

As Built Report Sewage Treatment Plant (STP) Upgrade

6526-460-132-REP-003

In Accordance with Licence 2AM-MEL1631 Part D, item 1 & 2

Prepared by:

Agnico Eagle Mines Limited – Meliadine Division

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DOCUMENT CONTROL

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1 INTRODUCTION

1.1 SITE LOCATION AND ACCESS

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine gold mine located approximately 25 km north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The project site is located on the peninsula between the East, South, and West basins of Meliadine Lake (63°01'23.8"N, 92°13'6.42"W). The area is accessible from the all-weather gravel road linking the Meliadine mine site with Rankin Inlet.

1.2 SITE FACILITIES

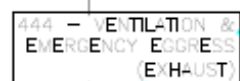
The current mine plan focuses on the development of the Tiriganiaq gold deposit which will be mined using both conventional open-pit and underground mining operations. Current mining facilities to support the Mine include a plant site and accommodations, tailings storage facility, waste rock storage facilities, ore storage pads, process plant, power plant, maintenance facilities, water management treatment plants and supporting infrastructures.

Such infrastructures include water retention dikes, berms, culverts, channels, collection ponds, pumping stations, fresh water intake and water treatment plants are required to manage water during pre-production, operation, and interim mine closure.

To support the camp accommodation, upgrading the current sewage treatment (STP) plant unit was required. The initial sewage treatment plant was able to treat a maximum daily flow of 216 000 L per day (maximum design flow). The upgrade STP equipment is able to handle an additional 83 076 L per day and was approved by Nunavut Water Board (6526-460-132-REP-002).

1.3 PURPOSE OF DOCUMENT

This report includes the As-built construction drawings for the STP upgrade. A general location plan for the STP is shown in Figure 1.



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2 CONSTRUCTION SUMMARY

2.1 PROCESS SUMMURY

The STP relies on bacterial activity. The process is composed of five (5) steps described below (Figure 2):

- flow equalization and screening,
- aerobic biological treatment,
- membrane filtration,
- ultraviolet disinfection,
- and sludge handling/dewatering.

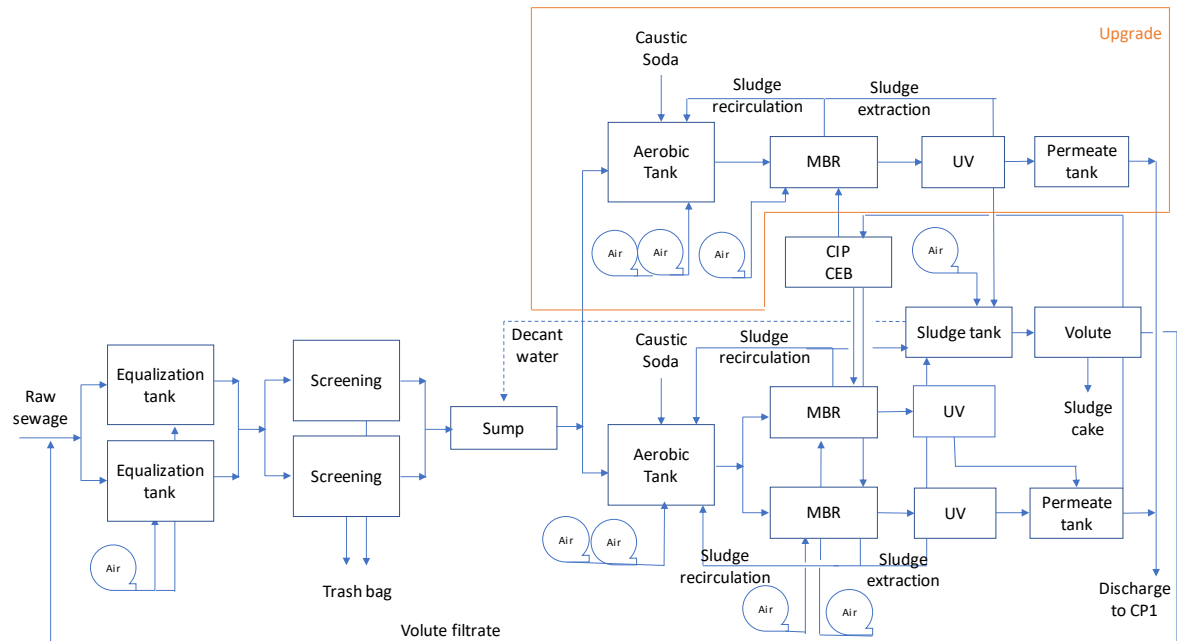


Figure 2: Process Flowsheet

2.2 FLOW EQUALIZATION AND SCREENING

The influent wastewater is pumped to the two (2) aerated equalization tanks. The equalization system is able to manage a variation in flows. It provides raw wastewater storage to store feed during high flow periods and to ensure feed supplementation during low flow periods. It provides a stable and consistent raw feed for the downstream processes. Equalized water is pumped via two (2) equalization pumps into a standpipe inside the second tank and flows from that pipe by gravity to the fine screens. The fine screens are rotary drum screens with 2 mm perforated plate openings that operate continuously. The screens will ensure the removal of large debris to protect downstream equipment. Pressurized wash water is used intermittently to clean the screens and screenings.

2.3 AEROBIC REACTOR

Screened raw water flows by gravity from the screens into the sump tank, where it is pumped to the aerobic tanks, which are located outdoors. Aerobic biological treatment removes the organic load (measured as BOD) of the wastewater. Bacteria grown in the bioreactor remove unwanted organic pollutants to produce a treated water of high quality. Oxygen is supplied by regenerative blowers and is injected by fine bubble diffusers in the tank. The mixed liquor suspended solids (MLSS) overflows into a standpipe inside the tank and flows by gravity to the membrane filtration trains.

The equipment added in the STP upgrade was an aerobic tank with fine bubble diffusor.

2.4 MEMBRANE FILTRATION

Membrane filtration is used to separate the bacteria from the water to ensure keeping them in the process at the desired concentration. Activated sludge is returned at a constant flow rate to the aerobic tank to prevent a build-up of sludge in the membrane tank. The return activated sludge (RAS) is pumped at a higher flow rate than the design flow rate of the plant, to make sure that there is good circulation in the whole system and that there is no accumulation of solids.

An additional sea can with a membrane train and utilities (instrumentation, blower, pumps, UV, CIP tank, sodium hypochlorite system) was added to the current STP system. This allows the filtration area to increase from 900 m² (current system) to 1350 m² (upgraded system).

2.5 UV DISINFECTION

From the permeate pumps, each membrane bioreactor train sends permeate through an inline ultraviolet disinfection system. It is a physical process that inactivates instantaneously microorganisms. From here, effluent is sent to a common permeate storage tank. The permeate tank acts as a reservoir for treated water that is pumped to the discharge location.

2.6 SLUDGE STORAGE AND DEWATERING

Since bacteria continue to reproduce as they consume organics and nutrients, the concentration of biomass, measured as Mixed Liquor Suspended Solids (MLSS), increases with time. Periodic sludge wasting is required to control the MLSS concentration in the bioreactor tanks. Sludge is sent to the sludge storage tank by redirecting the flow of the RAS pump (approximately at 1% solid content).

A Sludge Dewatering System (Volute) system is also available to remove the solid fraction out of the sludge storage tank. Basically, the flocculated sludge pass through a screw press that utilizes a screw inside a moving casing. Water collected during the dewatering is sent back to the STP equalization tank. The cake is then collected in a solid-waste bin for disposal.

2.7 CONSTRUCTION SCHEDULE

The construction was conducted between September 5, 2020 and December 3, 2020.

2.8 FIELD DECISIONS THAT DEVIATE FROM ORIGINAL DESIGN

The deviation from the design report are presented below:

- The Sea can containing the Membrane filtration system was moved parallel to the existing sea can. In the design report, it was located perpendicular to the current sea can location. This relocalisation is within the existing pad and has no impact on the process.
- Piping was installed according to the new location of the new sea can containing the membrane filtration system.

2.9 AS BUILT DRAWING AND PHOTOGRAPHS

As-built documentation is presented in Appendices A to B:

- Photographs.
- General arrangement and P&ID;

Appendix A: Photographs



STP Upgrade extension: new seacan interior.

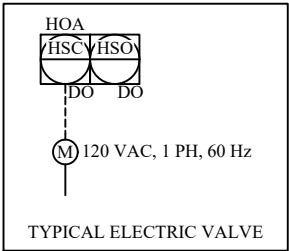
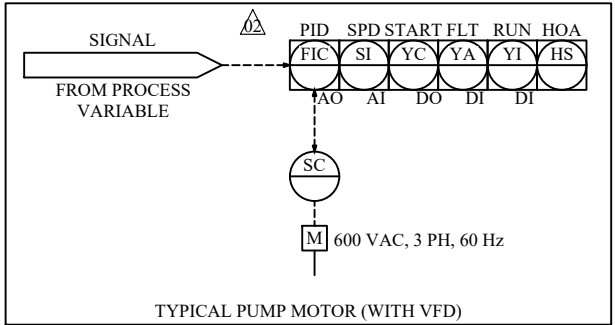
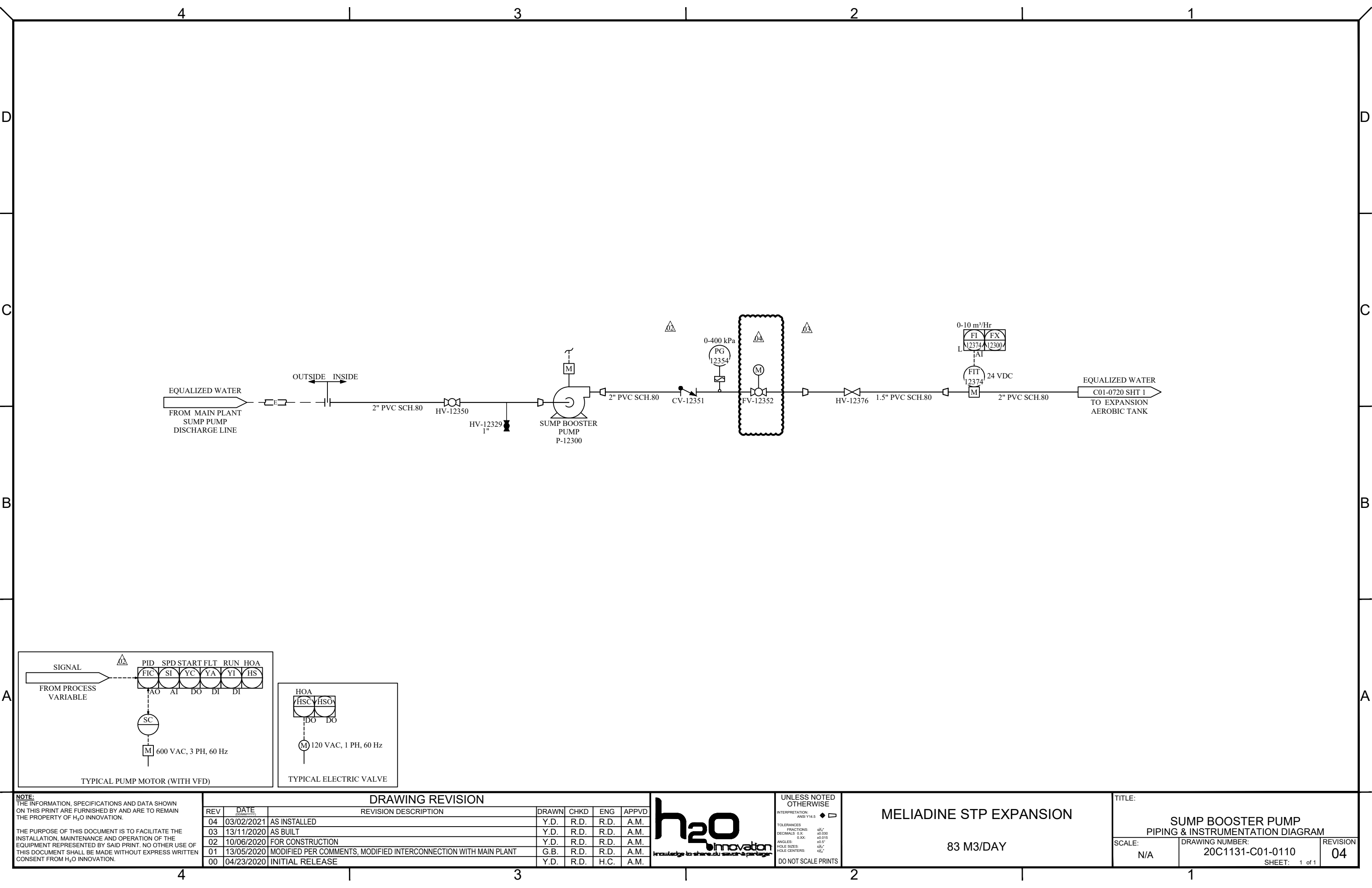


New Seacan and reactor



New Seacan line connection

Appendix B: General arrangement and P&ID



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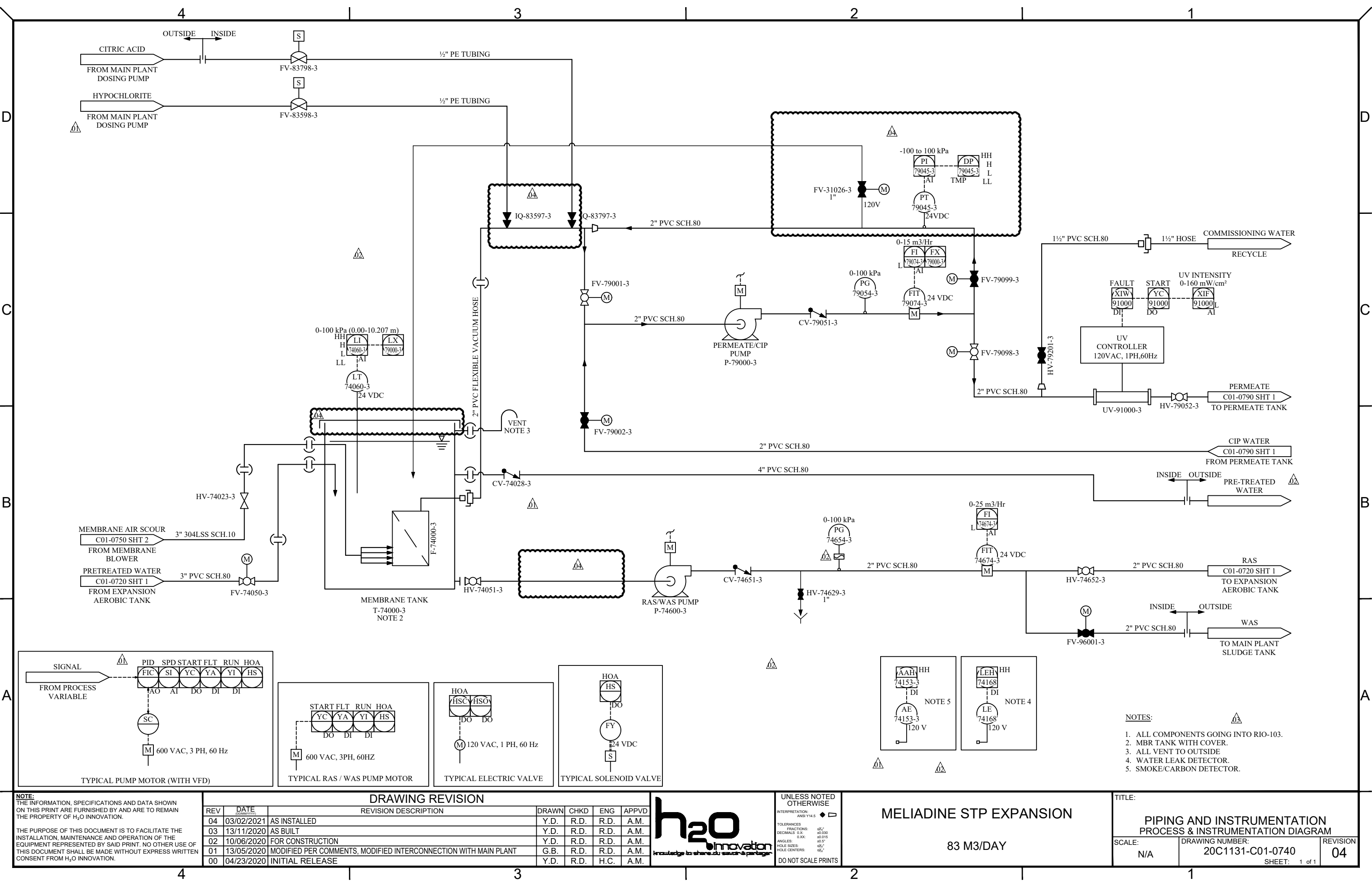
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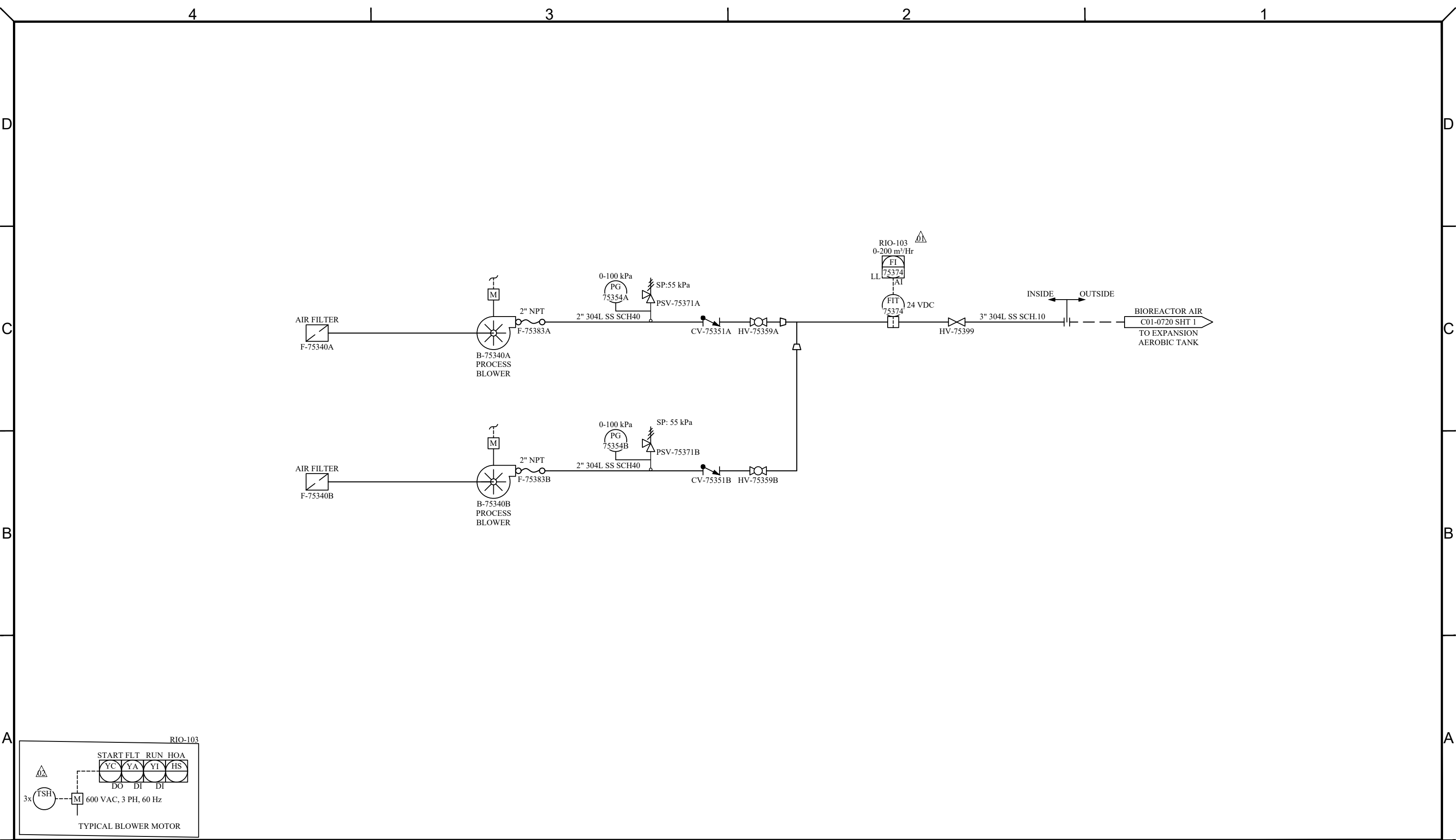
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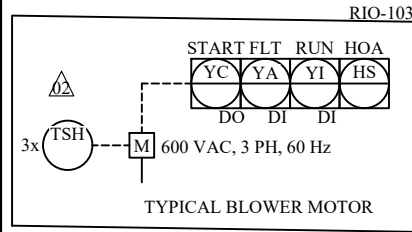
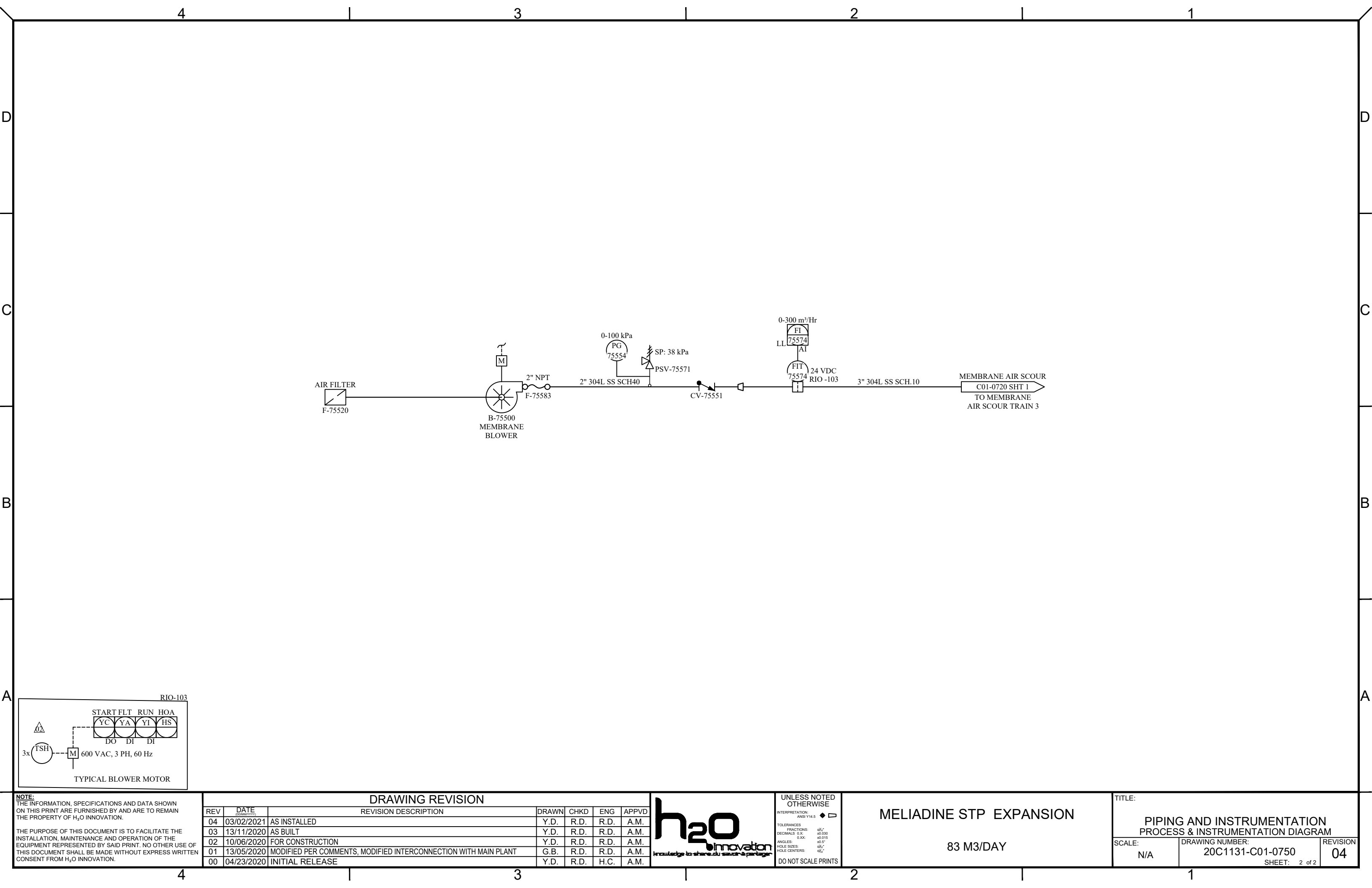
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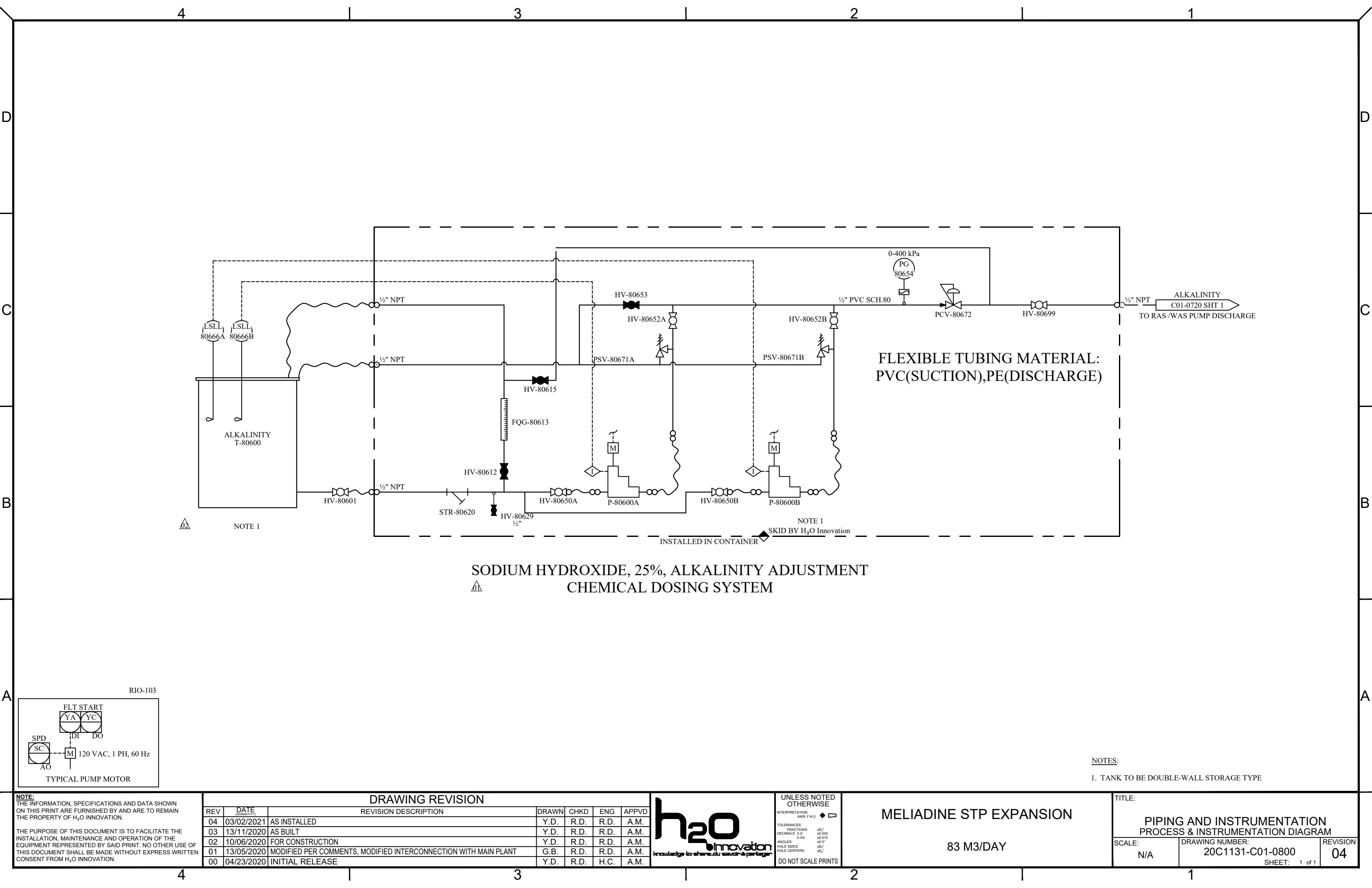
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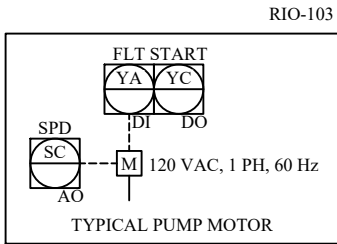
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SODIUM HYDROXIDE, 25%, ALKALINITY ADJUSTMENT
CHEMICAL DOSING SYSTEM



- NOTES:
- 1. TANK TO BE DOUBLE-WALL STORAGE TYPE

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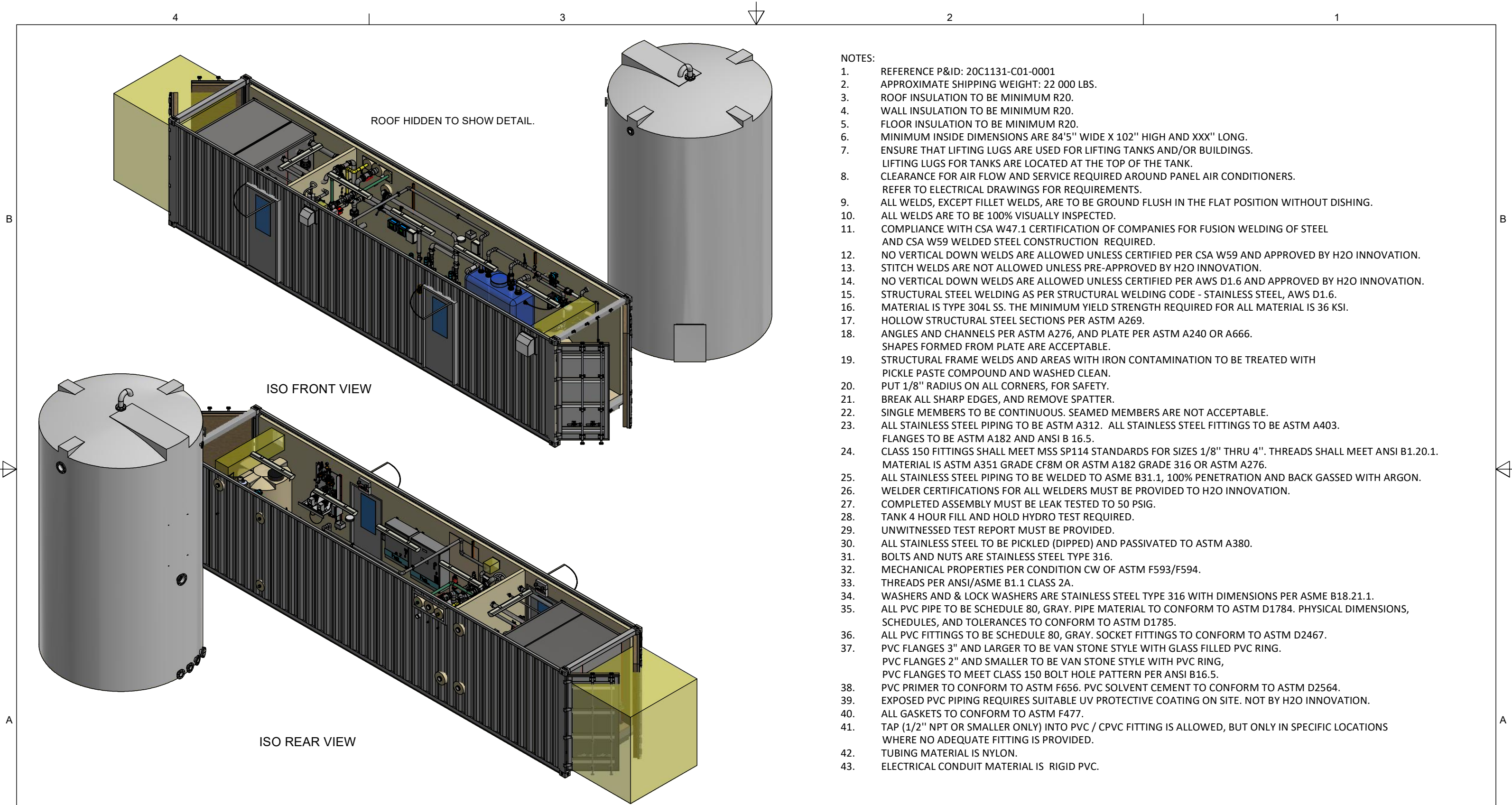
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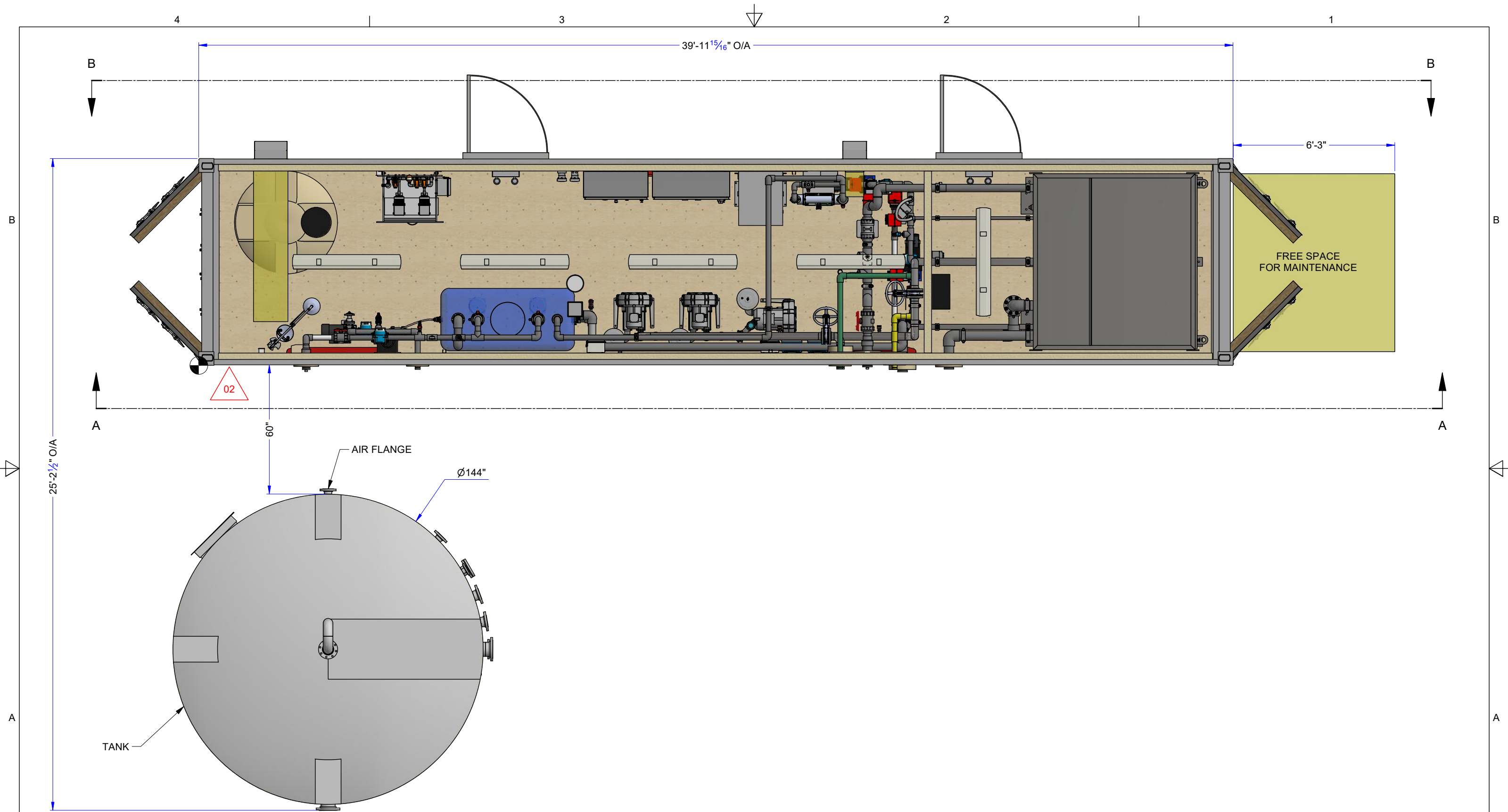
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MELIADINE WW EXPANSION

MELIADINE , NU

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WASTE WATER CONTAINER GENERAL ARRANGEMENT		
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TOP VIEW

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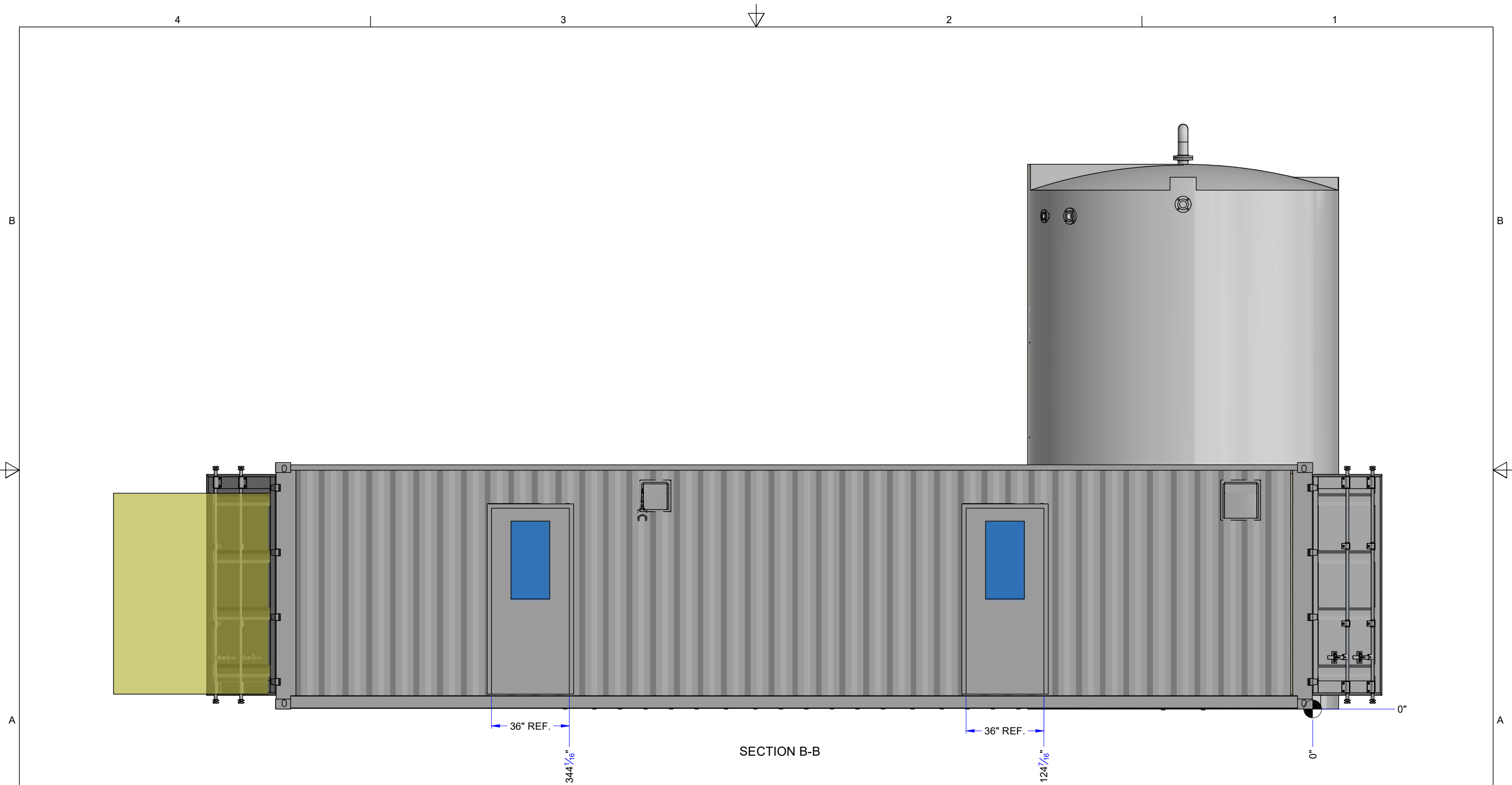
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MELIADINE WW EXPANSION

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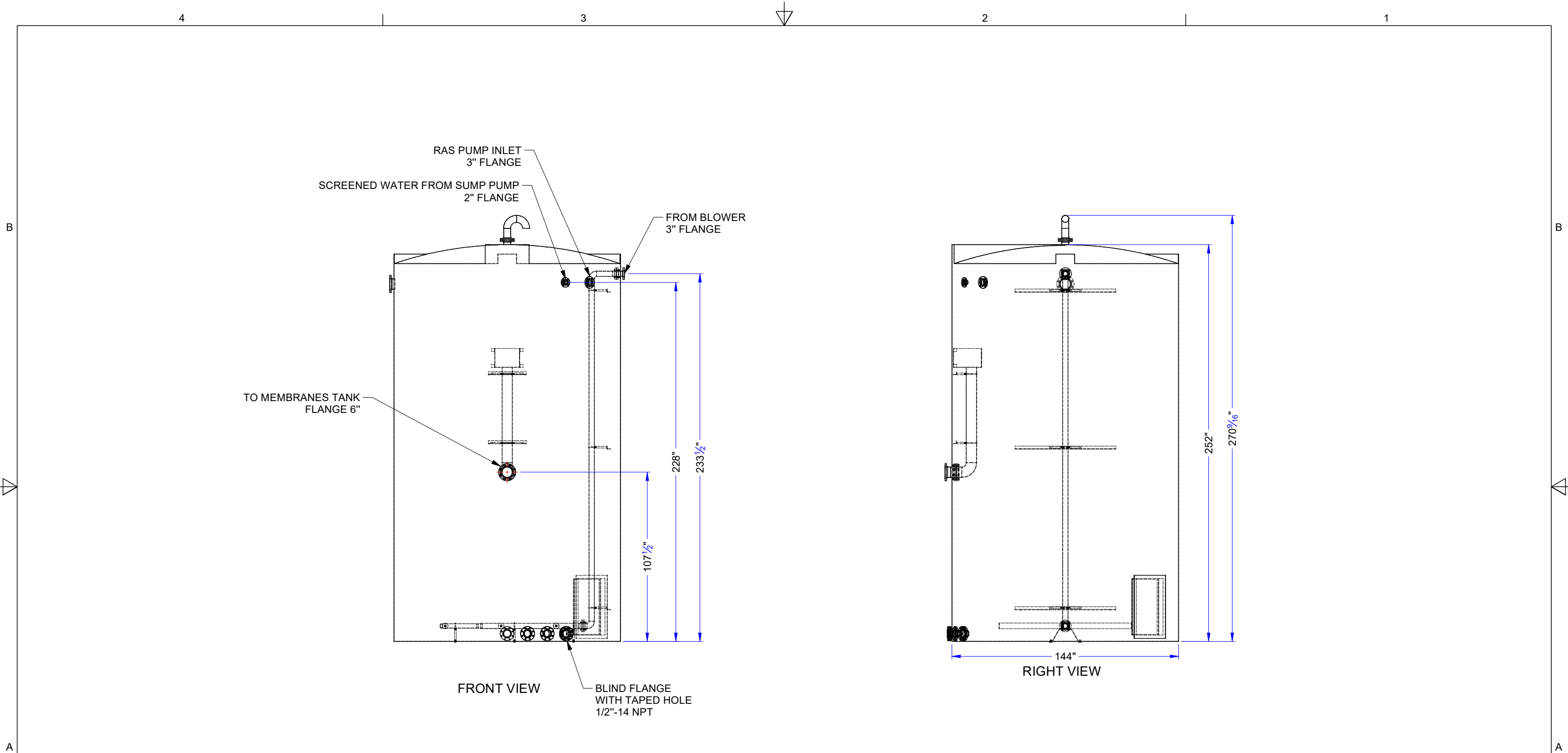
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