1 PROJECT SUMMARY

1.1 CLIENT

UNB Fredericton Campus
Fredericton, NB

1.2 ROLE

Mechanical and Electric Design Engineers, Construction Administration

1.3 PROJECT SCOPE AND ACHIEVEMENTS

The new Kinesiology Building located on the University of New Brunswick Fredericton Campus is a three storey, 68,850 sq. ft. academic and research building which opened in August 2018. The University of New Brunswick has been at the forefront of kinesiology, physical education and recreation since 1957. The University of New Brunswick had a vision of constructing a state of the art Kinesiology facility that will bring students and faculty together like never before. Instead of attending classes all around the campus, UNB's 580 undergraduate and 60 graduate students will take their courses in a central "home," with many more opportunities for collaboration and interaction. The New Kinesiology Building includes research laboratories focused on occupational performance; motor control and learning; cardio-metabolic health; and a center for recreation and sport in society; all specifically designed to maximize cross-disciplinary study. The new Kinesiology Building is linked to the Richard J. Currie Centre.

MCW Maricor were the mechanical and electrical design engineers on the project. MCW Maricor worked closely with the Design Team and the University of New Brunswick to achieve the unique and aggressive energy targets for the facility, while maximizing the user experience and indoor environment. The building is designed and built to achieve a Gold certification from LEED (Leadership in Energy and Environmental Design), which requires sustainable site development, water savings, energy efficiency, appropriate materials selection and indoor environmental quality. The building is also targeted at achieving Silver certification from the International WELL Building Institute, which if achieved, would make it the ***first WELL Pilot for Educational Facilities certified building in the world.*** WELL certification is based on eight concepts that include light, fitness, physical and psychological comfort, and a built environment that reflects the values of the Faculty.

Design and construction was fast-tracked, as a Federal Government funding program required design to substantial completion in 20 months.

Sustainable features include:

- Currie Center integration and thermal storage;
- Heat wheel energy recovery;
- Rain water harvesting;
- Daylight harvesting;
- LED Lighting; and
- Underground earth tubes for fresh air preheat/precool;
- Natural ventilation;
- Demand control strategies;
- Displacement ventilation;
- Green Roof

1.4 COMPLETION DATE:

August 2018

2 PROJECT HIGHLIGHTS

2.1 Q.1 – INNOVATION

The University of New Brunswick had a vision of constructing a state of the art Kinesiology facility that will bring students and faculty together like never before. The facility will be a leader in Kinesiology as well as energy efficiency. The facility set high energy efficiency targets with LEED (Leadership in Energy and Environmental Design) gold and WELL certification targeted and silver certification from the International WELL Building Institute. UNB has a long history of implementing energy efficient solutions within its buildings and the goal for this facility was to exceed the environmental performance standard for any comparable facility and better position UNB apart from other competing institutions.

The new Kinesiology Building at the UNB Fredericton Campus had high energy/water conservation targets outlined. The many innovative features to achieve the targets outlined had to fit within the existing site (constructed on a hill), be constructible within a 20 month window and maintain the budget outlined for the facility. The use of REVIT BIM software for coordination of the above and below slab services was crucial in delivery of the project.

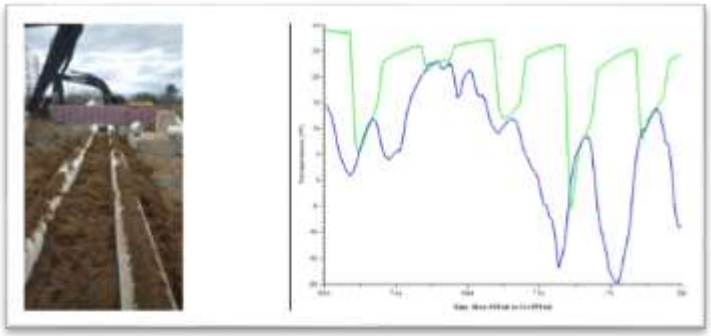
A breakdown of the technical and innovative features utilized at the new facility is outlined below:

Currie center integration and thermal storage;

All of the heating and cooling energy is fed from the existing thermal capacity with the infrastructure at the Currie Centre. Two 10,000 gallon thermal storage tanks were installed to permit energy sharing between buildings. High demand activities in the Currie Center such as large spectator venues can provide heating to the new Kinesiology building and permit “free heat” to be utilized by both facilities. Energy removed from the dehumidification process can also be re-used through a heat recovery chiller to maintain optimal humidity and temperature set points within the facility without increasing the energy expenditure.

Underground earth tubes for fresh air preheat/precool;

All of the fresh air for the building is brought in through an underground network of ventilation ducts called ‘earth tubes’. These pipes are buried below the frost line where the temperature remains relatively constant throughout the year. This pre-conditioning process works for both heating and cooling the air inside the building. As the air passes through the earth tubes, a geo-exchange occurs between the relatively constant underground temperature and the varying outdoor air temperature. The result is a relatively constant entering air temperature to the facility throughout the varying outdoor air conditions.



Heat wheel energy recovery;

In the Kinesiology Building, enthalpy energy recovery wheels are used to adjust air temperatures for heating and cooling the entire building. The combination of the earth tubes, which draw air in from the outside through an underground duct network, and the energy recovery wheel virtually eliminate the need for any fresh air conditioning for the facility, which is the facilities largest thermal load.

Natural ventilation;

The Kinesiology building has a large atrium through the center, which interconnects the 3 floors of the building. The open atrium in the Kinesiology Building and its associated height were utilized to provide natural ventilation when outdoor air conditions permit. The highest windows of the atrium pull open to permit the warm air up rising through atrium to provide natural exhaust. A combination of both manual and automatic windows is also opened to provide fresh air to the building when conditions are optimal. The ventilation systems are shut down during this time.

Rain water harvesting;

Rain water is collected to be used as a non-potable source for uses such as toilet flushing, urinals, fill systems, trap primers, and irrigation. Rainwater is collected from the entire rooftop of the Kinesiology Building and stored underground in a 41,600-litre storage tank. This water is then pumped into the building with variable speed pumps for the non-potable uses.

Demand control strategies;

All lighting and heating, ventilation and air conditioning (HVAC) in the Kinesiology Building is controlled by one system, allowing us to fine-tune spaces to suit occupancy needs and maximize energy efficiency. A great example of this is the automatic light sensors that turn on and off as occupants enter areas within the building, which also permits the fresh air to be enabled/disabled for the same space. Once enabled through the system, lighting and ventilation will automatically be controlled to meet the current space demand.

Daylight harvesting;

Daylight harvesting was used to further increase the building's energy efficiency. Daylight sensors control the first two rows of lighting adjacent to the windows in large spaces and classrooms. The two rows are dimmed down or turned completely off if natural sunlight provides adequate lighting levels in the space.

Displacement ventilation;

Displacement Ventilation cooling uses a low-velocity stream of moderately cooled air introduced via diffusers located in the stair risers of the central teaching auditorium. The cooler, slow-moving air slowly spreads over the floor and displaces the warmer, stale air toward the ceiling, where it leaves the room. This ventilation method provides direct conditioning of the occupant, reducing fan power, reducing the ventilation requirements and providing optimal comfort to the occupants.

LED Lighting; and

Occupancy and daylight harvesting sensors are installed in the Kinesiology Building to reduce unnecessary lighting. When lights are required, the building's lights provide the best lighting quality with the lowest possible electrical demand. LED lighting has been utilized throughout.

Vegetative Roof

A vegetative roof or living roof is a roof of a building that is partially or completely covered with vegetation. Vegetative roofs serve several purposes for a building, such as absorbing rainwater, providing insulation, and decreasing stress of the people utilizing the building by providing aesthetically pleasing landscape for them to enjoy. The green roof operates in conjunction with the rainwater harvesting system to control flow and maximize filtration efficiency.

2.2 Q.2 – COMPLEXITY

The new Kinesiology Building at the UNB Fredericton Campus had high energy/water conservation targets outlined. The many innovative features to achieve the targets outlined had to fit within the existing site (constructed on a hill), be constructible within a 20 month window and maintain the budget outlined for the facility. The use of REVIT BIM software for coordination of the above and below slab services was crucial in delivery of the project.

The facility was built into a hill on campus, having ground level exit to grade on the north side of the building and level 3 exits to grade on the south side of the building. With the premium space at the front of the building allocated to teaching and lab space for access to the natural light, the mechanical service spaces were positioned at the rear of the building, well below grade. Given the structural requirements for the site being imbedded into a hill, REVIT Building Information Modeling (BIM) software was utilized to coordinate the innovative features utilized within the building and physical constraints/natural attributes offered by the site. Given the fast track schedule, the BIM software played a key part in on-site conflict resolution and quick and clear turnaround on contractor queries to maintain the schedule. Regular construction meetings were held where MCW, in conjunction with Bird Construction, reviewed the areas of work, on site in the job construction trailer, for implementation that week in order to maintain schedule and make the execution plan clear.

Given the location below grade, all of the fresh air was brought into the building through a network of underground ducts that allow for a geo-exchange of energy, providing preheating and precooling to the outdoor air. Coupled with natural ventilation through an open atrium within the facility, the system permits pre-cooling, pre-heating and free cooling during the spring and fall seasons. To further enhance the buildings performance and conservation initiatives, other unique solutions were implemented which include chiller heat recovery and building interconnection, heat wheels for final heating/cooling of the outdoor air, rain water collection for all of the facilities non-potable water demands, demand control ventilation/demand control lighting, displacement ventilation and a green roof implementation.

2.3 Q.3 – SOCIAL AND/OR ECONOMIC BENEFITS

Kinesiology addresses physiological, biomechanical, and psychological mechanisms of movement. Applications of kinesiology to human health include biomechanics and orthopedics; strength and conditioning; sport psychology; rehabilitation and occupational therapy; and sport and exercise.

This new Kinesiology Facility will create a nationally significant research cluster focused on health, wellness, physical fitness and health promotion that will establish New Brunswick as a leader in preventative health care. The state of the art facility focuses on healthy living and promotes healthy living to both the students and the community alike. Not only do the students have exposure to facility and healthy living practices to share with the public upon their graduation, the community also has access to the facility. One main way the community will be strengthened is through features such as the community teaching kitchen where healthy eating would be discussed and preparation displayed for the users use day to day.

The engineering and design of the building greatly contributes to the learning environment and is an example of engineering impacting the quality of life. Building design affects not only the building operation, but occupant behavior as well. With the addition of many spaces that encourage social interaction and collaboration, with the benefits of natural light and ventilation, the building design and systems can have a positive impact on occupant behavior. With the addition of the WELL Building Standard, the Faculty of kinesiology is fully able to “Walk the walk” and be leaders in the promotion of wellness and healthy living.

2.4 Q.4 – ENVIRONMENTAL BENEFITS

With the construction of this new facility, UNB has continued with its commitment to reduce energy use and GHG emissions while increasing energy efficiency. This project has been registered for LEED and is currently on track for Gold, the first LEED building on the Fredericton Campus. In addition, this project is also registered with WELL and is on target for a Silver Certification. The decision to pursue WELL for this project was a simple one as the guiding principles for this program align so closely with the goals and mission of the Faculty. Following the WELL Building Standard ensures that the Faculty will not only educate people on the benefits of wellness and healthy living, but also put these principals into practice in their daily operations.

To achieve the strict energy reduction targets many sustainable features were utilized, which include:

• Currie Center integration and thermal storage;	• Underground earth tubes for fresh air preheat/precool;
• Heat wheel energy recovery;	• Natural ventilation;
• Rain water harvesting;	• Demand control strategies;
• Daylight harvesting;	• Displacement ventilation;
• LED Lighting; and	• Green Roof

The facility has reduced its energy usage by over 40% as compared to a reference building of the same type and function. As a result, the facility is a leading example for other institutions and the community for energy efficiency and sustainability. All of the innovative features are on display through large signage installed throughout the building that describe and show instantaneous data on the innovative systems installed.

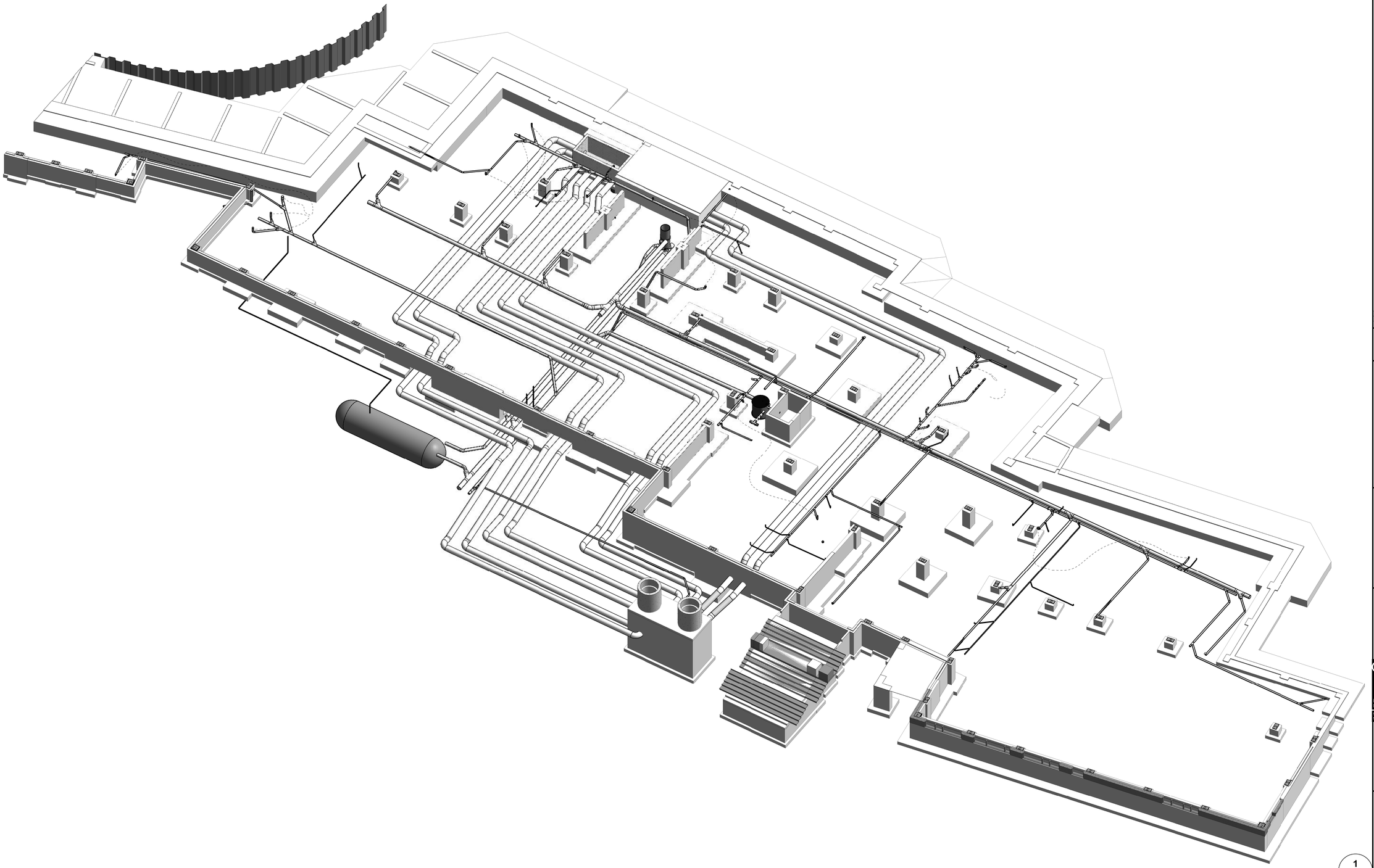
2.5 Q.5 – MEETING CLIENT'S NEEDS

The University of New Brunswick had a vision of constructing a state of the art Kinesiology facility that will bring students and faculty together like never before. The new facility will be home to UNB's 580 undergraduate and 60 graduate students studying in the field, with a direct focus on collaboration and interaction.

The facility also had high energy efficiency targets with LEED (Leadership in Energy and Environmental Design) gold and WELL certification targeted and silver certification from the International WELL Building Institute.

To maximize the efficiency of the facility and stay in tune with the facilities requirements, many innovative features were utilized to fit within the design constraints. All of the fresh air was brought into the building through a network of underground ducts that allow for a geo-exchange of energy, providing preheating and precooling to the outdoor air. Coupled with natural ventilation through an open atrium within the facility, the system permits pre-cooling, pre-heating and free cooling during the spring and fall seasons. To further enhance the buildings performance and conservation initiatives, other unique solutions were implemented which include chiller heat recovery and building interconnection, heat wheels for final heating/cooling of the outdoor air, rain water collection for all of the facilities non-potable water demands, demand control ventilation/demand control lighting, displacement ventilation and a green roof implementation.

The facility is on track for LEED Gold certification and WELL Silver certification. The building will be the first WELL certified facility under the education program in North America.



UnderGround Piping

1
M-002

UNB
EST. 1785
Fredericton

NO.	REVISION	DATE
B	ISSUED FOR CONSTRUCTION	02/22/17
A	ISSUED FOR TENDER	01/26/17

A DETAIL NUMBER
B REFERENCE DWG NO.
C DETAIL DWG NO.

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TENDER PACKAGE #2
FOUNDATIONS & STRUCTURAL STEEL

CENTRE FOR HEALTHY LIVING
UNB FREDERICTON, NB

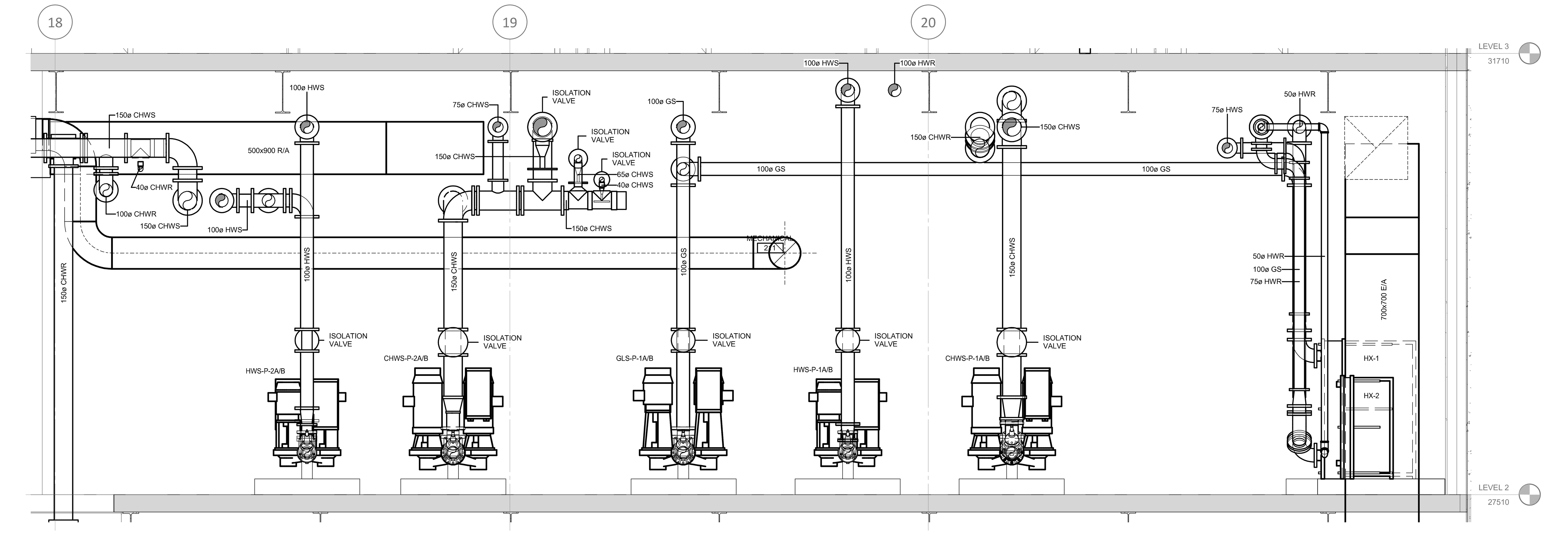
EARTH TUBE - 3D VIEW

February 22, 2017

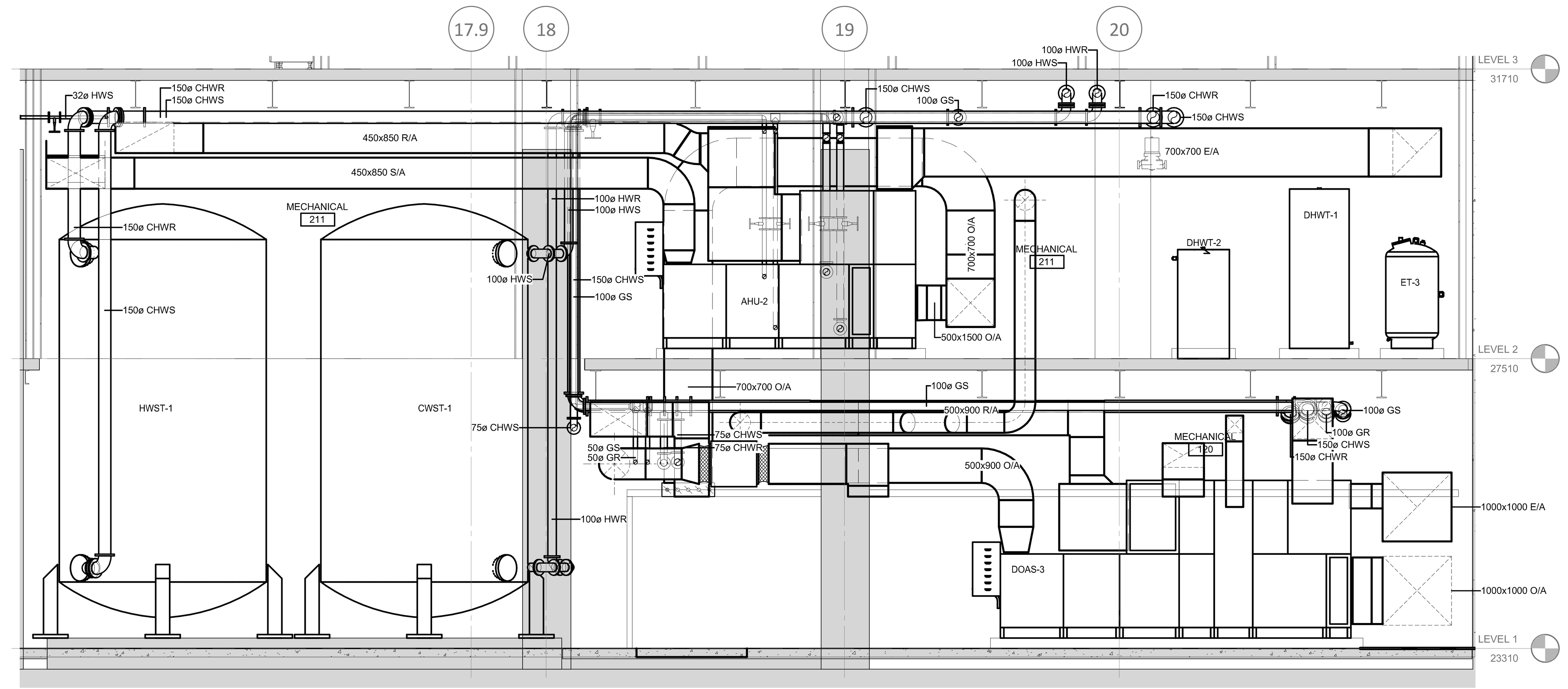
11-16-236

M-002

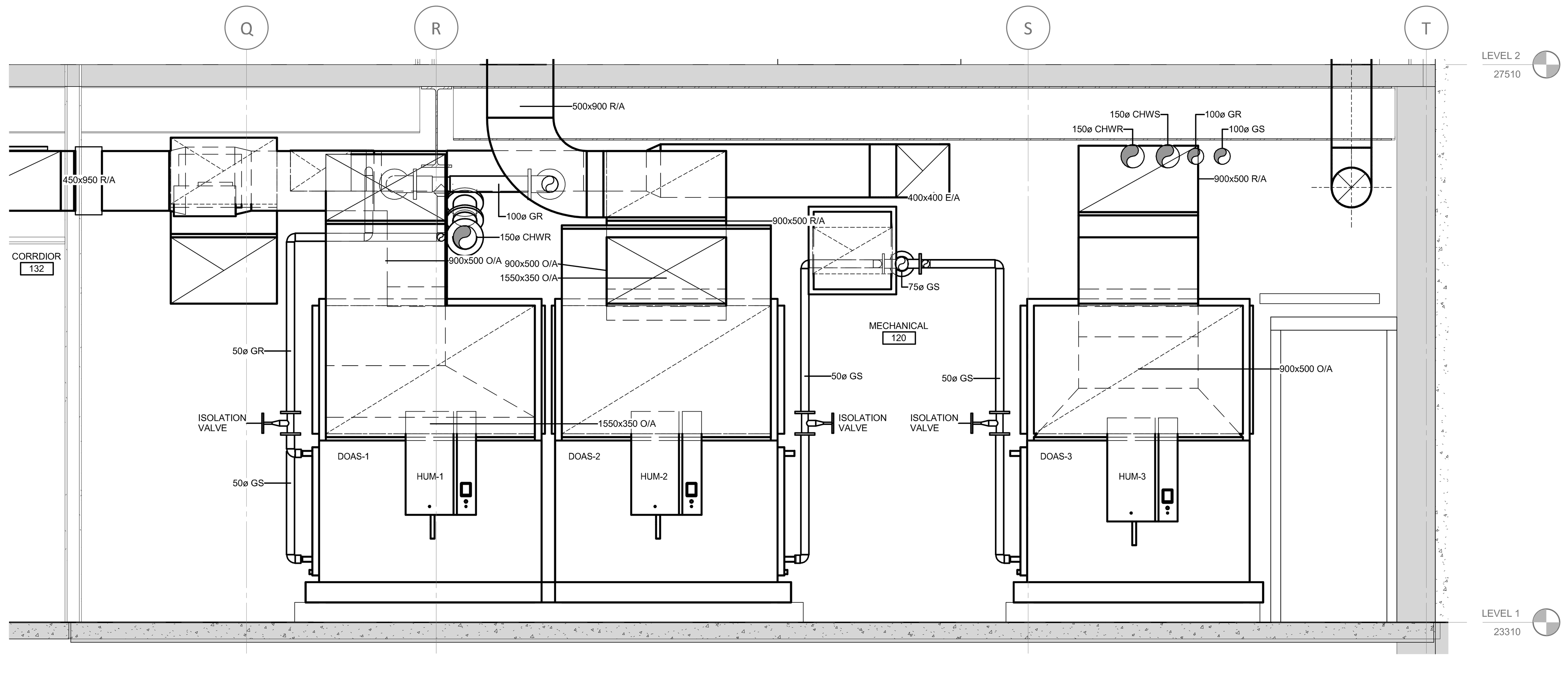
PLOT DATE: 2/22/2017 11:33:45 AM



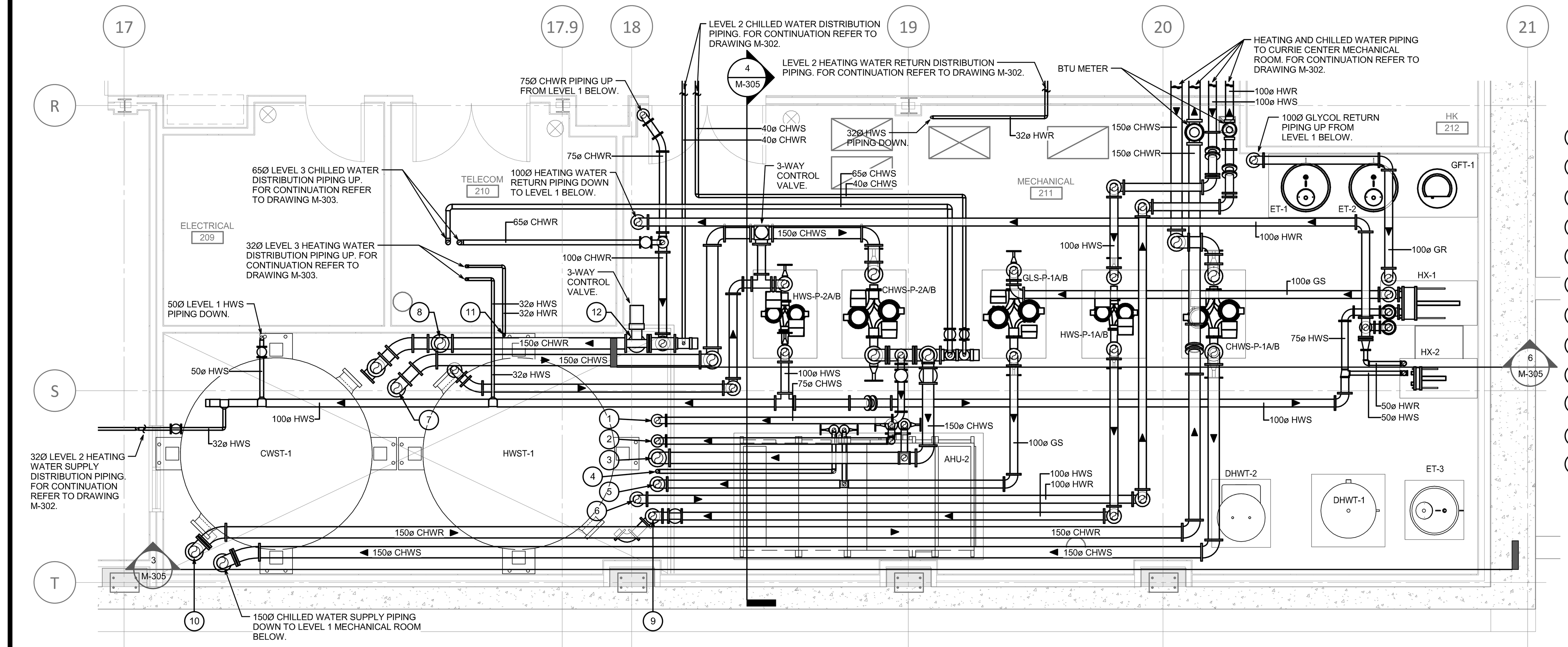
MECH ROOM LEVEL 2 SECTION D 1 : 25 — 6 / M-305



MECH ROOM SECTION A 1 : 50 — 3 / M-305



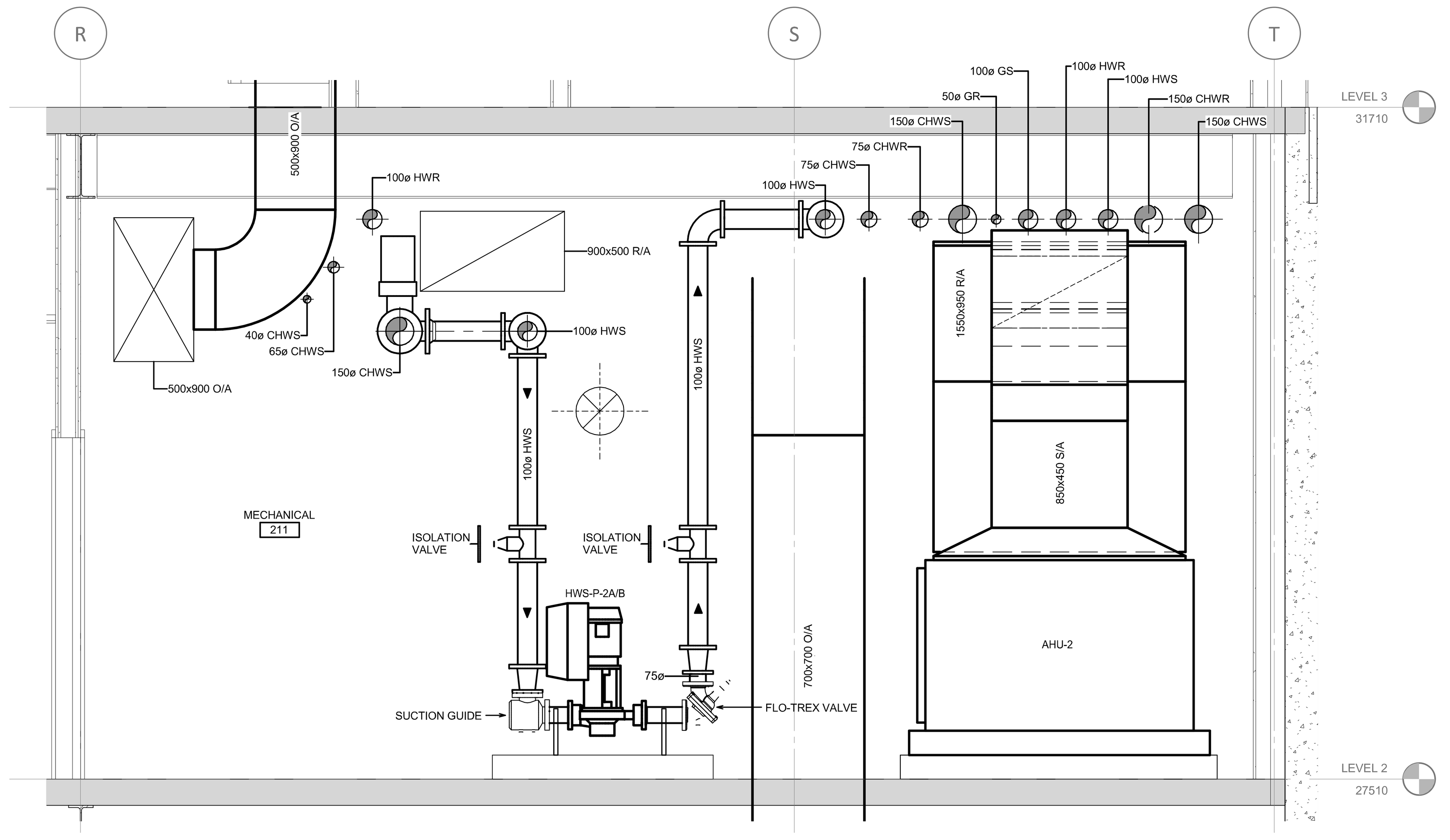
MECH ROOM LEVEL 1 SECTION C 1 : 25 — 5 / M-305



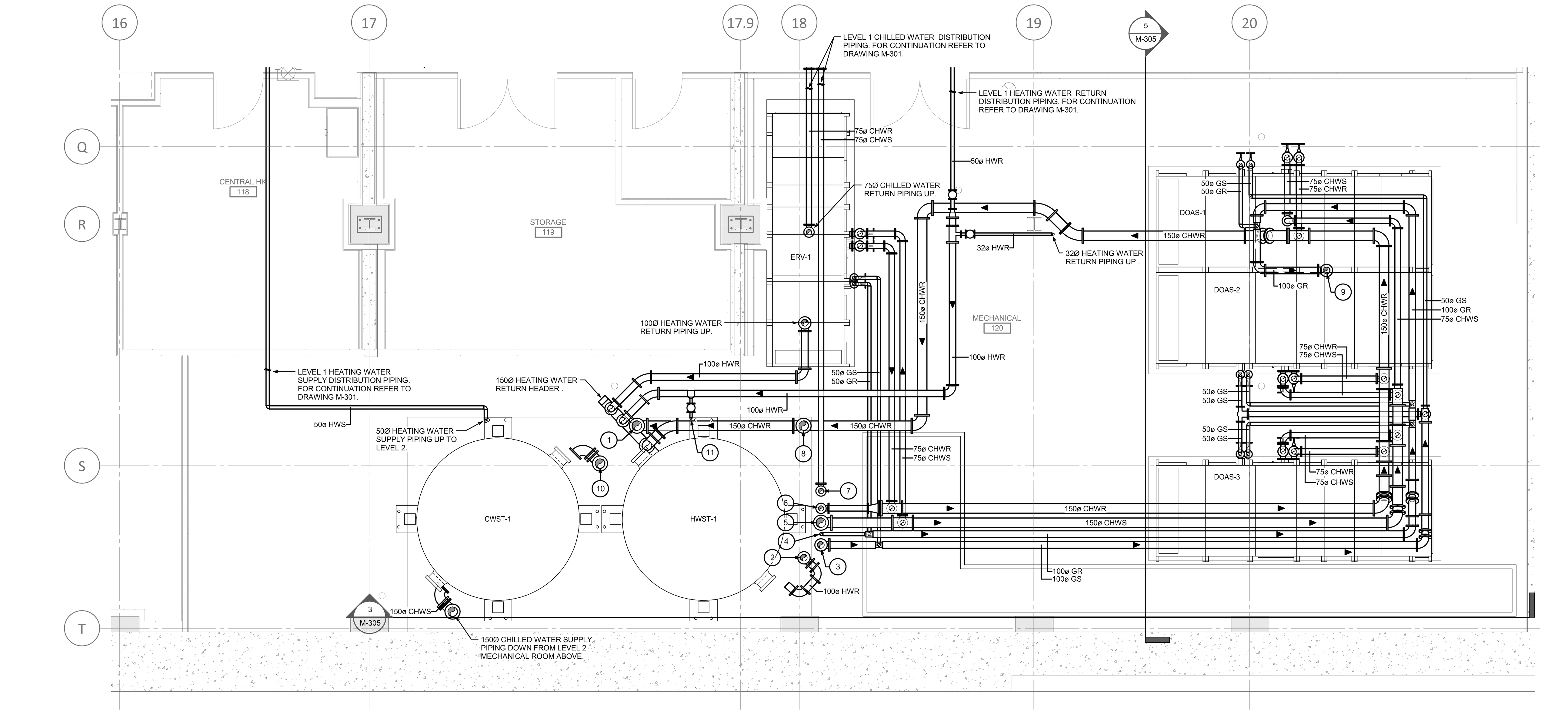
DRAWING REFERENCE NOTES

1. 75mmØ CHILLED WATER SUPPLY PIPING DOWN TO LEVEL 1 MECHANICAL ROOM BELOW.
2. 75mmØ CHILLED WATER RETURN PIPING DOWN TO LEVEL 1 MECHNAICAL ROOM BELOW.
3. 150mmØ CHILLED WATER SUPPLY PIPING DOWN TO LEVEL 1 MECHANICAL ROOM BELOW.
4. 50mmØ GLYCOL RETURN PIPING DOWN TO LEVEL 1 MECHANICAL ROOM BELOW.
5. 100mmØ GLYCOL SUPPLY PIPING DOWN TO LEVEL 1 MECHANICAL ROOM BELOW.
6. 100mmØ HEATING WATER RETURN PIPING DOWN TO LEVEL 1 MECHANICAL ROOM BELOW.
7. 150mmØ CHILLED WATER SUPPLY PIPING DOWN TO LEVEL 1 MECHANICAL ROOM BELOW.
8. 150mmØ CHILLED WATER PIPING UP FROM LEVEL 1 MECHANICAL ROOM BELOW.
9. 100mmØ HEATING WATER PIPING TO TOP HWST-1 CONNECTION.
10. 150mmØ CHILLED WATER PIPING TO TOP CWST-1 CONNECTION.
11. 32mmØ HEATING WATER RETURN PIPING DOWN TO LEVEL 1 MECHANICAL ROOM BELOW.
12. 150mmØ CHILLED WATER PIPING DOWN TO LEVEL 1 MECHANICAL ROOM BELOW.

LEVEL 2 - HVAC Piping - MECHANICAL ROOM ENLARGEMNET 1 : 50 — 2 / M-305



MECH ROOM LEVEL 2 SECTION B 1 : 25 — 4 / M-305



DRAWING REFERENCE NOTES

1. 150mmØ CHILLED WATER RETURN PIPING UP TO LEVEL 2 MECHANICAL ROOM ABOVE.
2. 100mmØ HEATING WATER RETURN PIPING DOWN FROM LEVEL 2 MECHNAICAL ROOM ABOVE.
3. 100mmØ GLYCOL SUPPLY PIPING DOWN FROM LEVEL 2 MECHANICAL ROOM ABOVE.
4. 50mmØ GLYCOL RETURN PIPING DOWN FROM LEVEL 2 MECHANICAL ROOM ABOVE.
5. 150mmØ CHILLED WATER SUPPLY PIPING DOWN FROM LEVEL 2 MECHANICAL ROOM ABOVE.
6. 75mmØ CHILLED WATER RETURN PIPING DOWN FROM LEVEL 2 MECHANICAL ROOM ABOVE.
7. 75mmØ CHILLED WATER SUPPLY PIPING DOWN FROM LEVEL 2 MECHANICAL ROOM ABOVE.
8. 150mmØ CHILLED WATER RETURN PIPING DOWN FROM LEVEL 2 MECHANICAL ROOM ABOVE.
9. 100mmØ GLYGOL RETURN PIPING UP TO LEVEL 2 MECHANICAL ROOM ABOVE.
10. 150mmØ CHILLED WATER SUPPLY PIPING UP TO LEVEL 2 MECHANICAL ROOM ABOVE.
11. 32mmØ HEATING WATER RETURN PIPING DOWN TO LEVEL 1 MECHANICAL ROOM BELOW.

LEVEL 1 - HVAC Piping - MECHANICAL ROOM ENLARGEMENT 1 : 50 — 1 / M-305

PLOT DATE: 7/20/2017 3:18:39 PM

UNB Fredericton EST. 1785

NO.	REVISION	DATE
1	ISSUED FOR CONSTRUCTION	07/20/17
O	ISSUED FOR TENDER	04/13/17

A — DETAIL NUMBER
B — REFERENCE DWG NO.
C — DETAIL DWG NO.

REGISTERED PROFESSIONAL ENGINEER — M7492 — Scott J. Shreenan — Signature — July 20, 2017 — Date — Province du Nouveau-Brunswick — INGÉNIEUR IMMATRICULÉ

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TENDER PACKAGE #3
BUILDING ENVELOPE & INTERIORS

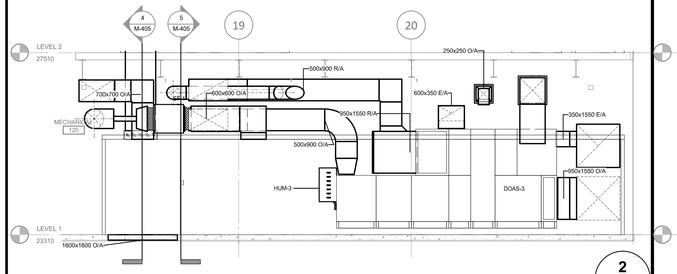
CENTRE FOR HEALTHY LIVING
UNB FREDERICTON, NB

MECHANICAL ROOM ENLARGEMENTS AND SECTIONS

As indicated

JULY 20, 2017

11-16-236 M-305



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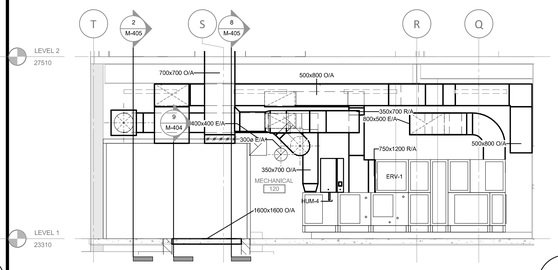

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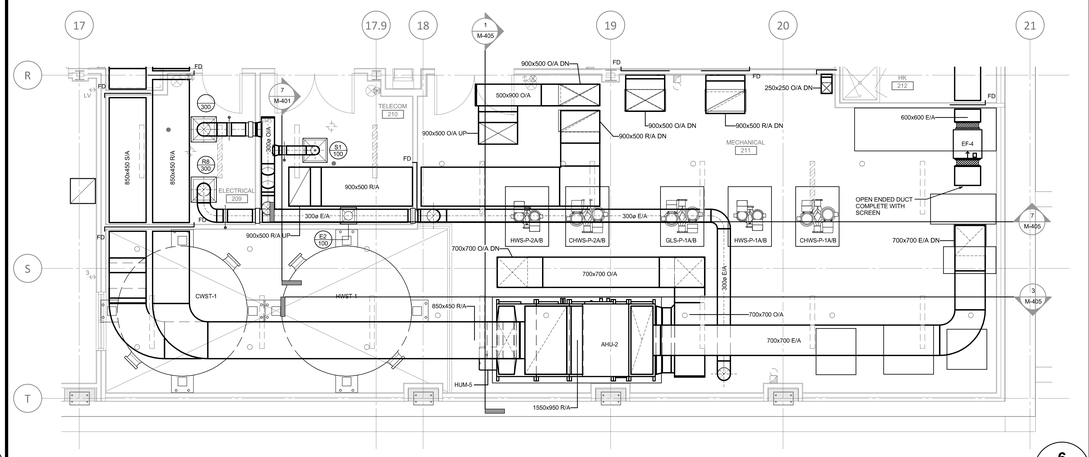
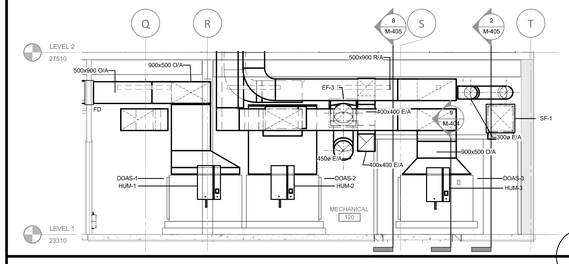


LEVEL 2 - HVAC - MECHANICAL ROOM ENLARGEMNET 1 : 50 — 6 / M-405



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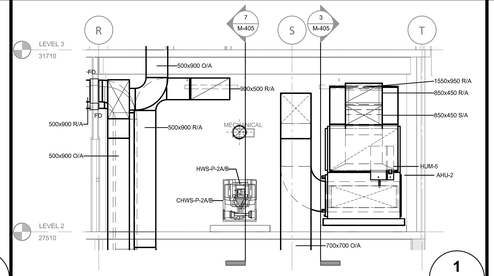

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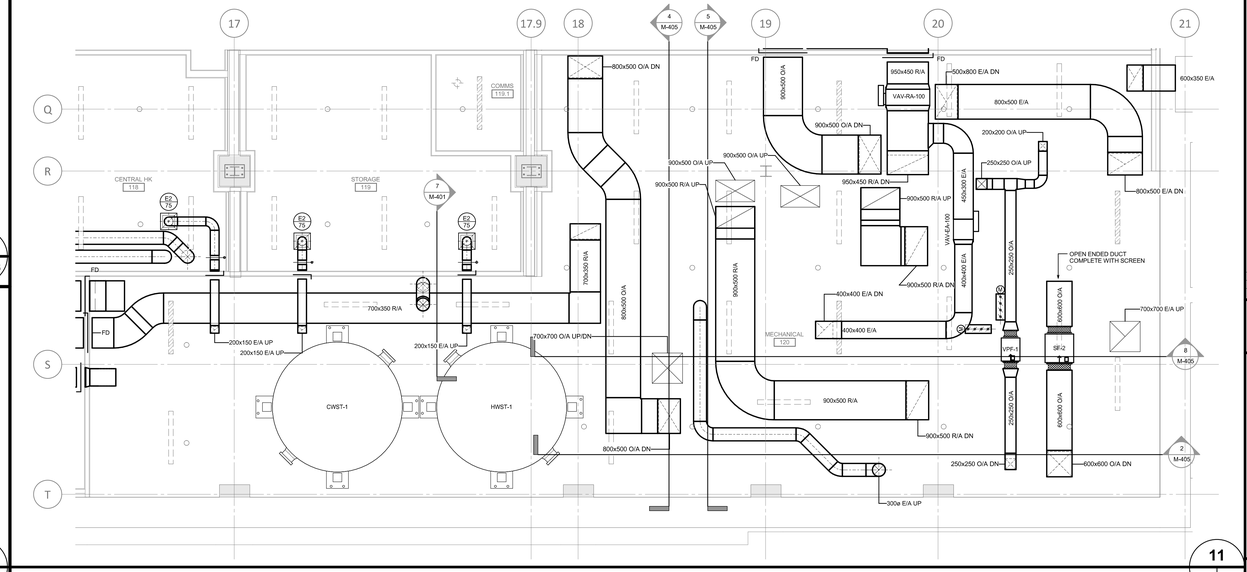

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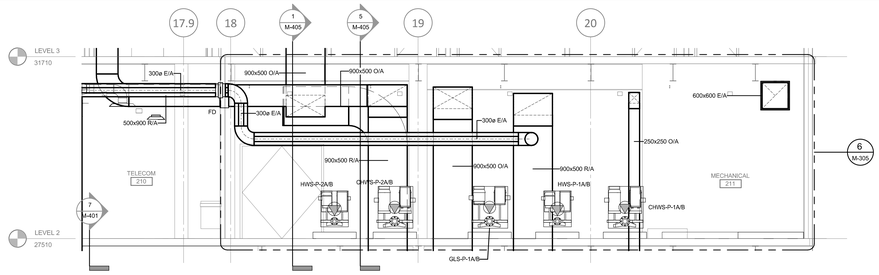

Section 50 1 : 50 — 7 / M-405

Section 39 1 : 50 — 8 / M-405

LEVEL 1 - HVAC - MECHANICAL ROOM ENLARGEMENT - LOWER LEVEL 1 : 50 — 10 / M-405

NO.	REVISION	DATE
1	ISSUED FOR CONSTRUCTION	07/20/17
0	ISSUED FOR TENDER	04/13/17

A DETAIL NUMBER
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C DETAIL DWG NO.

REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NEW BRUNSWICK — M7492 — Scott J. Shreenan — Signature — July 20, 2017 — Date — ASSOCIATION OF PROFESSIONAL ENGINEERS OF NEW BRUNSWICK — ASSOCIATION DES INGÉNIEURS PROFESSIONNELS DU NOUVEAU-BRUNSWICK

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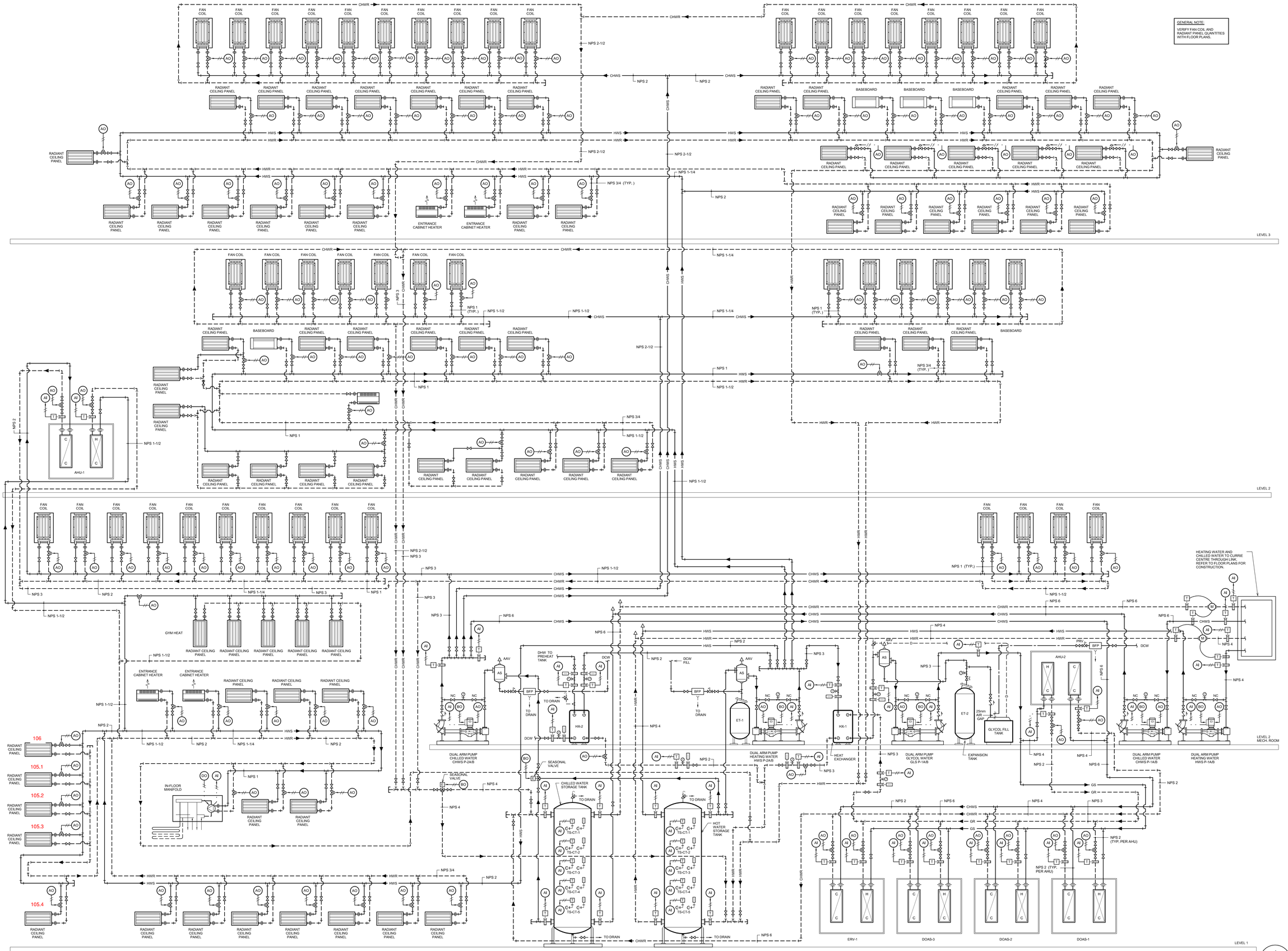
TENDER PACKAGE #3
BUILDING ENVELOPE & INTERIORS

CENTRE FOR HEALTHY LIVING
UNB FREDERICTON, NB

MECHANICAL ROOM ENLARGEMENTS AND SECTIONS

1 : 50
JULY 20, 2017
11-16-236
M-405

PLOT DATE: 7/20/2017 3:19:35 PM



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NO.	REVISION	DATE
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A DETAIL NUMBER
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REGISTERED PROFESSIONAL ENGINEER
Province of New Brunswick
M7492
Scott J. Shreenan
Signature
July 20, 2017
Date
PERMIT TO PRACTICE
REGISTERED ASSOCIATION

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TENDER PACKAGE #3
BUILDING ENVELOPE & INTERIORS

CENTRE FOR HEALTHY LIVING
UNB FREDERICTON, NB

MECHANICAL SCHEMATIC - UNB CHL

N.T.S.

JULY 20, 2017

11-16-236

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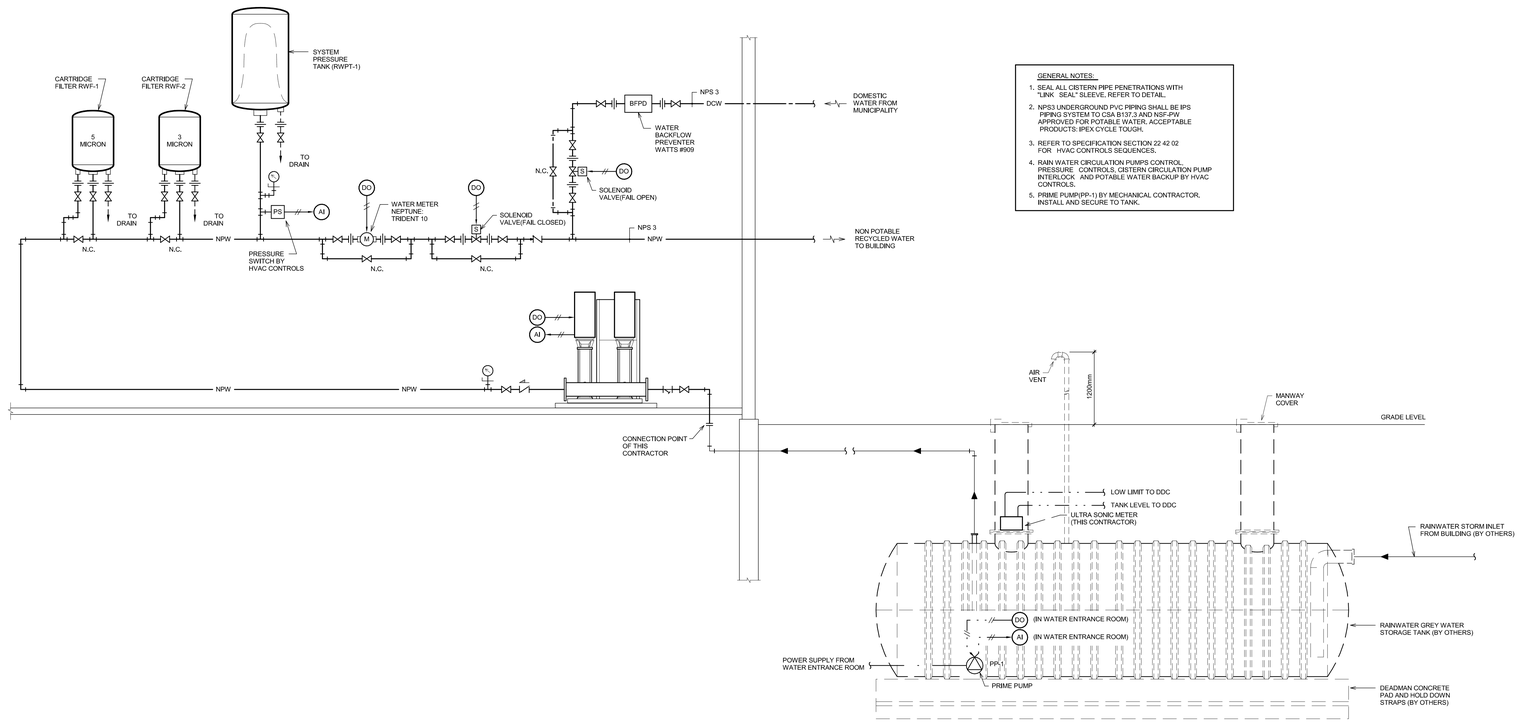
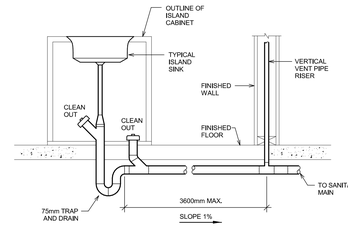


GENERAL NOTES:

1. SEAL ALL CISTERN PIPE PENETRATIONS WITH "LINK SEAL" SLEEVE, REFER TO DETAIL.
2. NPS3 UNDERGROUND PVC PIPING SHALL BE IPS PIPING SYSTEM TO CSA B137.3 AND NSF-PW APPROVED FOR POTABLE WATER, ACCEPTABLE PRODUCTS: IPEX CYCLE TOUGH.
3. REFER TO SPECIFICATION SECTION 22 42 02 FOR HVAC CONTROLS SEQUENCES.
4. RAIN WATER CIRCULATION PUMPS CONTROL, PRESSURE CONTROLS, CISTERN CIRCULATION PUMP INTERLOCK AND POTABLE WATER BACKUP BY HVAC CONTROLS.
5. PRIME PUMP(PP-1) BY MECHANICAL CONTRACTOR, INSTALL AND SECURE TO TANK.

GREY WATER FLOW SCHEMATIC

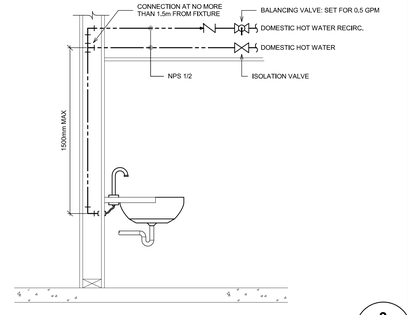
N.T.S. — 1 — M-205



ISLAND SINK PIPING DETAIL

ISLAND SINK INSTALLATION DETAIL

N.T.S. — 2 — M-205

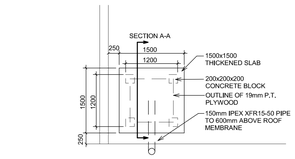


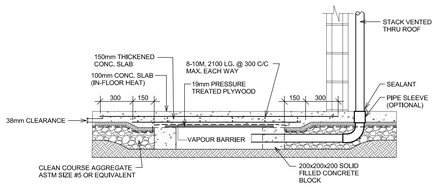
DHWR BRANCHES TO FIXTURE DETAIL

N.T.S. — 3 — M-205

NO.	REVISION	DATE
1	ISSUED FOR CONSTRUCTION	07/20/17
0	ISSUED FOR TENDER	04/13/17

A/B/C — A DETAIL NUMBER; B REFERENCE DWG NO.; C DETAIL DWG NO.

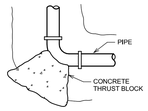




SECTION A-A

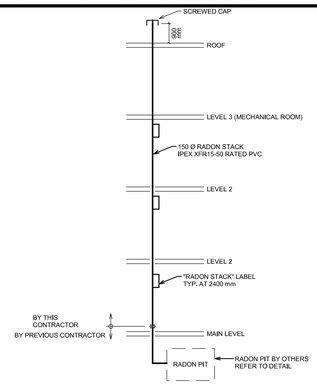
RADON PIPING DETAILS

N.T.S. — 4 — M-205



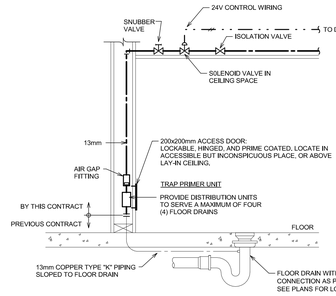
THRUST BLOCK DETAIL

N.T.S. — 5 — M-205



RADON PIPING SCHEMATIC

N.T.S. — 6 — M-205



TRAP PRIMER DETAIL

N.T.S. — 7 — M-205

REGISTERED PROFESSIONAL ENGINEER
Province of New Brunswick
M7492
Scott J. Shreenan
Signature
July 20, 2017
Date
Association of Professional Engineers
ENGINEER MAINTENANCE

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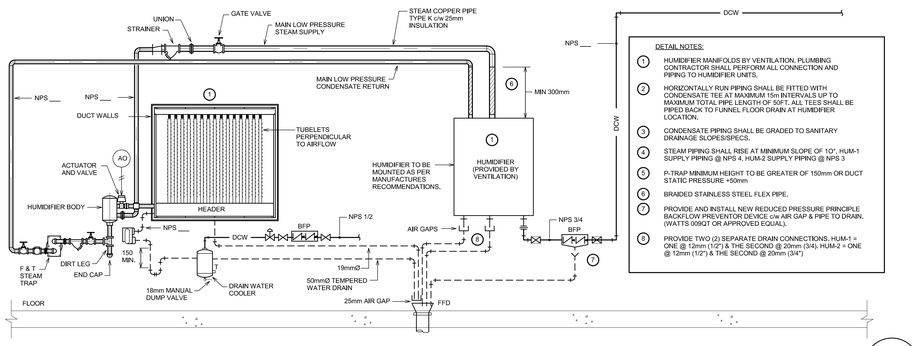
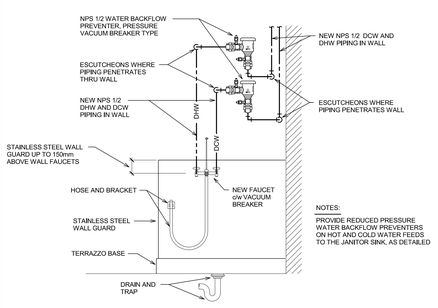


DETAIL NOTES:

1. HUMIDIFIER MANIFOLDS BY VENTILATION, PLUMBING CONTRACTOR SHALL PERFORM ALL CONNECTION AND PIPING TO HUMIDIFIER UNITS.
2. HORIZONTALLY RUN PIPING SHALL BE FITTED WITH CONDENSATE TEE AT MAXIMUM 15m INTERVALS UP TO MAXIMUM TOTAL PIPE LENGTH OF 50FT. ALL TEES SHALL BE PIPED BACK TO FUNNEL FLOOR DRAIN AT HUMIDIFIER LOCATION.
3. CONDENSATE PIPING SHALL BE GRADED TO SANITARY DRAINAGE SLOPES/SPECS.
4. STEAM PIPING SHALL RISE AT MINIMUM SLOPE OF 10", HUM-1 SUPPLY PIPING @ NPS 4, HUM-2 SUPPLY PIPING @ NPS 3
5. P-TRAP MINIMUM HEIGHT TO BE GREATER OF 150mm OR DUCT STATIC PRESSURE +50mm
6. BRAIDED STAINLESS STEEL FLEX PIPE.
7. PROVIDE AND INSTALL NEW REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTOR DEVICE c/w AIR GAP & PIPE TO DRAIN, (WATTS 009QT OR APPROVED EQUAL).
8. PROVIDE TWO (2) SEPARATE DRAIN CONNECTIONS, HUM-1 = ONE @ 12mm (1/2") & THE SECOND @ 20mm (3/4), HUM-2 = ONE @ 12mm (1/2") & THE SECOND @ 20mm (3/4")

STEAM HUMIDIFIER CONNECTION DETAIL

N.T.S. — 8 — M-205

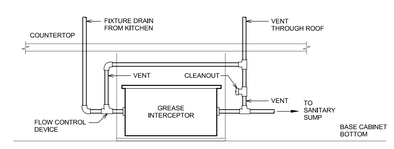


NOTES:

PROVIDE REDUCED PRESSURE WATER BACKFLOW PREVENTERS ON HOT AND COLD WATER FEEDS TO THE JANITOR SINK, AS DETAILED

JANITOR SINK PIPING DETAIL

N.T.S. — 9 — M-205

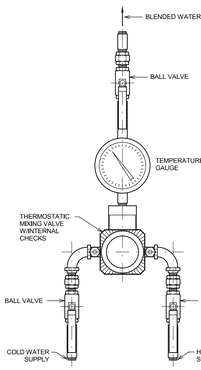


GENERAL NOTE:

1. GREASE INTERCEPTOR TO BE UNDER COUNTER COMPLETE WITH GALVANIZED STEEL SUPPORTS.
2. GREASE INTERCEPTOR TO BE INSTALLED MAINTAINING 300mm BETWEEN TOP OF GREASE INTERCEPTOR AND UNDERSIDE OF COUNTER.

GREASE INTERCEPTOR DETAIL

N.T.S. — 10 — M-205



THERMOSTATIC MIXING VALVE DETAIL

N.T.S. — 11 — M-205

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TENDER PACKAGE #3
BUILDING ENVELOPE & INTERIORS

CENTRE FOR HEALTHY LIVING
UNB FREDERICTON, NB

DETAILS AND SCHEMATICS - PLUMBING

N.T.S.

JULY 20, 2017

11-16-236 — M-205

PLOT DATE: 7/20/2017 3:18:07 PM