LG QuantumFlux™ Pressurized UF Membrane

Technical Service Bulletin 608

UF System Design

Although LG Chem does not typically supply the UF system, it is critical to have a properly designed system, capable of following LG Chem recommended operating process. Please refer to the LG Chem Technical Service Bulletins (TSB's) for system design recommendations.

Key Operating Parameter Definitions

- **Filtrate flow rate**

Filtrate flow rate is the rate of the water that passes through the membrane from the feed side to the filtrate side. It is a function of the pressure, and the quality of the feed water. The filtrate flow rate should be set in according to LG Chem's recommended membrane flux.

- **Filtrate flux**

Filtrate flux is the volume of filtered water passing through a unit of membrane surface area in a specified period of time. It is commonly expressed as lmh (Liters of filtered water/m2 of surface area/hour of filtration time), gfd (gallons of filtered water/ft2 of surface area/day of filtration time), or m/d (m3 of filtered water/m2 of surface area/day of filtration time). Appropriate flux selection is one of the most important design and operating considerations. The filtrate flux should be set according to LG Chem's recommendation for your specific application. The flux may be increased or decreased during operation to account for changes in feed water quality, temperature or product water demand.

- **Transmembrane Pressure**

Transmembrane Pressure (TMP) is the pressure difference between the feed and filtrate sides of the membrane. It is commonly measured in units of bar, psi, or kPa. TMP is the driving force for filtration. Most ultrafiltration systems operate at a constant flow rate during filtration. As filtration occurs, solids deposited on the membrane surface will create resistance to filtration causing the TMP to increase. Proper design filtrate flux is necessary to control the rate of TMP increase. Physical and chemical cleaning are required to remove accumulated fouling and reduce TMP. The maximum allowable TMP is 0.15 MPa (22.1 psi).

- **Normalized permeability**

Normalized permeability, or specific flux, is defined as filtrate flux per applied transmembrane pressure (differential pressure) corrected to a specified temperature, typically 20 or 25 degrees Celsius. It is commonly measured in units of lmh/bar or gfd/psi @20 deg C. Normalized permeability is one of the most important parameters used to measure the performance of the membrane system. In a properly designed and operated UF system, the normalized permeability will decrease slowly between cleanings and will return to previous levels after cleaning such that it remains essentially constant over long-term operation.

- **Filtration cycle duration**

The filtration cycle duration is dependent on the quality of the feed water. An appropriate design value should be selected per LG Chem's recommendation. The actual time should be set by testing at site and adjusted according to the changes of the feed water quality during the operation. Typical filtration cycle duration is 20-60 minutes.

To facilitate operation explanation, the following typical P&IDs are provided.

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Feedwater Limiting Conditions

Parameter	Allowed Range	Comments
pH	1 – 10 (NIPS) 1-14 (TIPS)	1—14 allowed during cleaning (TIPS)
Particle Size	≤0.5 mm, ≤0.12 mm for seawater feeds, no sharp particles allowed	To prevent mechanical damage
Oil	≤0.5 mg/L (NIPS) ≤2 mg/L (TIPS)	To prevent membrane fouling
Turbidity	<300 NTU	Contact the sales team if your operating parameters exceed the allowed

CAUTION

This is not an extensive list and does not constitute the only conditions for a valid warranty claim. Refer to your project specific warranty document for all conditions that apply to your warranty

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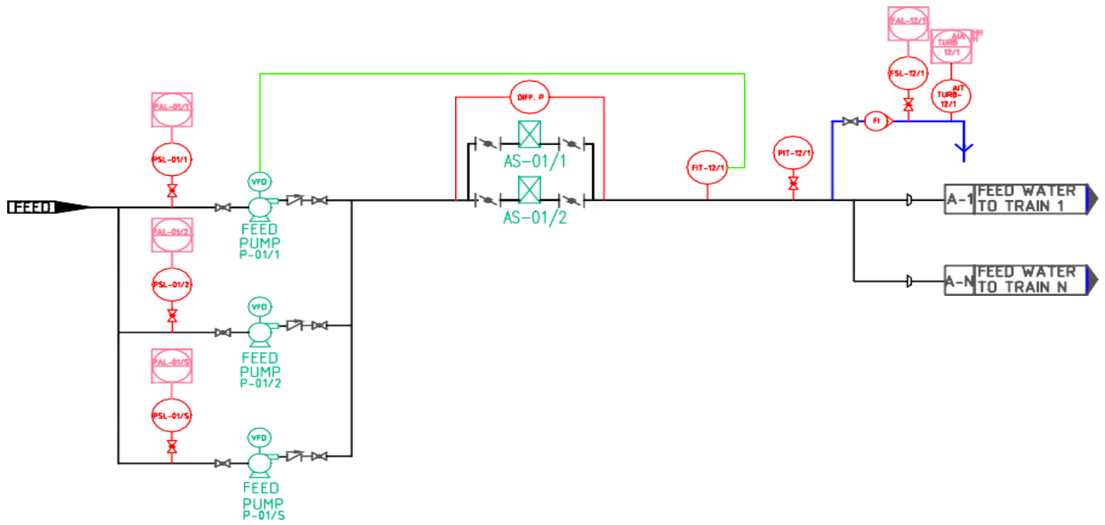
The following P&I Diagrams refer to QuantumFlux Pxxxx-D modules

FEED PUMPING CENTER TO ALL TRAINS

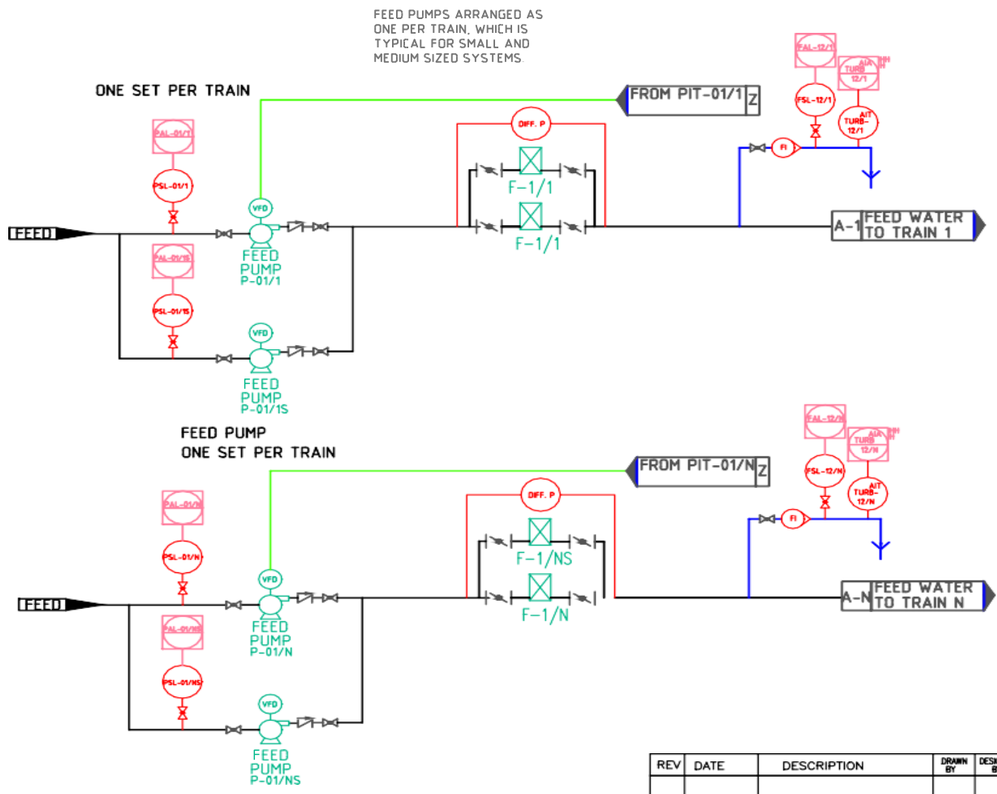
FEED PUMPS ARRANGED IN PARALLEL WITH DISCHARGE TO FEED WATER HEADER, WHICH IS TYPICAL FOR LARGER SYSTEMS.



OR

ONE FEED PUMP PER TRAIN

FEED PUMPS ARRANGED AS ONE PER TRAIN, WHICH IS TYPICAL FOR SMALL AND MEDIUM SIZED SYSTEMS.



REV	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	APPROVED BY
0	12/06/24	Initial Release			

CLIENT

DESCRIPTION: FEED PUMPS

SCALE: NTS

UNIT: NTS

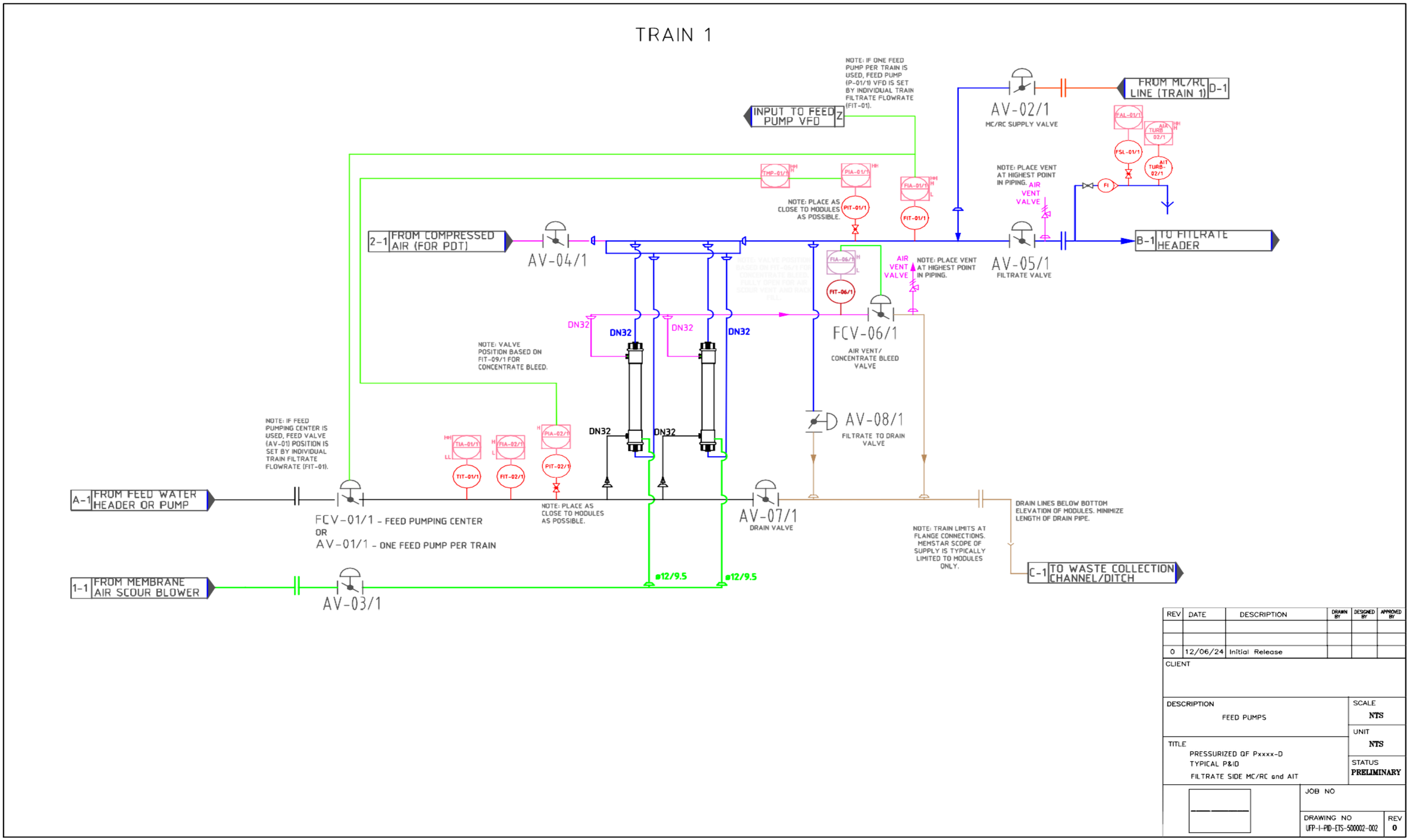
TITLE: PRESSURIZED QF Pxxxx-D
TYPICAL P&ID
FILTRATE SIDE MC/RC and AIT

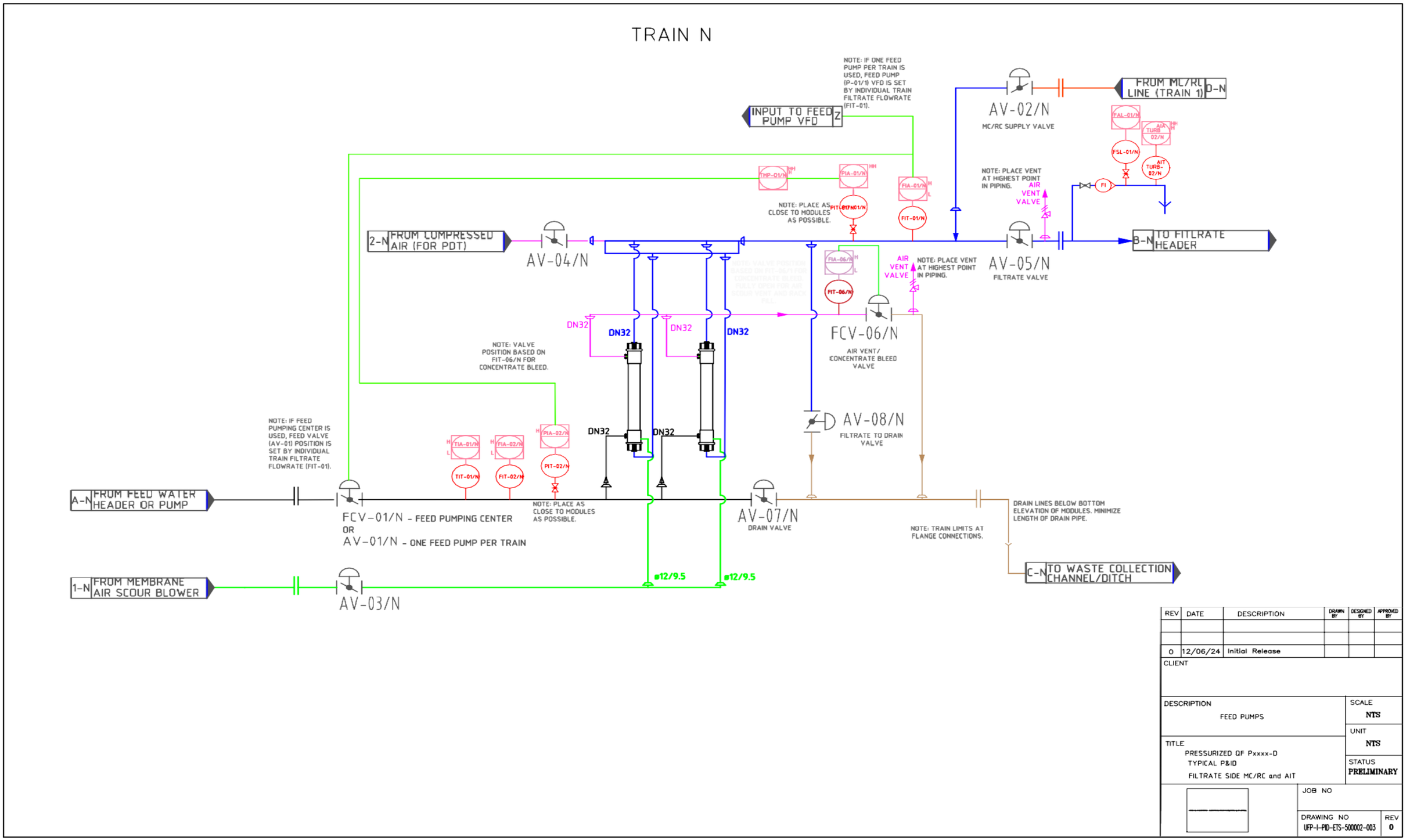
STATUS: PRELIMINARY

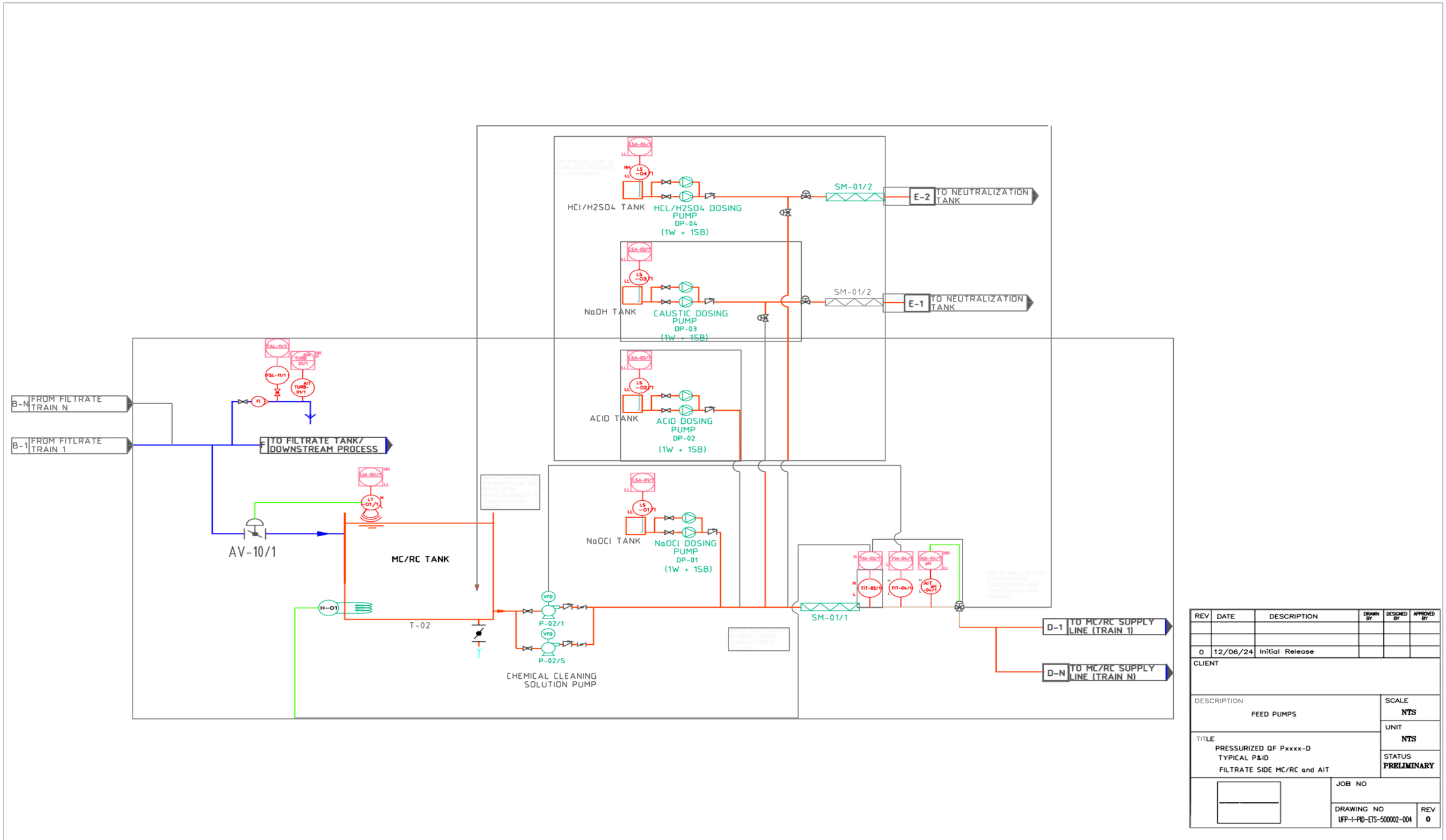
JOB NO

DRAWING NO: UFP-I-PID-ETS-500002-001

REV: 0







REV	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	APPROVED BY
0	12/06/24	Initial Release			

CLIENT

DESCRIPTION
FEED PUMPS

SCALE
NTS

UNIT
NTS

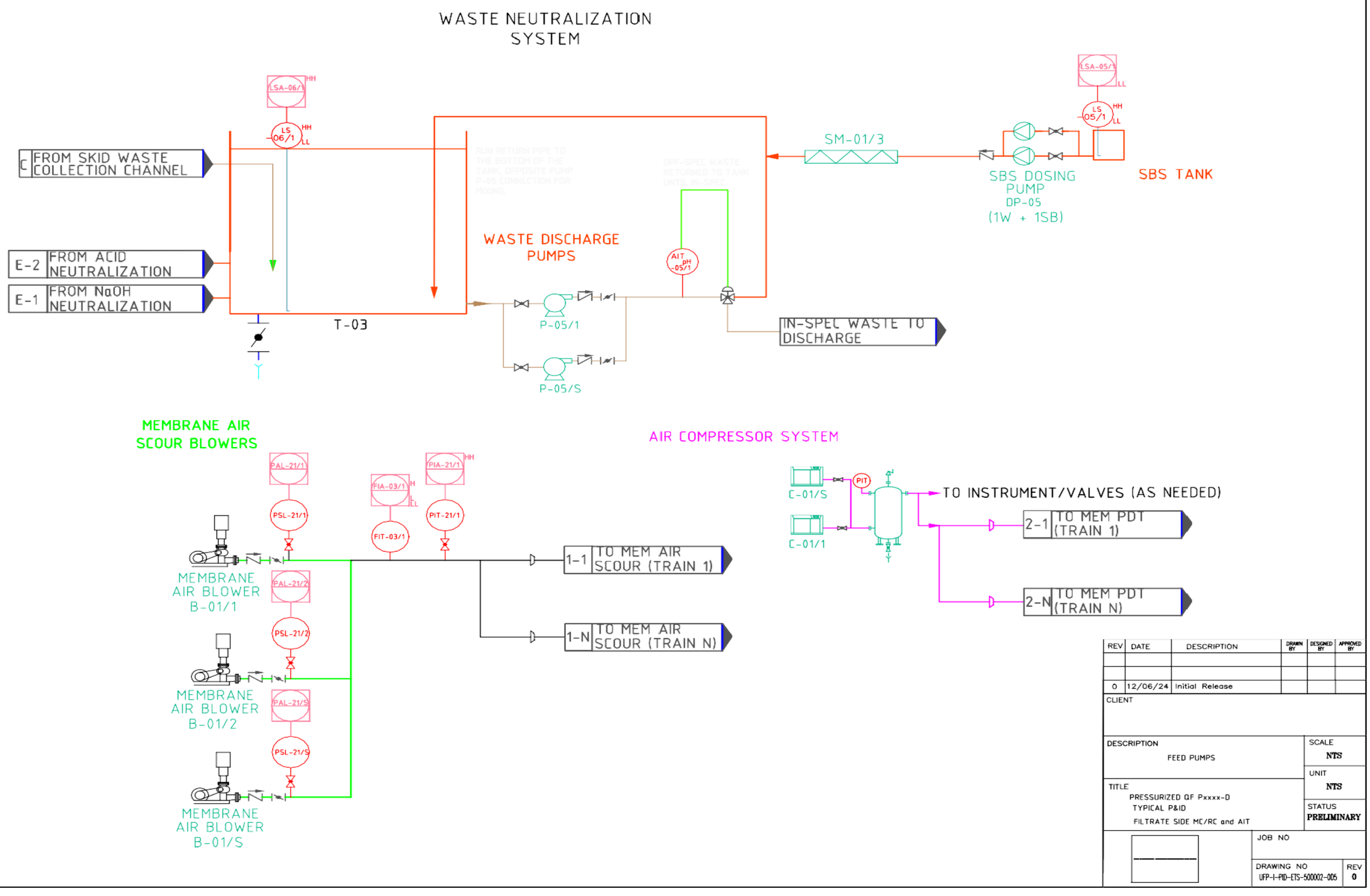
TITLE
PRESSURIZED QF Pxxxx-D
TYPICAL P&ID
FILTRATE SIDE MC/RC and AIT

STATUS
PRELIMINARY

JOB NO

DRAWING NO
UFP-I-PID-ETS-500002-004

REV
0



The following P&I Diagrams refer to QuantumFlux Pxxxx-S modules

FEED PUMPING CENTER TO ALL TRAINS

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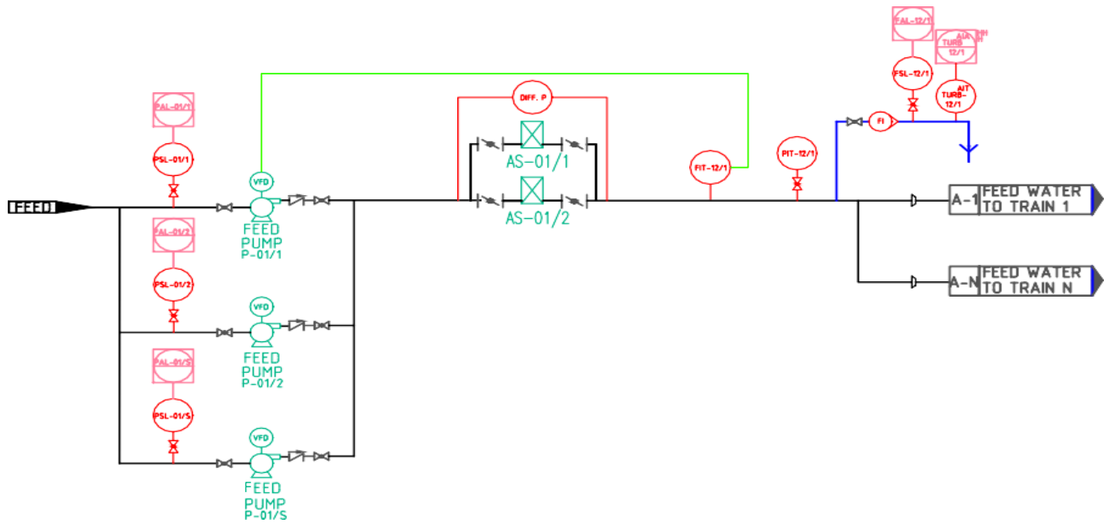


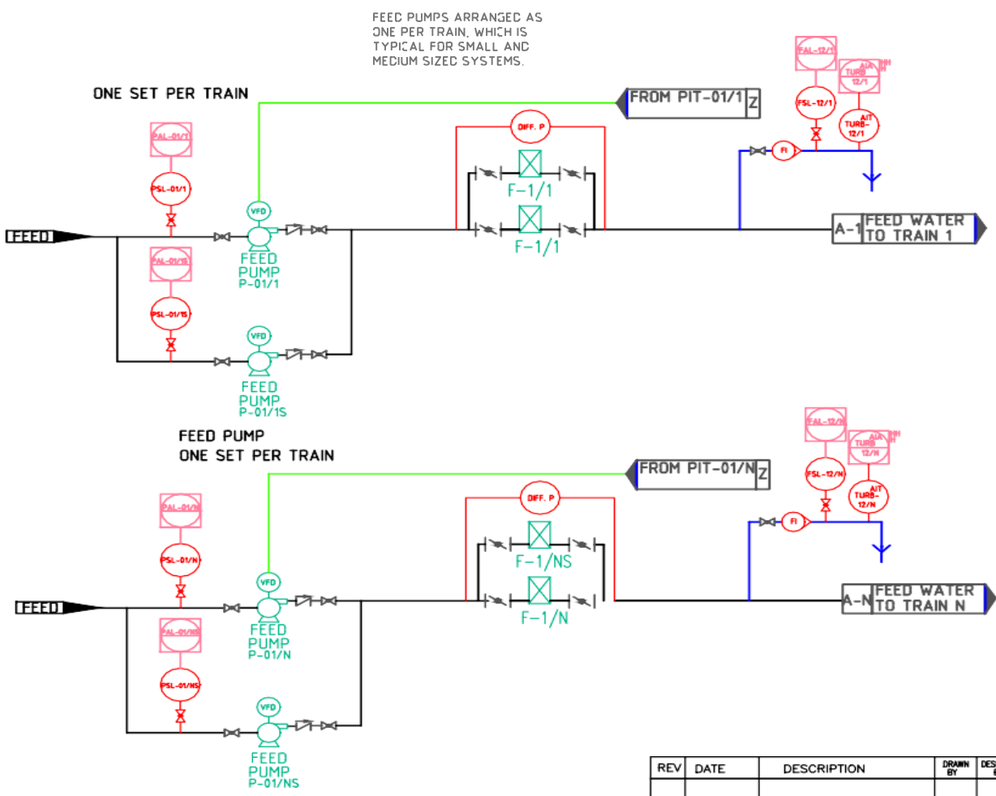
OR

ONE FEED PUMP PER TRAIN

FEED PUMPS ARRANGED AS ONE PER TRAIN, WHICH IS TYPICAL FOR SMALL AND MEDIUM SIZED SYSTEMS.

ONE SET PER TRAIN

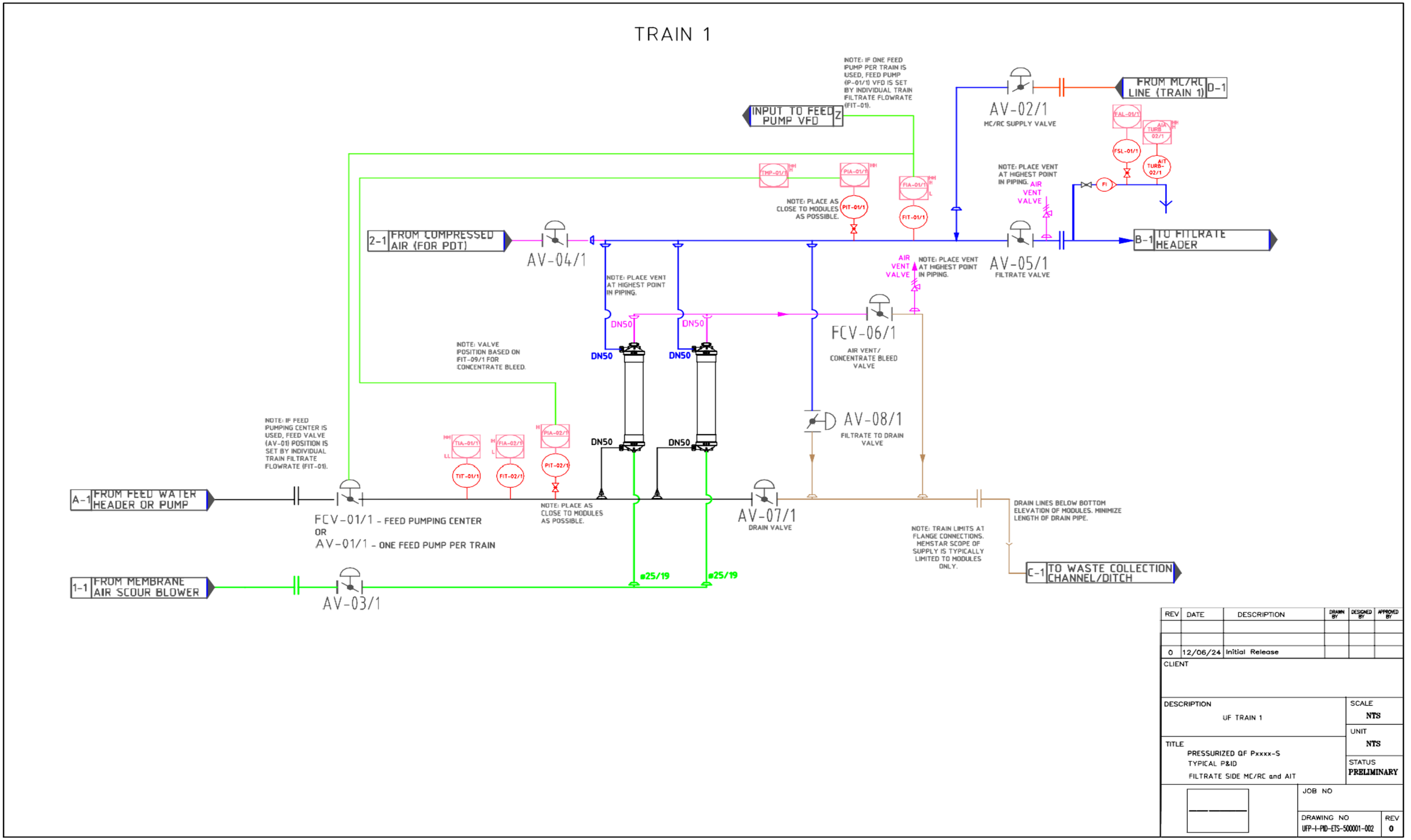
FEED PUMP ONE SET PER TRAIN

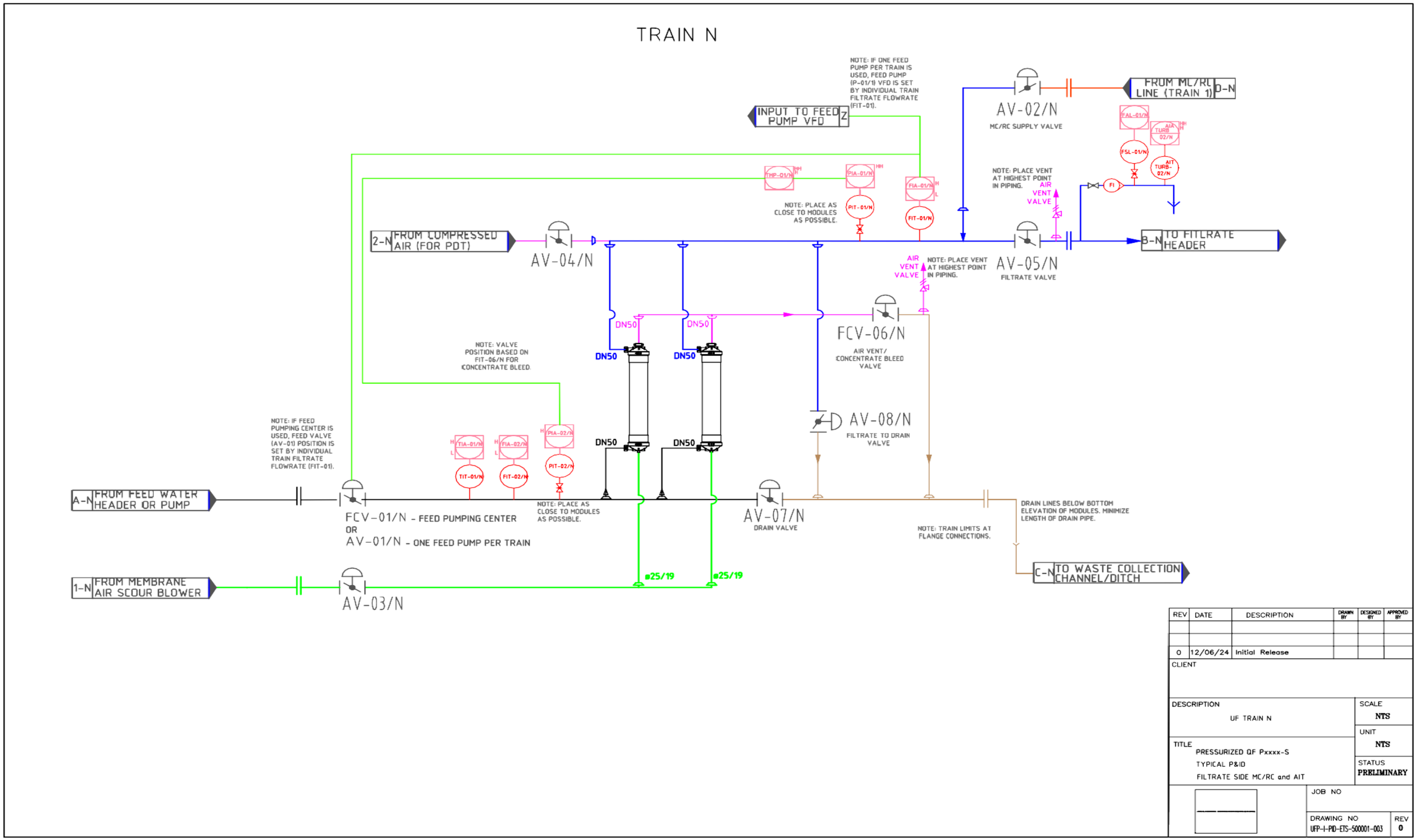


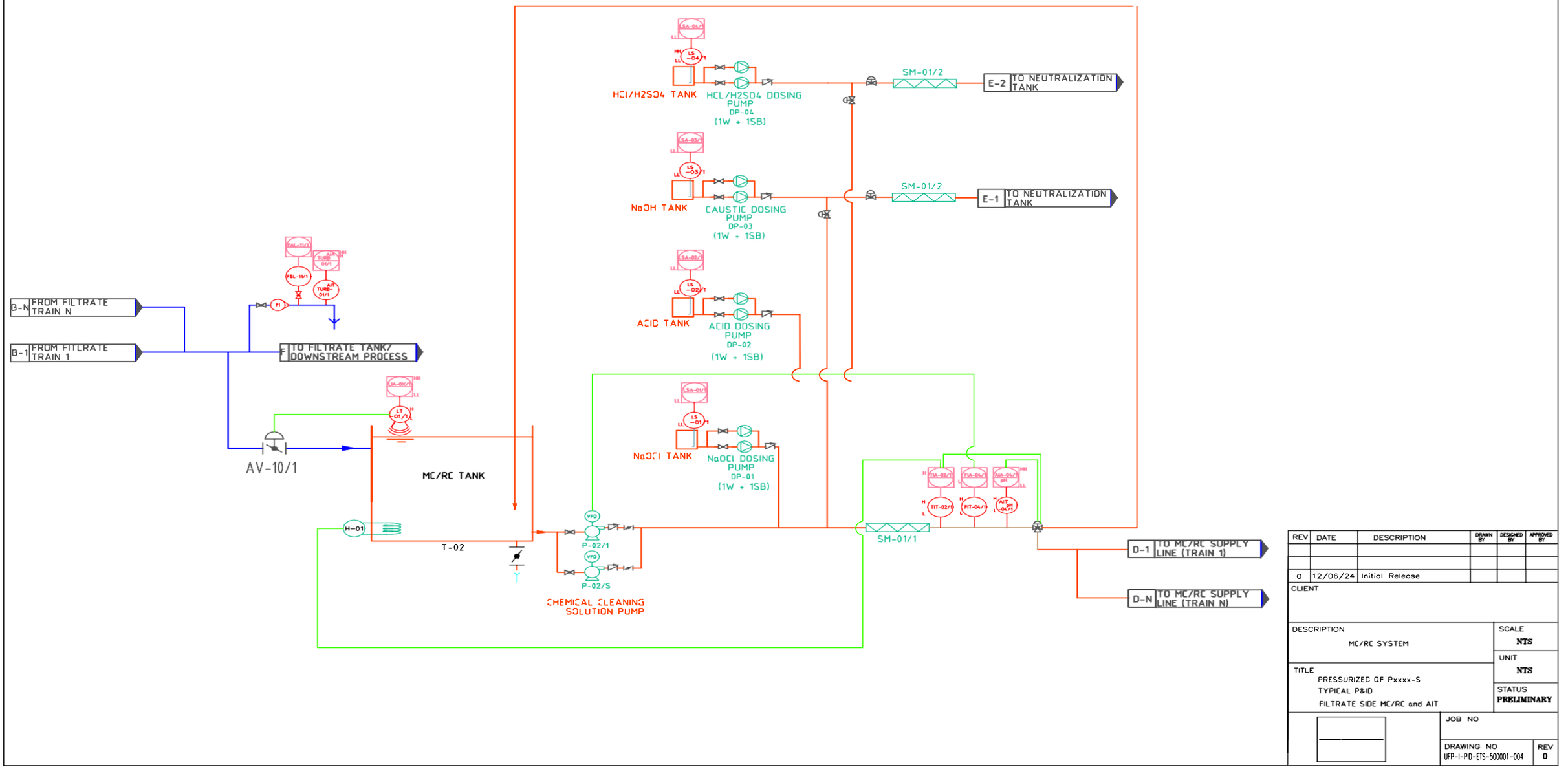
REV	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	APPROVED BY
0	12/06/24	Initial Release			

CLIENT

DESCRIPTION: FEED PUMPS	SCALE: NTS
TITLE: PRESSURIZED QF Pxxxx-S TYPICAL P&ID FILTRATE SIDE MC/RC and AIT	UNIT: NTS STATUS: PRELIMINARY
	JOB NO
	DRAWING NO: UFP-I-PID-ETS-500001-001 / REV: 0







REV	DATE	DESCRIPTION	DRAWN BY	DESIGNED BY	APPROVED BY
0	12/06/24	Initial Release			

CLIENT

DESCRIPTION: MC/RC SYSTEM

SCALE: NTS

UNIT: NTS

TITLE: PRESSURIZED QF Pxxxx-S TYPICAL P&ID FILTRATE SIDE MC/RC and AIT

STATUS: PRELIMINARY

JOB NO

DRAWING NO: UFP-I-PID-ETS-500001-004

REV: 0