be verified by visual observation on system | | |
| 45. | Diaphragm valves | 40 mm,SS316+EPDM,TC end | Before CIP-104 | Component shall be verified by visual observation on system | | |
| 46. | Diaphragm valves | 40 mm,SS316+EPDM,TC end | Discharge line of ROHP-102 | Component shall be verified by visual observation on system | | |
| 47. | Diaphragm valves | 40 mm,SS316+EPDM,TC end | Before CIP-107 inlet | Component shall be verified by visual observation on system | | |
| 48. | Diaphragm valves | 15 mm,SS316+EPDM,TC end | EDI-101 conc. feed line | Component shall be verified by visual observation on system | | |
| 49. | Diaphragm valves | 25 mm,SS316+EPDM,TC end | Drain line of T-101 | Component shall be verified by visual observation on system | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|--------------------|-------------------------|----------------------------------|---|--------------------------------------|------------------------|
| 50. | Diaphragm valves | 50 mm,SS316+EPDM,TC end | Suction line of UFFP-101 | Component shall be verified by visual observation on system | | |
| 51. | Diaphragm valves | 40 mm,SS316+EPDM,TC end | Discharge line of UFFP-101 | Component shall be verified by visual observation on system | | |
| 52. | Diaphragm valves | 15 mm,SS316+EPDM,TC end | Reject line of post UF | Component shall be verified by visual observation on system | | |
| 53. | Non return valve | 40 mm, SS316,TC end | Discharge line of ROFP-101 | Component shall be verified by visual observation on system | | |
| 54. | Non return valve | 25 mm, SS316,TC end | Reject line of RO pass-2 | Component shall be verified by visual observation on system | | |
| 55. | Non return valve | 25 mm, SS316,TC end | Reject recycle line of RO pass-1 | Component shall be verified by visual observation on system | | |
| 56. | Non return valve | 25 mm, SS316,TC end | Reject recycle line of RO pass-2 | Component shall be verified by visual observation on system | | |
| 57. | Non return valve | 40 mm, SS316,TC end | Discharge line of UFFP-101 | Component shall be verified by visual observation on system | | |
| 58. | Needle valve | ¼ inch,SS304,PU tube | For ORP Analyzer(orp- | Component shall be verified by | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|----------------------------------|----------------------------------|----------------------------------|---|--------------------------------------|------------------------|
| | | connector | 101) | visual observation on system | | |
| 59. | Needle valve | 3/4 inch,SS316,TC end | Reject recycle line of RO pass-1 | Component shall be verified by visual observation on system | | |
| 60. | Needle valve | 3/4 inch,SS316,TC end | Reject recycle line of RO pass-2 | Component shall be verified by visual observation on system | | |
| 61. | PID control valves | 1 inch ,SS316L,Butt weld | Reject line of RO pass-1 | Component shall be verified by visual observation on system | | |
| 62. | PID control valves | 1/2 inch ,SS316L,Butt weld | Reject line of RO pass-2 | Component shall be verified by visual observation on system | | |
| 63. | Actuated angle seat ON/OFF Valve | 50mm,SS316,NC,pneumatic actuator | Suction line of ROFP-101 | Component shall be verified by visual observation on system | | |
| 64. | Actuated angle seat ON/OFF Valve | 40mm,SS316,NC,pneumatic actuator | ORP-101 dump valve | Component shall be verified by visual observation on system | | |
| 65. | Actuated angle seat ON/OFF | 40mm,SS316,NC,pneumatic actuator | RO Pass-1 Reject line | Component shall be verified by visual observation on system | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|----------------------------------|----------------------------------|--------------------------|---|--------------------------------------|------------------------|
| | Valve | | | | | |
| 66. | Actuated angle seat ON/OFF Valve | 40mm,SS316,NC,pneumatic actuator | CIC-101 dump line valve | Component shall be verified by visual observation on system | | |
| 67. | Actuated angle seat ON/OFF Valve | 40mm,SS316,NC,pneumatic actuator | RO Pass-2 reject line | Component shall be verified by visual observation on system | | |
| 68. | Actuated angle seat ON/OFF Valve | 40mm,SS316,NC,pneumatic actuator | CIC-102 dump line valve | Component shall be verified by visual observation on system | | |
| 69. | Actuated angle seat ON/OFF Valve | 20mm,SS316,NC,pneumatic actuator | Steam inlet line | Component shall be verified by visual observation on system | | |
| 70. | Actuated angle seat ON/OFF Valve | 40mm,SS316,NC,pneumatic actuator | Reject line of UF System | Component shall be verified by visual observation on system | | |
| 71. | Flow diverter valve | 25mm,SS316L,TC End connection | Permeate line of EDI-101 | Component shall be verified by visual observation on system | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|--------------------|-----------------------------|-------------------------------------|---|--------------------------------------|------------------------|
| 72. | Sampling Valve | 8mm,SS316,TC End connection | Before SMBS dosing system, SP-101 | Component shall be verified by visual observation on system | | |
| 73. | Sampling Valve | 8mm,SS316,TC End connection | Outlet of CF-101,SP-102 | Component shall be verified by visual observation on system | | |
| 74. | Sampling Valve | 8mm,SS316,TC End connection | Outlet of CF-102,SP-103 | Component shall be verified by visual observation on system | | |
| 75. | Sampling Valve | 8mm,SS316,TC End connection | Permeate line of ROH-101,SP-104 | Component shall be verified by visual observation on system | | |
| 76. | Sampling Valve | 8mm,SS316,TC End connection | Permeate line of ROH-102,SP-105 | Component shall be verified by visual observation on system | | |
| 77. | Sampling Valve | 8mm,SS316,TC End connection | Permeate header of RO pass-1,SP-106 | Component shall be verified by visual observation on system | | |
| 78. | Sampling Valve | 8mm,SS316,TC End connection | Permeate line of ROH-103,SP-107 | Component shall be verified by visual observation on system | | |
| 79. | Sampling Valve | 8mm,SS316,TC End connection | Permeate line of EDI-101,SP-108 | Component shall be verified by visual observation on system | | |



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| S.No. | Name of Components | Range/Specification | Location | Method of Verification | Observation / Reference Document No. | Checked by Sign & Date |
|-------|--------------------|---|--|---|--------------------------------------|------------------------|
| 80. | Sampling Valve | 8mm,SS316,TC End connection | Feed line of Post UF System,SP-109 | Component shall be verified by visual observation on system | | |
| 81. | Sampling Valve | 8mm,SS316,TC End connection | Permeate line of Post UF System,SP-110 | Component shall be verified by visual observation on system | | |
| 82. | Spray Ball | Rotating Type, TC SS316L End Connection | In UF Feed Tank | Component shall be verified by visual observation on system | | |
| 83. | Steam Trap | 15 NB, Ball & Float Type | In UF Feed Tank | Component shall be verified by visual observation on system | | |

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5.6 Identification of provided interlocking / safety feature:

| S.No. | Interlock/Safety Feature Description | Location | Method of Verification | Observation | Verified by Sign & Date |
|-------|--------------------------------------|------------------------------------|--|-------------|-------------------------|
| 1. | Low Level | In SMBS-101 Dosing Tank (DT-101) | Interlocking sensor shall be verified by visual observation | | |
| 2. | Low Level | in ADS-101 Dosing Tank (DT-102) | Interlocking sensor shall be verified by visual observation | | |
| 3. | Low Level | in pHC-101 Dosing Tank (DT-103) | Interlocking sensor shall be verified by visual observation | | |
| 4. | High ORP Value than the preset Value | ORP sensor provided (ORP-101) | Interlocking sensor shall be verified by visual observation | | |
| 5. | Low Pressure | Provided at ROHP-101 suction | Interlocking pressure switch shall be verified by visual observation | | |
| 6. | Repeated Low Pressure | Provided at ROHP-101 suction | Interlocking pressure switch shall be verified by visual observation | | |
| 7. | High Pressure | Provided at ROHP-101 discharge | Interlocking pressure switch shall be verified by visual observation | | |
| 8. | High Conductivity | Provided at RO First Pass Permeate | Interlocking sensor shall be verified by visual observation | | |



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| S.No. | Interlock/Safety Feature Description | Location | Method of Verification | Observation | Verified by Sign & Date |
|-------|--------------------------------------|-------------------------------------|--|-------------|-------------------------|
| 9. | Low Pressure | Provided at ROHP-102 suction | Interlocking pressure switch shall be verified by visual observation | | |
| 10. | Repeated Low Pressure | Provided at ROHP-102 suction | Interlocking pressure switch shall be verified by visual observation | | |
| 11. | High Pressure | at ROHP-102 discharge | Interlocking pressure switch shall be verified by visual observation | | |
| 12. | High Conductivity | Provided at RO Second Pass Permeate | Interlocking sensor shall be verified by visual observation | | |
| 13. | Low Pressure | Provided at EDI -101 inlet | Interlocking pressure switch shall be verified by visual observation | | |
| 14. | Repeated Low Pressure | Provided at EDI -101 inlet | Interlocking pressure switch shall be verified by visual observation | | |
| 15. | High Conductivity | Provided at EDI Permeate | Interlocking sensor shall be verified by visual observation | | |
| 16. | High level in T-101 | Provided in T-101 Feed Tank | Interlocking sensor shall be verified by visual observation | | |



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| S.No. | Interlock/Safety Feature Description | Location | Method of Verification | Observation | Verified by Sign & Date |
|-------|--------------------------------------|---|--|-------------|-------------------------|
| 17. | Low - Level | Provided in T-101 Feed Tank | Interlocking sensor shall be verified by visual observation | | |
| 18. | Low Temperature | Provided at TT-101 during Sanitization | Interlocking sensor shall be verified by visual observation | | |
| 19. | High Temperature | Provided at TT-101 during Sanitization | Interlocking sensor shall be verified by visual observation | | |
| 20. | High Pressure | Provided at PS-101 | Interlocking pressure switch shall be verified by visual observation | | |
| 21. | High conductivity in return line | Provided at CIC-201 | Interlocking sensor shall be verified by visual observation | | |
| 22. | Emergency Stop | Emergency button provided on control panel. | Interlocking sensor shall be verified by visual observation | | |

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5.7 Verification of Material of Construction:

All components material of construction has been verified at section identification & verification major components with respective test certificates.

Apart from that SS materials also should be verified with molybdenum test kit and same shall be recorded in below table.

| Name of Components | Material of Construction | Method of Verification | Observation | Checked by Sign/Date |
|-------------------------|--------------------------|--|-------------|----------------------|
| UF Storage tank | SS 316L | Shall be verified with test certificate | | |
| Level transmitter | SS 316 | Shall be verified with test certificate | | |
| Vent filter housing MOC | SS 316L | Shall be verified with test certificate | | |
| Pump contact part | SS 316 | Shall be verified with test certificate | | |
| Dosing tanks | SS304 | Shall be verified with molybdenum test kit | | |

Inference: -----

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5.8 IDENTIFICATION OF SUPPORTING UTILITIES:

The required utility connection shall be verified with visual observation

| Name of utility | Requirements | Method of verification | Observation | Checked by Sign & Date |
|-----------------|---|--|-------------|------------------------|
| Electricity | 3 phase, 415V, 50Hz supply with neutral and proper Earthing | Provided electricity shall be verified with clamp meter | | |
| Compressed air | 6 Kg/cm ² | Provided compressed air shall be verified pressure gauge | | |
| Steam | At 142 °C Temp (approx), 3-4 Kg/cm ² | Provided steam shall be verified with steam pressure gauge | | |
| Soft water | 6500 LPH @ 25° C | Provided raw water shall be verified with pressure gauge | | |

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5.9 Identification & verification of sampling & user points:

Following sampling & user point has been identified & verified by visual observation & manual counting and same shall be identified in P&ID also.

| S.No. | Tag No. | Name of Sampling & User point | Sampling ID No. | Observation /Reference Document No. | Verified by Sign & Date |
|-------|---------|---------------------------------|-----------------|-------------------------------------|-------------------------|
| 1. | | Before SMBS Dosing system | | | |
| 2. | | Outlet of CF-101 | | | |
| 3. | | Outlet of CF-102 | | | |
| 4. | | Permeate line of ROH-101 | | | |
| 5. | | Permeate line of ROH-102 | | | |
| 6. | | Permeate Header RO pass-I | | | |
| 7. | | Permeate line of ROH-103 | | | |
| 8. | | Permeate line of EDI-101 | | | |
| 9. | | Feed line of post UF system | | | |
| 10. | | Permeate line of post UF system | | | |

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5.10 IDENTIFICATION / VERIFICATION OF STANDARD OPERATING PROCEDURE (SOP):

The following Standard Operating Procedures were identified as important for effective performance of Purified water generation system operation.

| S.No. | SOP Title | Status | Verified By Sign & Date |
|-------|-----------|--------|----------------------------|
| | | | |
| | | | |
| | | | |
| | | | |

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5.11 VERIFICATION OF DRAWING & DOCUMENTS:

Following documents & drawing shall be verified but not limited to:

| S.No. | Title of Drawing and Document | Reference Document No. | Checked by Sign & Date |
|-------|-------------------------------|------------------------|------------------------|
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5.13 ABBREVIATIONS:

Following Abbreviations are used in the installation qualification protocol of Purified water generation system

mm : Millimeter

m/sec : Meter/second

P & ID : Piping & instrumentation diagram

PW : Purified water

NMT : Not more than

NLT : Not less than

HMI : Human machine interface

μ S/cm :Micro Siemens per centimeter

PWG : Purified water Generation

PIQ : Protocol for Installation qualification

RIQ : Report for installation qualification



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6.3 FINAL REPORT APPROVAL:

It has been verified that all tests required by this protocol are completed, reconciled and attached to this protocol or included in the qualification summary report. Verified that all amendments and discrepancies are documented, approved and attached to this protocol, (if applicable)

Signatures in the block below indicate that all items in this qualification report of Purified water generation system have been reviewed and found to be acceptable and that all variations or discrepancies have been satisfactorily resolved.

| NAME | DESIGNATION | DEPARTMENT | SIGNATURE | DATE |
|------|-------------|---------------------------|-----------|------|
| | | PROJECTS / ENGINEERING | | |
| | | PRODUCTION | | |
| | | QUALITY ASSURANCE | | |