

MECHANICAL ADDENDUM MA-3
CITY OF VAUGHAN FIRE STATION NO. 7 - 12
PROJECT NO. 2104
JSC PROJECT NO. 21-237
MAY 31, 2024

The following document is hereby made a part of the Contract Documents.

The following revisions and/or additions shall be made to Drawings and/or specifications and the cost shall be included in Tender Price.

REVISIONS TO SPECIFICATIONS

SECTION 23 21 00 – LIQUID HEAT TRANSFER

2.21 – Glycol System

1. Add new Subsection 2.21 – Glycol System as follows:

“2.21 GLYCOL SYSTEM

- .1 Underfloor heating system shall have glycol anti-freeze solution consisting of propylene glycol and water with strength capable of withstanding freezing to -34°C (-30°F) (i.e. approx. 40% glycol and 60% water by volume) using Union Carbide “Therminol 17” or Dow Chemical “Dowtherm SR-1”. Solution shall have a stable rust inhibitor.
- .2 Solution shall be premixed at room temperature before placing in system and extreme care shall be taken to ensure each batch is of proper percentage. Water for mixing shall be distilled or de-ionized water. Ordinary city or tap water must NOT be used. Solution shall be pumped into system independent of domestic water system. Completely fill entire system venting off all air except in cushion tank leaving 30psig (200 kPa) residual pressure in system.
- .3 System MUST be cleaned BEFORE filling, by circulating a 1¼% solution by weight of tripotassium phosphate or trisodium phosphate for at least 4 hours at 5°C (40°F) and then drained and flushed with deionized or demineralized water. See cleaning systems subsection.
- .4 Install two ¾” (19mm) valved capped hose end connections in this system for charging system across system pumps and clearly identify both connections as to use.
- .5 Circulate glycol solution in system for at least 48 hours and verify solution characteristics before starting system. Report actual characteristics and lowest safe operating temperature and guarantee same in writing to Architect.
- .6 On completion of work, supply at least one 45 Imp gallon (208 litre) drum of premixed solution for topping up system complete with instructions. Drum shall be suitably labeled to show contents.

- .7 Supply for each Glycol system, filling apparatus consisting of 45 Imp gallon (208 litre) steel drum fitted with Bowser #3013 or Fill-Rite #F-152 (Albany Pump Company) hand operated piston pump complete with 1" (25mm) suction piping, 1-1/2" x 2" (38mm x 50mm) bung adaptor, 8 foot (2400mm) length of 3/4" (19mm) neoprene hose with 3/4" (19mm) connections and female hose couplings and nozzle holder with vacuum breaker. Supply large mouth funnel with fine mesh screen insert for filling drum at separate tapping.
- .8 All components on glycol system shall be suitable for solution used. Pump seals, gaskets, valves and other materials must not be affected and have normal life span. Where solutions will affect normal life span, provide alternate materials to meet this requirement."

2.21 – Underfloor Heating System

1. Add new Subsection 2.22 – Underfloor Heating System as follows:

"2.22 UNDERFLOOR HEATING SYSTEM

.1 Work Included

1. Description: Furnish and install a REHAU radiant floor heating (RFH) system as supplied by KLIMATROL Environmental Systems Ltd (905)454-1742. Systems shall be complete with REHAU piping, pre-piped manifold hydronic panels with pump and mixing valve, with balancing and flow control valves, pipe to manifold compression nut fitting, manufacturer-approved cold-expansion compression-sleeve pipe repair couplings (if required), non-metallic pipe fasteners, Tamas hydronic pump panel and installation specialties, supervision and field engineering required for complete and proper function of the system. Any systems by another manufacturer shall be submitted as alternates with material cost savings.

.2 Regulatory Requirements

1. Cross-linked polyethylene (PEXa) pipe shall be manufactured by the high-pressure peroxide (Engel) method with a minimum degree of cross-linking of 80%, and conform to ASTM F 876, F 877 and CSA B 137.5. Fittings shall conform to ASTM F877, F 2080 and CSA B137.5. Pipe oxygen diffusion barrier shall conform to DIN4726.

.3 References

1. ASTM F 876: Standard Specification for Cross-Linked Polyethylene (PEX) Pipe
2. ASTM F 877: Cross-Linked Polyethylene (PEX) Plastic Hot- and Cold-Water distribution systems
3. ASTM F 2080: Standard Specification for Cold-Expansion Fittings with Metal Compression-Sleeves for use with Cross-Linked Polyethylene (PEX) Pipe
4. CSA B137.5: Cross-Linked Polyethylene (PEX) Tubing Systems for Pressure Applications
5. DIN 4726: German Standard for Plastic Piping used in Warm Water Floor Heating Systems

.4 Submittals

1. Provide submittals and shop drawings in accordance with the general requirements and as specified herein. Submit shop drawings indicating schematic layout of system, including equipment, critical dimensions and piping/slab penetration details as well as details for protecting exposed PEX piping.
2. Submit manufacturer's technical installation instructions.

3. Submit independent certification results for the piping systems from a recognized testing laboratory.
4. Submit computer-generated RFH system design indicating pipe sizing and panel performance at pipe spacing and water temperatures selected. RFH design calculations to be performed on pipe manufacturer's software.
5. Submit catalog data on all equipment, fittings, fasteners and associated items necessary for the installation of the piping and manifolds.
6. System shall be installed by a contractor experienced in radiant floor cooling / heating system pipe installation. Submit installer's installation certification and project installation resume of experience.

.5 Delivery, Storage and Handling

1. Deliver and store piping and equipment in shipping containers with labeling in place. Pipe to be kept in original shipping boxes until required for installation. Do not expose pipe to ultraviolet (sunlight) light for more than 90 days.
2. Protect piping and manifolds from entry of contaminating materials by installing suitable plugs in all open pipe ends until installation. Where possible, connect pipes to assembled manifolds to eliminate possibility of contaminants.
3. Piping shall not be dragged across the ground or concrete surfaces, and shall be stored on a flat surface with no sharp edges.
4. Pipe shall be protected from oil, grease, paint, direct sunlight and other elements as recommended by manufacturer.

.6 Warranty

1. The radiant floor heating pipe manufacturer shall warrant the cross-linked polyethylene piping and the "Everloc" fittings if required, to be free from defects in material and workmanship for a period of twenty-five (25) years. The design shall be approved either by submittal or stamped by a registered engineer as being complete and accurate.
2. All manifolds and controls shall be warranted for 18 months and/or two heating seasons.

.7 Piping

1. Material: All radiant floor heating piping shall be nominal high density cross-linked polyethylene as manufactured by REHAU using the peroxide method of cross-linking (PEXA) and with an approved cell classification in accordance with ASTM D3350. Pipe shall conform with ASTM F876 and CSA B137.5, and be certified by CSA or equivalent testing organization.
2. Temperature and Pressure Ratings: Piping shall be rated for 100 PSIG gauge pressure at 180°F temperature (690 kPa @ 82°C) continuous, and 80 PSIG gauge pressure at 200°F temperature (550 kPa @ 93°C) continuous.
3. Oxygen Diffusion Barrier: Piping shall have a co-extruded oxygen diffusion barrier capable of limiting oxygen diffusion through the pipe to less than 0.10 mg/l/day at 104°F (40°C) water temperature, in accordance with DIN 4726.
4. Bend Radius: The minimum bend radius for cold bending of the pipe shall be not less than five (5) times the outside diameter. Bends with a radius less than this shall require the use of a bending template as supplied by the pipe manufacturer, and/or hot air.
5. All floor heating piping shall be fastened using nylon cable binders to a middle rebar mesh (provided by general contractor) maintaining 800 mm pipe clearance from top and bottom of the concrete slab and keeping the pipe centered in the concrete slab.

.8 Fittings

1. Fittings shall be manufactured of dezincification-resistant brass and shall be supplied by the piping manufacturer as part of a proven cataloged system. manifold fittings to be compression nut style with split compression ring.
2. Fittings shall be certified to ASTM F 877, F 2080 and CSA B137.5 as part of the manufacturer's PEXpiping system. pipe couplings embedded within the thermal mass shall be EVERLOC® cold-expansion compression-sleeve fittings.

.9 Manifolds

1. Material: distribution manifolds shall be manufactured of brass and be supplied by the piping manufacturer as a proven cataloged part of the manufacturer's system.
2. Balancing Manifolds: where required by design, brass balancing manifolds shall be equipped with visual flow gauges, balancing and isolation valves for each circuit, header isolation valves and air vent/fill ports. Manifolds shall be pre-assembled, mounted on metal brackets and ready to install.
3. Each manifold shall be provided with automatic air vents.

.10 Controls

1. Tamas pre-piped and pre-wired 1 zone hydronic panel shall be provided c/w ETL approval. The panels shall consist of motorized zone isolation valves, control, isolation valves and a control center which accepts main power 115V.
2. Room space sensor shall be two stage low voltage device with electronic temperature sensing and a slab sensor and shall be supplied by this Division. Control shall sense space temperature and floor slab temperature and energize the Hydronic Panel to maintain target setpoints to control the floor heating as the first stage and the air heater as the second stage.
3. Valves and Actuators: 2-Way control valves for each manifold shall be installed and shall allow fluid circulation through the slab heating system on a call for heat. Valves and actuators shall be supplied by this Division."

.11 Accessories

1. Utilize manufacturer's system installation accessories including: nylon cable binders, pipe sleeves, protective sleeving, pipe cutters, pipe uncoilers and other installation tools and aids.pipe ties.

.12 Performance

Btuh Requirement	37 Btuh/Sq.Ft.
Surface Temperature	87° F
Floor Construction	Concrete slab on grade
Type Tubing	½" REHAU "CSA" RAUPEX Pie
Tube Spacing	6"
No. of Manifolds	Mainfolds (see drawings)
Design Mean Water Temp.	120° F
Temperature Difference	20°F
Estimated Headloss	15 Ft.

.13 Alternate Equipment

1. Uponor
2. Wrispo

3.24 – Underfloor Heating System

1. Add new Subsection 3.24 – Underfloor Heating System as follows:

“3.24 UNDERFLOOR HEATING SYSTEM

.1 Preparation

1. Concrete slab on grade: Subgrade should be compacted, flat and smooth to prevent damage to pipe or insulation. Approved vapor barrier material should be installed. Insulation should be installed vertically along all exterior walls or footings to which the edge of the slab will meet against. Horizontal insulation should be installed flat against the vapor barrier under where the slab will be poured. Rigid foam board insulation panels should be taped together at the seams. Reinforcing wire mesh or rebar, if required by structural design, must be flat and level, with all sharp ends pointing down. Finished grade of the thermal mass must be a minimum of 3/4" (19 mm) above the top of PEX heating pipes.
2. In slab on grade areas all floor heating piping shall be fastened at 9" to 12" spacing as specified in schedule using nylon cable binders to a rebar mesh (provided by general contractor), maintain 40mm minimum pipe clearance from top and bottom of the concrete slab.
3. All floor heating piping shall be fastened using nylon cable binders to a middle rebar mesh (provided by general contractor) maintaining 800 mm pipe clearance from top and bottom of the concrete slab and keeping the pipe centered in the concrete slab.
4. Pre-cast concrete subfloor: subfloor must be clean and free from all construction debris, which could potentially damage the pipe. Replace any areas that appear weak. If called for by design, approved vapor barrier material should be installed and insulation should be installed vertically along all exterior walls or footings to which the edge of the slab will meet against, as well as flat against the vapor barrier under where the slab will be poured. Rigid foam board insulation panels should be taped together at the seams. Finished grade of the thermal mass overpour must be a minimum of 3/4" (19 mm) above the top of PEX heating pipes.

.2 Installation

1. Install in accordance with manufacturer's published installation manual and/or published guidelines.
2. Mount manifolds in the locations previously prepared or in previously installed cabinets, if used. Manifolds should be mounted as level as possible.
3. Route piping in orderly manner, according to layout and spacing shown in approved submittal drawings. All notes on drawings shall be followed.
4. At connections and fittings, use a plastic pipe cutter to ensure square and clean cuts, and join pipes immediately or cap ends of pipe to seal from contaminants. Where fittings are installed within the thermal mass, they shall be wrapped in chloride-free tape or sealed within a heat-shrink material approved by the manufacturer.
5. Pipe should be dispensed using a suitable uncoiling device. Remove all twists prior to securing pipe. Pipe must lie flat on an even plane. Finished grade of a thermal mass must be a minimum of 3/4" (19 mm) above the top of PEX heating pipes. Fasten piping at no more than 3 feet (90 cm) intervals, being careful not to twist the pipe. In thin concrete slabs, it may be necessary to secure piping every 2 feet (60 cm). Use only fasteners supplied or approved by the manufacturer of the PEX pipe.
6. Piping that must pass through expansion joints shall be covered in protective polyethylene convoluted sleeving (flexible conduit) extending 15 inches (38 cm) on each side of the joint. Sleeving must be secured on pipe to prevent movement during installation of thermal mass.

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7. Where piping exits the thermal mass, a protective conduit shall be placed around the pipe, with the conduit extending a minimum of 6 inches (15 cm) into the floor and exiting by a minimum of 6 inches. For penetrations at manifolds, use rigid PVC bend guides secured in place to prevent movement.
 8. At the time of installation of each circuit of pipe, connect the pipe to the correct manifold outlet and record pipe length for balancing. If manifold is not installed, cap the end of the pipe and label the pipe's circuit numbers along with S for supply and R for return. Connect pipes to manifold as soon as possible and record circuit lengths. All circuits shall be labeled to indicate circuit length and serviced area.
 9. The following precautions shall be taken in areas intended for carpet:
 - .1 Notify carpet installer that radiant heating pipes have been installed.
 - .2 Keep pipes 6 inches (15 cm) from all wall baseplates.
 - .3 Install metal guards where pipe will pass through wall baseplates and where carpet tack strips will be installed.
 10. The following precautions shall be taken in areas intended for hardwood flooring:
 - .1 Ensure that nailing areas for hardwood flooring (if nailing is required) are clearly marked and known to hardwood installers.
 11. The heating system should not be put into operation until the poured concrete thermal mass has cured a minimum of 28 days, unless otherwise specified and approved by thermal mass supplier. If it is necessary to operate the heating system to prevent freezing, a maximum flow temperature of 72° F (22°C) must not be exceeded while the thermal mass is curing. After curing, gradually increase the flow temperature by no more than 10°F (6°C) each day until system reaches the required operating temperature.
 12. Contractor shall be responsible for provision of
 - .1 Wire mesh or rebar to secure tubing and any insulations to be provided by the general contractor
 - .2 Labour to install Radiant Floor Heating system
 - .3 Water, glycol and any chemical solutions.
 - .4 Field coordination of the pressure test equipment. (It is recommended to use the REHAU hydraulic pressure test unit available through Klimatrol to conduct pressure tests.)
 - .5 Supervision of concrete pours to instruct concrete installers on maintenance of pipe integrity and position of pipe in slab during concrete installation.
 - .6 Installation of control valves, pumps, supply and return piping, all valves and fittings.
 - .7 Electrical control interconnection and testing.
- .3 Field Quality Control
1. Filling, Testing & Balancing: Tests of hydronic heating systems shall comply with local codes, and, where required, shall be witnessed by the building official. (Reference BOCA, ICBO, SBCCI or the acceptable code body for the jurisdiction).
 2. Pressure gauges used must show pressure increments of 1 PSIG and should be located at or near the lowest points in the distribution system.
 3. Air Test: Charge the completed, yet unconcealed pipes with air. Do not exceed 150 PSIG. Use liquid gas detector or soap solution to check for leakage at manifold connections.
 4. Perform a preliminary pressure test pressurizing the system to the greater of 1.5 times the maximum operating pressure or 100 psi for 30 minutes. As the piping expands, restore pressure, first at 10 minutes into the test and again at 20 minutes. At the end of the 30 minute preliminary test, pressure must not fall by more than 5 PSIG from the maximum, and there shall be no leakage.

5. After performing the preliminary test, perform the main pressure test immediately. The main pressure test shall last 2 hours. The test pressure should be restored and must not fall more than 3 PSIG after 2 hours. No leakage should be detected.
6. Pressure shall be maintained and monitored during installation of the thermal mass. If any leak is detected during installation of thermal mass, the leak must be found immediately and the area cleared for repair using manufacturer approved repair coupling. Retest before covering repair.
7. Water Test: Purge all air from pipes. Charge the completed, yet unconcealed pipes with water. Take necessary precautions to prevent water from freezing. Check the system for leaks, especially at all pipe joints.
8. Perform the same procedures as used in the Air Test 3.3.2.1 – 3.3.2.3.”

SECTION 23 31 00 – AIR DISTRIBUTION

2.7 – Heat Recovery Unit

1. Replace Paragraph .9 – Indirect Gas Fired Auxiliary Heat, with .9 – Electric Heat as follows:

“.9 Electric Heat

1. Electric resistance heaters shall be provided in the capacities, voltage, and steps of control as noted in the Schedules and shall bear a listing or certification mark from an authorized agency.
2. Heater element wiring shall terminate in a full height enclosure at one end of the heater. All internal wiring shall terminate on clearly identified terminal blocks. A wiring diagram shall be provided on the enclosure cover.
3. Heaters shall be equipped with an automatic reset disc type thermal cut-out. Heaters rated at 30 kW and less shall be equipped with an additional manual reset disc type thermal cut-out.
4. Heater elements shall be open type nickel-chromium construction, (2/3 Ni, 1/3 Cr) with a maximum of 22.5 kw/ft² (Sheathed coils shall be a maximum of 13 kw/ft²). Coil terminal pins shall be mechanically secured and insulated from the frame by means of non-rotating ceramic bushings.
5. Discharge air control with Silicon Controlled Rectifier (SCR) performing time based sine wave phase control. The SCR shall be controlled by a factory installed solid-state proportional integral controller.

6. Delete Paragraph .11 – Remote Control Panel in its entirety.

2.13 – Gas Piping & Service

1. Add new Subsection 2.13 – Gas Piping & Service as follows:

“2.13 GAS PIPING & SERVICE

- .1 Provide gas piping and connections as shown to gas equipment noted. Piping shall conform to CGA #B149 and Ontario Gas Code, Regulation #826/82 as amended to date. Obtain local Gas Company approval of system, valving and sizing before starting piping. Install all work in compliance with CGA Natural Gas Appliance Installation Manual of latest date.

- .2 Gas Piping: black steel pipe, Schedule #40, CSA #B-63 (ASTM-#A53), with 150# black malleable iron fittings. Install piping to conform to CGA #B149 and Provincial Gas Utilization Code both amended to date. Weld piping 2½" and larger and all concealed piping using ANSI #B16.9 butt-welding or #B16.11 socket welding fittings and test to Code Regulations.
- .3 Gas Valves: CGA or ULC approved self-lubricated ball valve or lubricated plug with greasing nipple, each with manual lever handle. Provide valve at each unit connection including equipment supplied by Owner or another Section."

3.5 – Heat Recovery Unit

- 1. Delete Paragraphs .5, .6 and .7 in its entirety.

3.10 – Gas Piping & Service

- 1. Add new Subsection 3.10 – Gas Piping & Service as follows:

"3.10 GAS PIPING & SERVICE

- .1 Pressure test gas piping with not less than 50# air for at least 24 hours without decrease in pressure. Check each joint with soap and water solution during test. Disconnect system during tests. Do not use oxygen for testing.
- .2 Painting of gas piping will be done by this Section.
- .3 Provide gas piping necessary and connect up each unit. Provide shut-off valve on each connection.
- .4 Support piping on roof on minimum 200 x 200 x 50 mm long pressure treated blocks set on 50 x 25 x 900 mm long pressure treated boards secured to 450 x 900 x 13 mm thick W.R. Meadows "Roof Tread" hot mopped set after removal of gravel at each block. Secure pipe to blocks with Myatt 161 pipe clamps or equal to allow pipe and block movement. See Detail #H-13.
- .5 Arrange and pay charges for gas meter/regulator assemblies by local Gas Company to approval. Meter/Regulator assembly shall be sized to provide not less than capacity noted at 1740 Pa for building service.
- .6 Provide wire harness. provide wire harness from manufacturer (Dresser Canada part M1S046-000. The pulse signal shall be 4-20 milliamp. Division 15 must also provide a Zenor barrier between the monitoring system and the meter pulse output, as required by Enbridge Consumers Gas. The Zenor barrier shall be as follows:

Hoffman Model S604NF-5 NEMA 4 as manufactured by Alpha Controls Rated CSA/UL listed enclosure (6"H x 4"W x 4"D)

Compression glands (IE – 0.25") containing R.Stahl I.S. positive barriers. Model 8901/31-086/150/70."

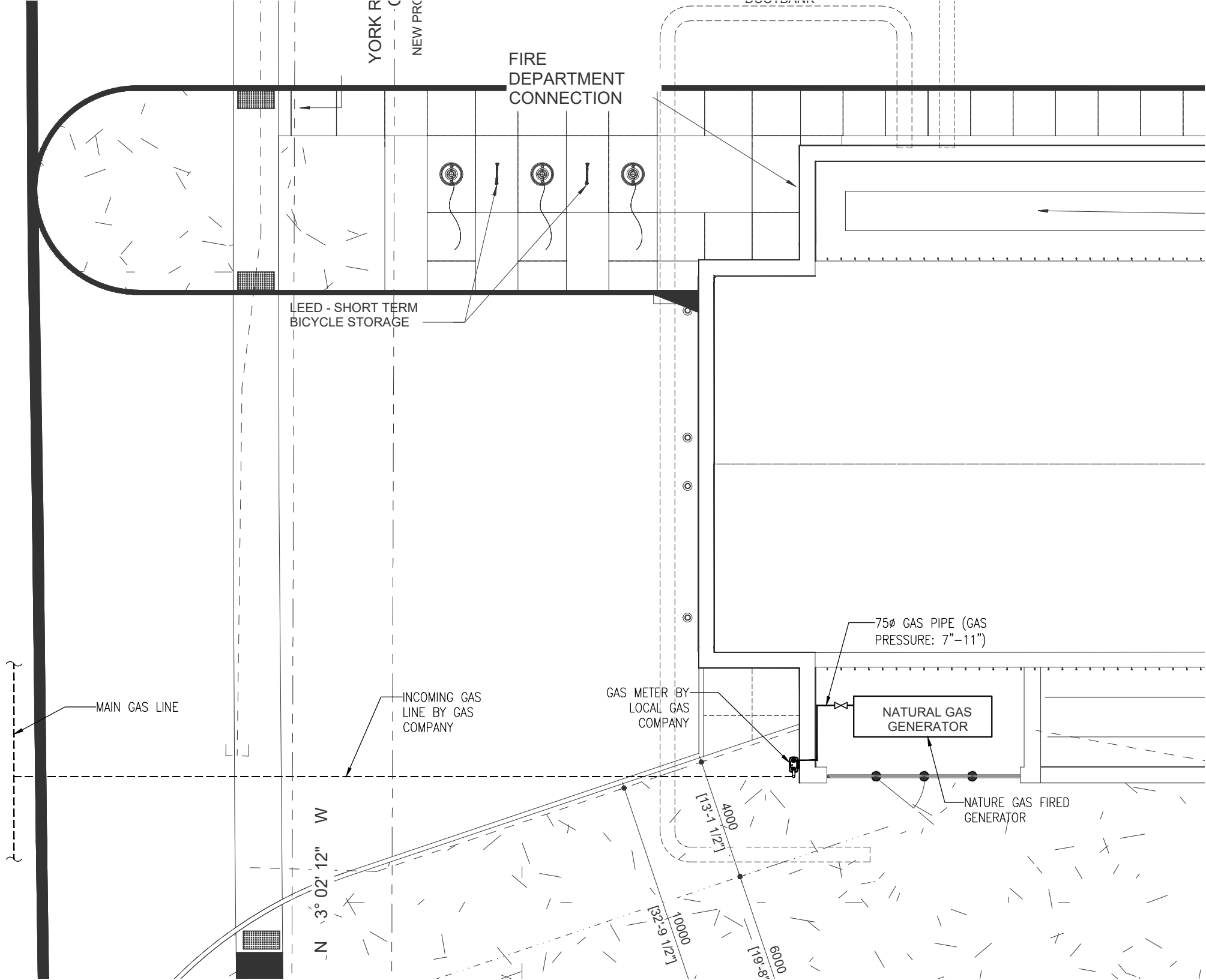
REVISIONS TO DRAWINGS

DRAWING M2.0

1. Provide new gas pipe to the generator as per attached Sketch MSK-1.

END

WESTON ROAD



PROJECT

CITY OF VAUGHAN FIRE STATION 7-12
9511 WESTON ROAD, VAUGHAN

TITLE

REVISION OF GAS METER AND PIPE FOR GENERATOR



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SCALE	1:150
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ARCH. JOB NO.	

DRAWING NUMBER:

MSK-1

REV. No.

REFERENCE DRAWING(S):
M2.0