

CITY OF WINNIPEG TRANSIT DEPARTMENT

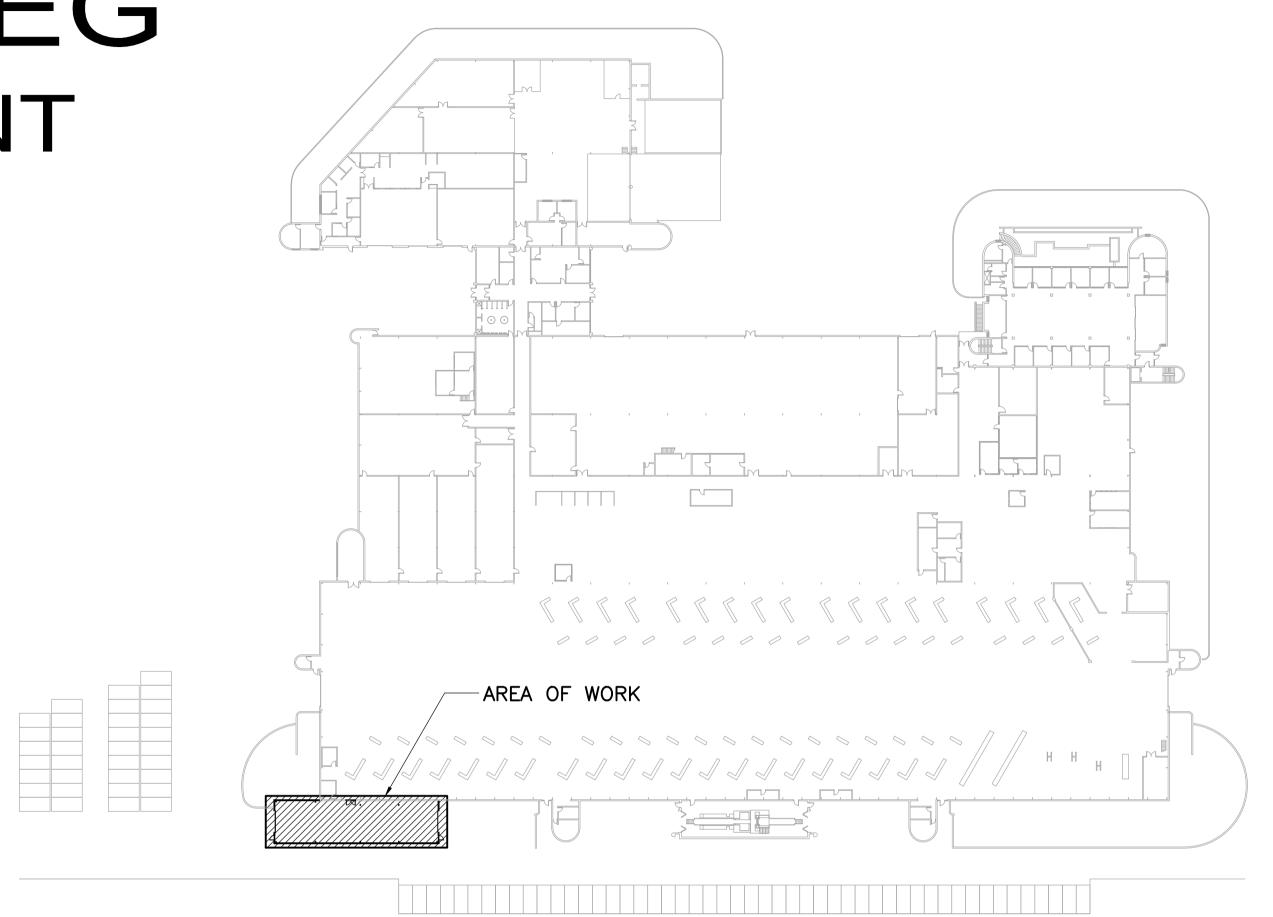
BID OPPORTUNITY No. 11-2014 CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE BUS MAINTENANCE ADDITION

ISSUED FOR CONSTRUCTION JANUARY 17, 2014

DRAWING INDEX

1329720500-DWG-S0007-00

1329720500-DWG-S0008-00



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| 1329720500-DWG-E0005-00 | ELECTRICAL SPECIFICATIONS - SHEET 2 OF 2 | ROOF / FLOOR |
| | | MF77ΔN |

ABBREVIATED CODE REVIEW — MBC 2011 1. OCCUPANCY CLASSIFICATION CLASSIFICATION: 3.2.2.72. INDUSTRIAL BUILDINGS, GROUP F, DIVISION 2, ANY HEIGHT, ANY AREA, SPRINKLERED MAJOR OCCUPANCY: VEHICLE PARKING, MAINTENANCE AND STORAGE FACILITY AREA OF ADDITION: 288m² NO. OF STOREYS: SPRINKLERED: 1 YES

| | MAJOR OCCUPANCY: | VEHICLE PARKING, MAINTENANCE AND STORAGE FACILITY |
|----|--|---|
| | AREA OF ADDITION: | 288m ² |
| | NO. OF STOREYS: SPRINKLERED: | 1 YES |
| 2. | CONSTRUCTION REQUIREMEN | NTS |
| | TYPE OF CONSTRUCTION: ROOF ASSEMBLIES: FLOOR ASSEMBLIES: | NO RATING REQUIRED |
| | MEZZANINES: | 1 HR. FIRE-RATED - NOT APPLICABLE IN THIS AREA |
| | LOAD BEARING WALLS AND COLUMNS: | RATED TO MATCH SUPPORTED ASSEMBLY |
| | MINIMUM EXITS REQUIRED: DISTANCE BETWEEN EXITS: | 3.3.1.5.(1) 2 REQUIRED 3.4.2.3.(1)(b) 1/2 DIAGONAL FLOOR AREA BUT NOT LESS THAN 9m. |
| | TRAVEL DISTANCE: | 3.4.2.5.(1)(c) 45m |

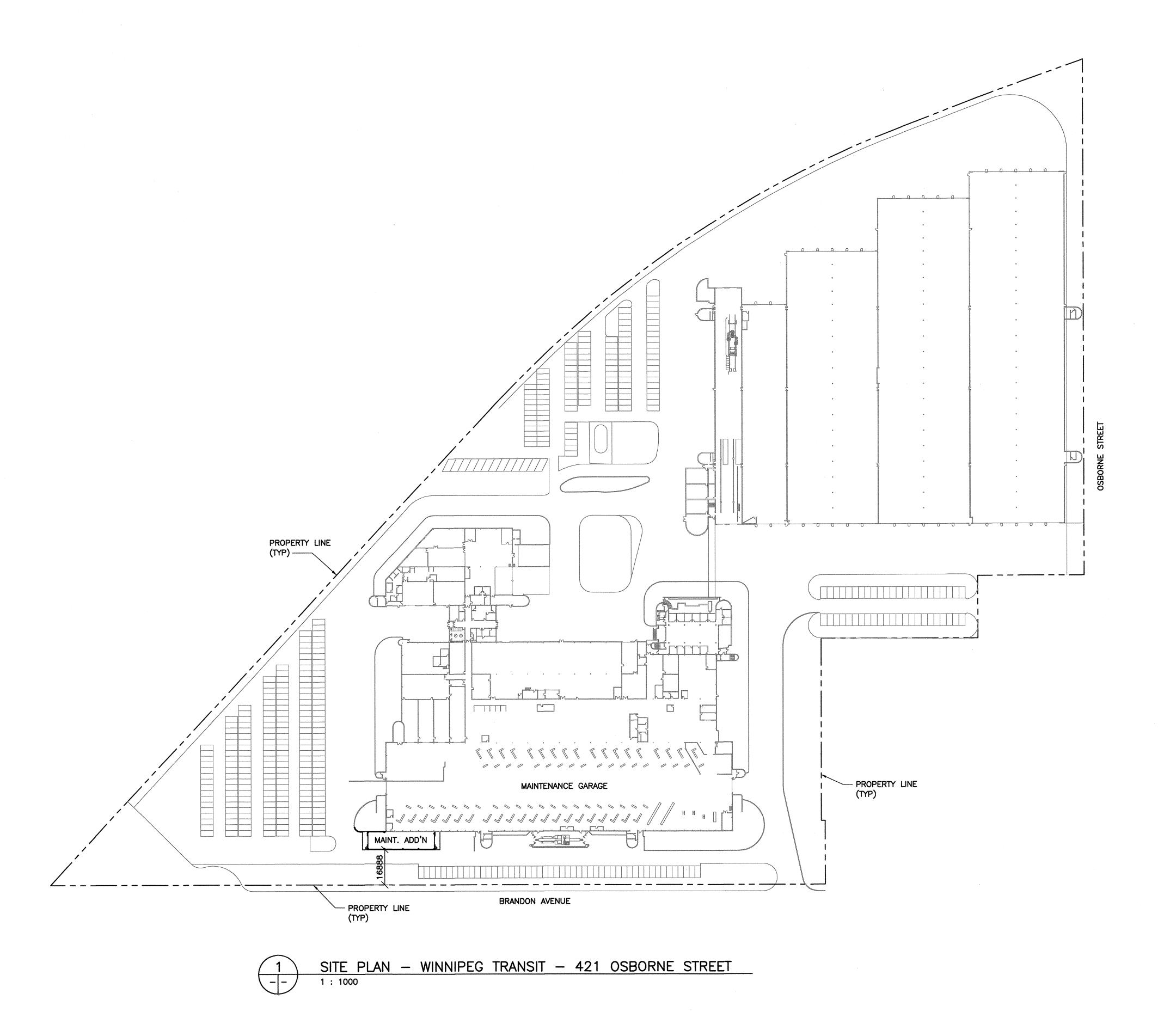


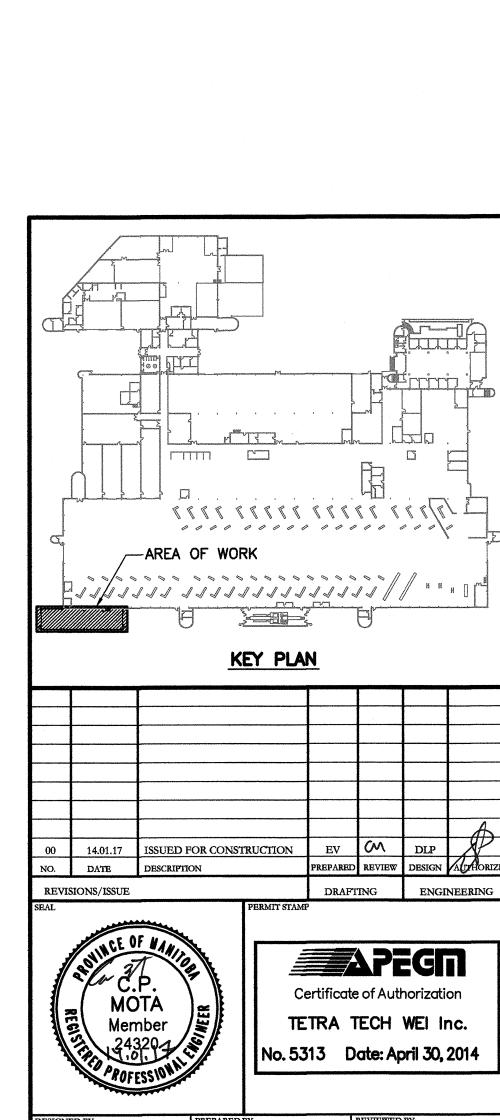
TT PROJECT No. 1329720500

REFERENCE DRAWINGS

DESCRIPTION







DLP

AUTHORIZED BY

DATE:

13.11.06

SCALE:

13.11.06

AS NOTED

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CITY OF WINNIPEG TRANSIT DEPARTMENT



TETRA TECH

CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE BUS MAINTENANCE ADDITION

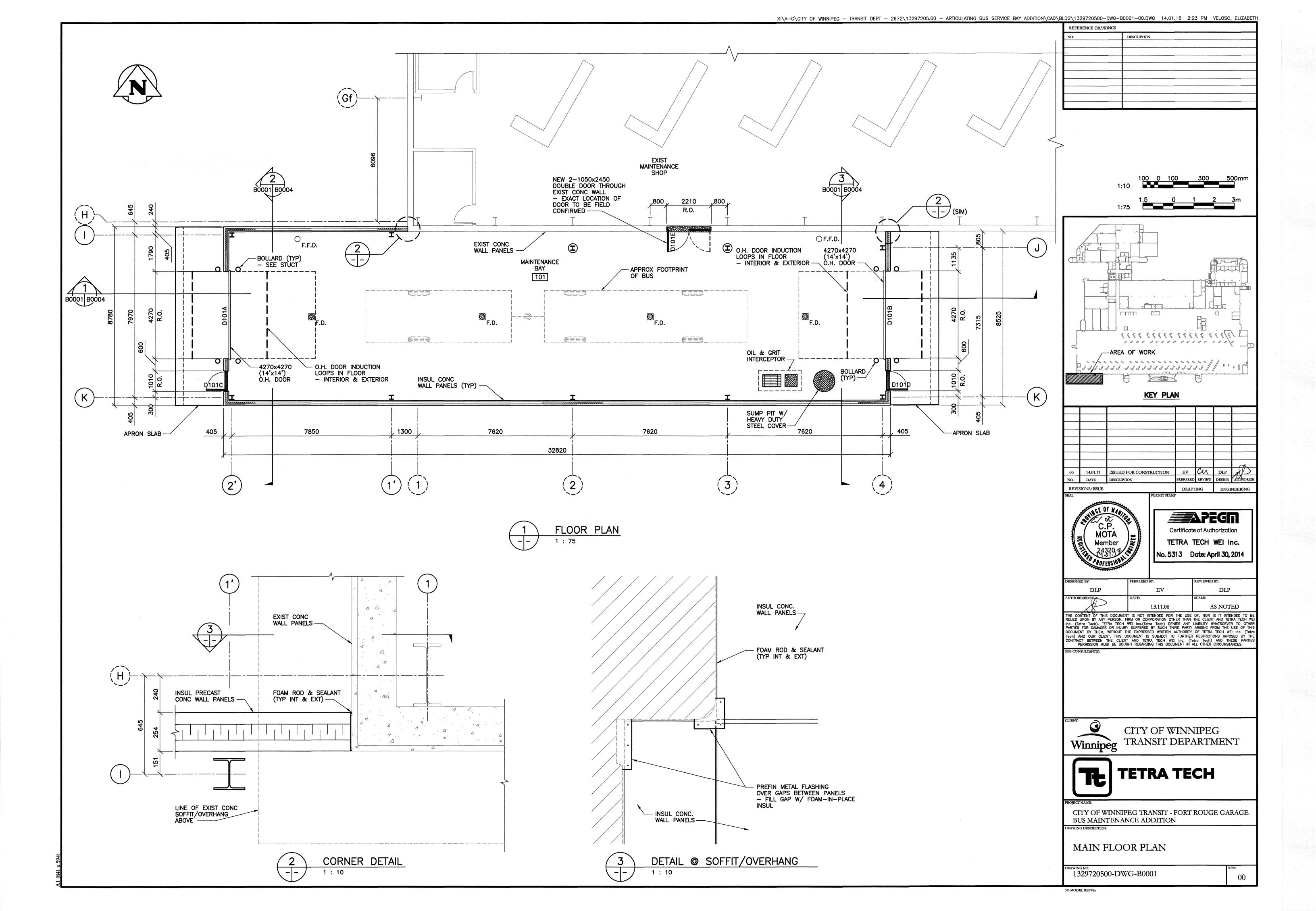
OVERALL SITE PLAN

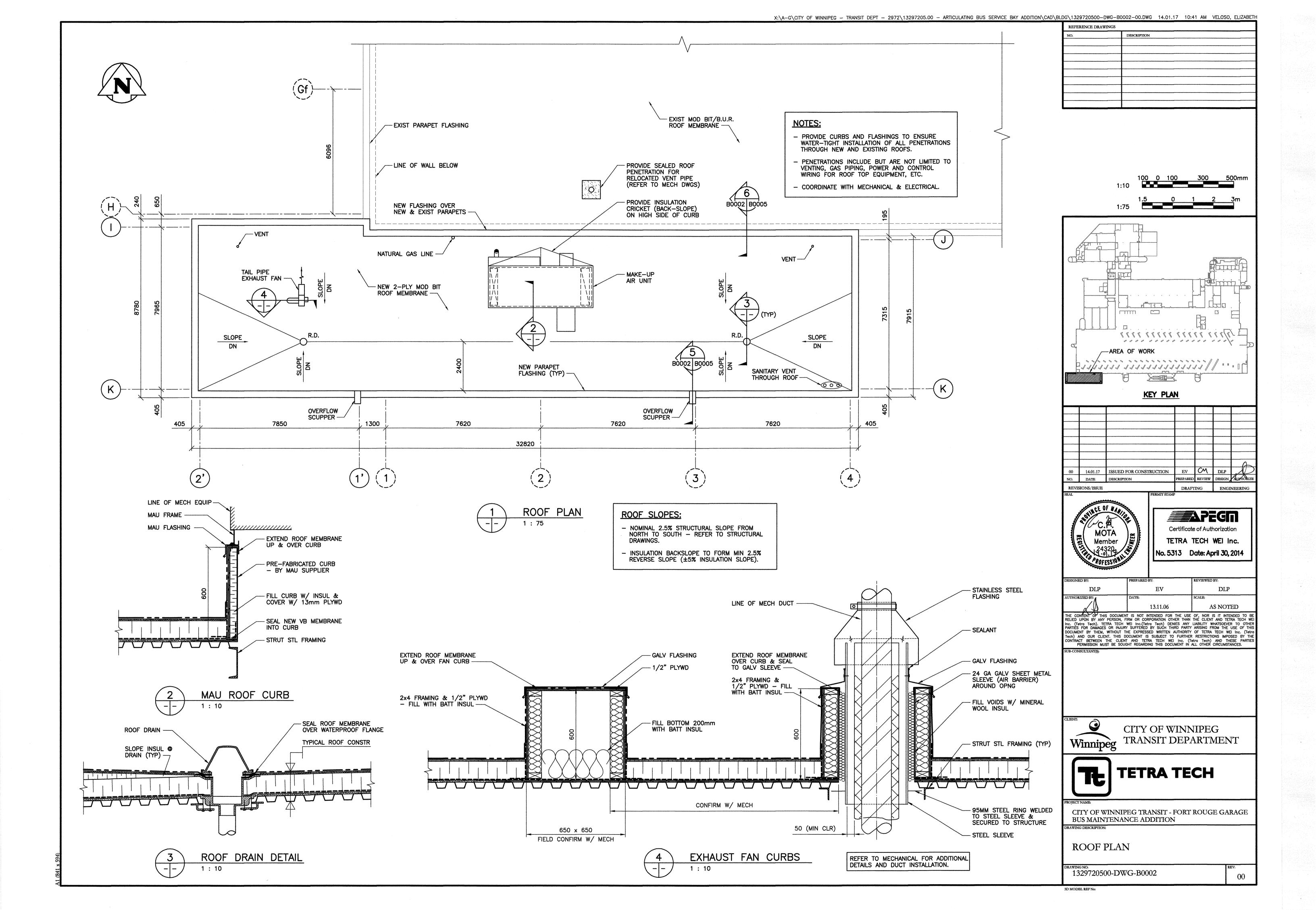
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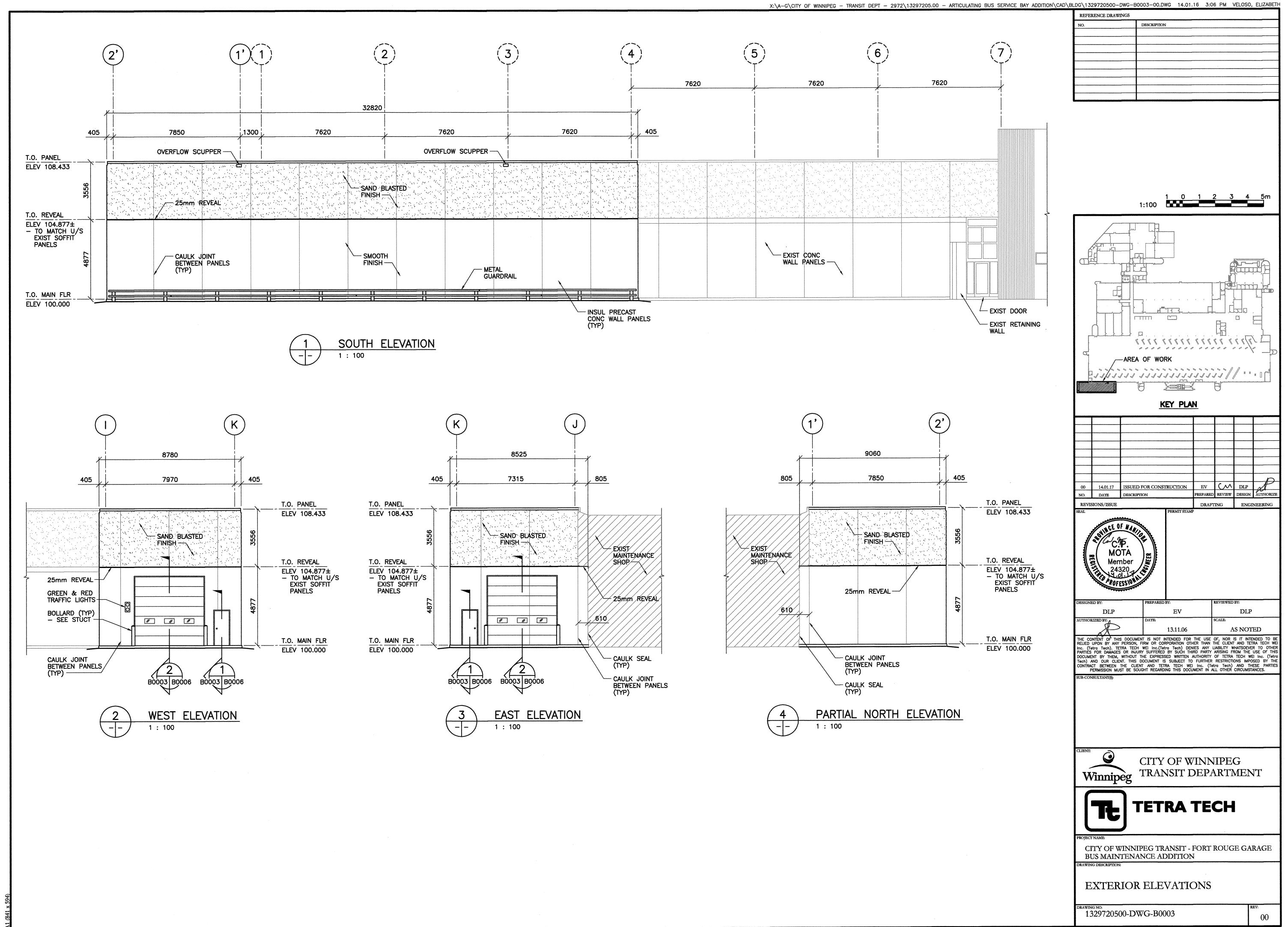
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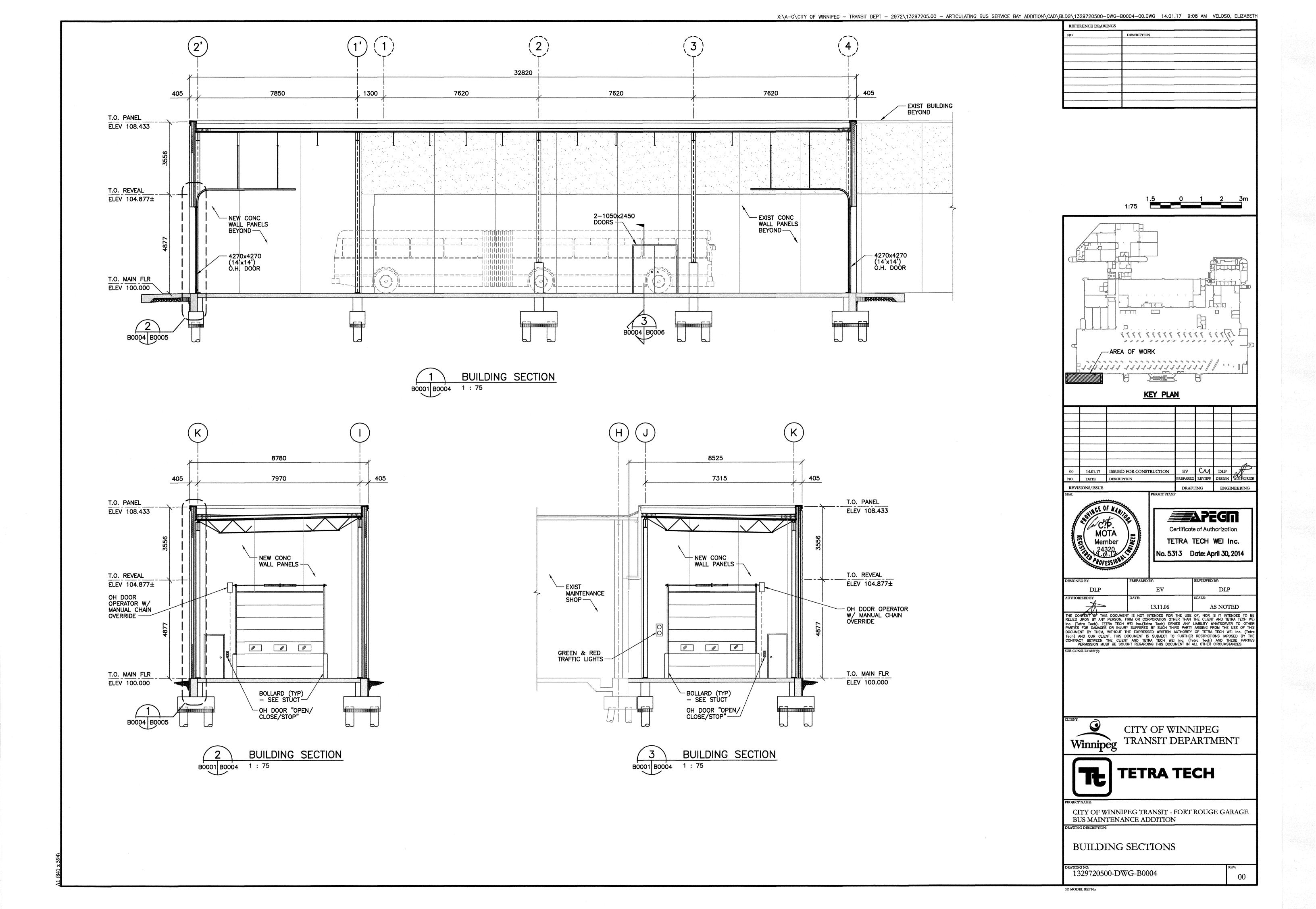
PAVEMENT MODIFICATION PLAN

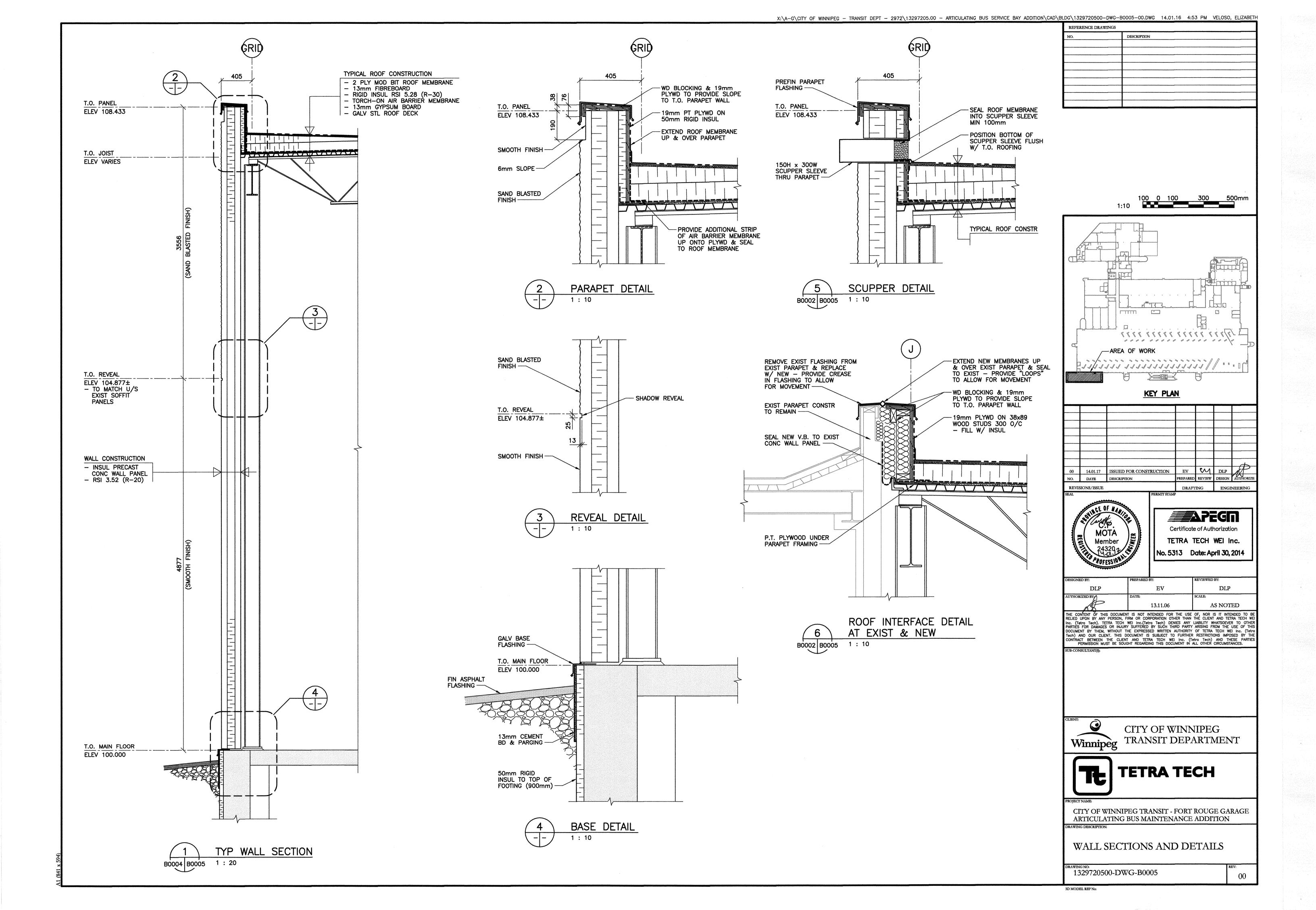
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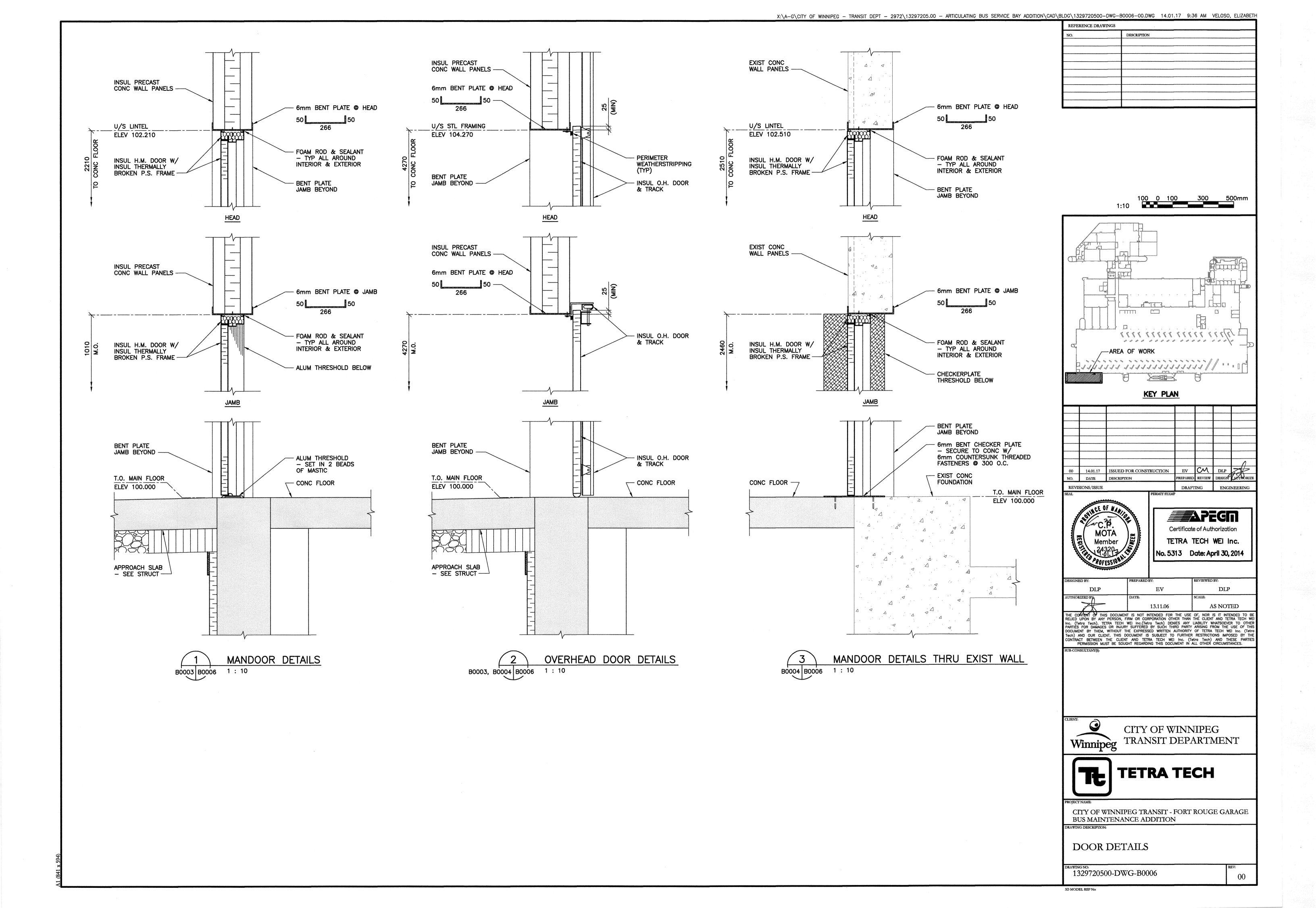












GENERAL:

DO NOT SCALE DRAWINGS.

VERIFY ALL DIMENSIONS PRIOR TO COMMENCING CONSTRUCTION. VERIFY ALL MECHANICAL AND ELECTRICAL REQUIREMENTS WITH RESPECTIVE DISCIPLINES. VERIFY ALL MAJOR OPENINGS WHICH

ARE REQUIRED BUT ARE NOT SHOWN ON THE DRAWINGS WITH

- THE CONTRACT ADMINISTRATOR. SHOP DRAWINGS AND PRODUCT DATA: SUBMIT OR REVIEW PRIOR TO FABRICATION. SHOP DRAWINGS AND PRODUCT DATA REQUIRED FOR THIS PROJECT INCLUDE:
 - INSULATED CONCRETE PANELS ROOFING
- STEEL DOORS AND FRAMES
- OVERHEAD DOORS
- .5 UNLESS NOTED OTHERWISE, INSTALL PRODUCTS IN ACCORDANCE WITH MANUFACTURES WRITTEN INSTRUCTIONS.

PRESSURE TREATED LUMBER AND PLYWOOD:

- WOOD STUDS AND PLATES TO BE GROUP D, #2 OR BETTER, (SPF).
- ALL WOOD TO BE KILN DRIED.
- PLYWOOD THICKNESS AS SHOWN ON DRAWINGS. - PRESSURE PRESERVATIVE: CHROMATED COPPER ARSENATE TO CSA 080-74.
- SURFACE-APPLIED WOOD PRESERVATIVE: CLEAR SOLUTION, WATER REPELLENT PRESERVATIVE.
- ALL FASTENERS TO BE GALVANIZED TO CAN/CSA-G164.

INSULATED CONCRETE PANELS

MANUFACTURER QUALIFICATIONS:

- MANUFACTURER OF PRECAST CONCRETE ELEMENTS SHALL BE CERTIFIED BY THE CANADIAN STANDARDS ASSOCIATION (CSA) ACCORDING TO CSA-A23.4 "PRECAST CONCRETE - MATERIALS AND CONSTRUCTION.
- MANUFACTURER SHALL BE A MEMBER IN GOOD STANDING WITH THE CANADIAN PRECAST/PRESTESSED CONCRETE INSTITUTE (CPCI).

.2 FIELD VERIFICATION:

- CONTRACTOR SHALL FIELD VERIFY ALL DETAILS AND DIMENSIONS RELATED TO THE MANUFACTURING AND INSTALLATION OF NEW PANELS. - ENSURE PROFILES AND DIMENSIONS OF EXISTING CONCRETE WALLS AND SOFFITS/OVERHANGS ARE ACCOMMODATED.

SAMPLES:

- PROVIDE 300x200x25mm SAMPLES OF PANELS FOR APPROVAL. - PROVIDE FINISHES AS DESCRIBED BELOW.

.4 MATERIALS:

- OVERALL PANEL THICKNESS: 254mm (10") - 76mm (3") EXTERIOR CONCRETE
 - 102mm (4") INSULATION RSI 3.52 (R-20) - 76mm (3") INTERIOR CONCRETE
- CONCRETE MIXES: - 28 DAY COMPRESSIVE STRENGTH: 35 MPa (CSA-A23.4)
- EXPOSURE CLASS: C-2 (CSA-A23.1)
- CEMENT, AGGREGATES WATER AND ADMIXTURES: TO CSA-A23.4 AND CSA-A23.1
- AIR ENTRAINMENT ADMIXTURE: TO ASTM C260 (CSA-A23.1) - USE OF CALCIUM CHLORIDE IS NOT PERMITTED
- INSULATION: EXTRUDED POLYSTYRENE TO CAN/CGSB-51.20-M87 TYPE 2 - COLOUR AND EXTERIOR FINISH: TO MATCH EXISTING CONCRETE PANELS - LOWER PORTION - SMOOTH
- UPPER PORTION SANDBLASTED - ANCHORS AND SUPPORTS: TO CSA-G40.21, TYPE 400W.

.4 INSTALLATION:

- INSTALL IN ACCORDANCE WITH ACCEPTED SHOP DRAWINGS AND MANUFACTURER'S WRITTEN INSTRUCTIONS.

MODIFIED BITUMINOUS ROOFING:

- ACCEPTABLE SYSTEMS: SOPREMA, IKO.
- .1 GYPSUM BOARD SHEATHING: - TO CSA A82.27, EXTERIOR GRADE, 1/2" THICKNESS.
 - FASTEN TO STEEL DECK USING No. 10 FLAT HEAD, SELF-TAPPING,
- .2 VAPOUR BARRIER: - TO CGSB 37-GP-56M, STYRENE-BUTADIENE-STYRENE (SBS) ELASTOMERIC POLYMER, PREFABRICATED SHEET, GLASS REINFORCEMENT, WEIGHING 95 g/m².

TYPE A OR TYPE AB, CADMIUM PLATED SCREWS TO CSA B35.3.

- TOP SANDED, BOTTOM POLYPROPYLENE. .3 ROOF MEMBRANE:

BASE SHEET:

- TO CGSB 37-GP-56M, STYRENE-BUTADIENE-STYRENE (SBS) ELASTOMERIC POLYMER, PREFABRICATED SHEET, POLYESTER REINFORCEMENT. WEIGHING 180 a/m². - TOP POLYETHYLENE, BOTTOM SANDED.
- CAP SHEET: - TO CGSB 37-GP-56M, STYRENE-BUTADIENE-STYRENE (SBS) ELASTOMERIC POLYMER, PREFABRICATED SHEET, POLYESTER
- REINFORCEMENT, WEIGHING 250 g/m². - TOP GRANULE SURFACE, BOTTOM POLYETHYLENE.
- AS RECOMMENDED BY ROOFING SYSTEM MANUFACTURER.
- ASPHALT TO CSA A123.4, TYPE 2.
- .6 INSULATION BOARD: - POLYISOCYANURATE BOARD INSULATION TO CAN/CGSB-51.26, THICKNESS AS INDICATED ON THE DRAWINGS, SHIPLAPPED EDGES.
- ADHERED TO ROOF IN FULL BED OF ASPHALT. - ACCEPTABLE PRODUCT: FIRESTONE ISO 95+, "E'NRG'Y 2" BY NRG BARRIERS, EXELTHERM Rx ISO, JOHNS MANVEL.
- HIGH DENSITY WOOD FIBREBOARD, 1/2" THICKNESS.
- .8 INSTALLATION:
 - INSTALL FIBREBOARD AND INSULATION IN FULL BED OF ASPHALT. - DO ALL ROOF WORK IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND CRCA STANDARDS.

OVERHEAD DOORS:

MATERIALS:

- GALVANIZED STEEL SHEET WITH Z275 ZINC COATING.
 0.41mm (0.016") SKINS AND 1.52mm (16 GA) END CAPS.
- 2 COAT BAKED ON POLYESTER FINISH.
- INSULATION TO PROVIDE R-14 VALUE. - 3" 14 ga. GALVANIZED STEEL TRACKS, HEAVY DUTY HARDWARE
- GLAZING: 610x305 (24"x12") INSULATED PANELS, 3 PER DOOR. - INTERIOR MOUNTED SLIDE LOCK AND WEATHERSTRIPPED. - AUTO-REVERSING BOTTOM SAFETY EDGE.
- MOTORIZED OPERATION W/ MANUAL CHAIN HOIST OVERRIDE. - MIN. 3/4 HP, 208V/3 PH MOTOR
- INDUCTION LOOP "SWITCHES" (2 PER DOOR) CUT INTO CONCRETE FLOOR AND APPROACH SLABS ON INTÈRIOR AND EXTERIOR OF DOOR. INTERIOR SURFACE—MOUNTED 3—BUTTON DOOR CONTROL STATION
- IN NEMA 1 ENCLOSURE "OPEN-CLOSE-STOP" - TRAFFIC LIGHT INDICATORS MOUNTED ON APPROACH SIDE OF DOOR. "GREEN" TO INCIDATE DOOR IS OPEN
- "RED" TO INDICATE DOOR IN MOTION - BOTH LIGHTS OFF WHEN DOOR IS CLOSED
- ACCEPTABLE PRODUCTS: THERMO-DOR TD-134 BY RELIABLE OVERHEAD DOORS, OR CLOPLAY #3720 BY WALLACE & WALLACE
- .2 INSTALLATION:
 - COORDINATE INSTALLATION WITH ELECTRICAL TO ENSURE PROPER OPERATION OF DOOR AND CONTROL/SAFETY COMPONENTS.

STEEL DOORS AND FRAMES

- HOT DIPPED GALVANIZED STEEL SHEET: TO ASTM A653M, Z275 COATING - REINFORCEMENT CHANNEL: TO CSA G40.20/G40.21, TYPE 44W, COATING DESIGNATION TO ASTM A653M, Z275 COATING.
- FACE SHEETS: 1.2mm (18 GA) BASE METAL THICKNESS.
- 2. FABRICATION: - FABRICATE DOORS WITH POLYURETHANE INSULATED CORE
 - FABRICATE DOORS WITH LONGITUDINAL EDGES CONTINUOUSLY WELDED. - SEAMS: GRIND WELDED JOINTS TO A FLAT PLANE, FILL WITH METALLIC
 - PASTE FILLER AND SAND TO A UNIFORM SMOOTH FINISH - BLANK, REINFORCE, DRILL DOORS AND TAP FOR TEMPLATED HARDWARE - PROVIDE FLUSH STEEL TOP CAP
- FRAMES: - 16 GA FULLY WELDED CONSTRUCTION.
- EXTERIOR DOOR FRAME THERMALLY BROKEN
- 4. FABRICATION: - BLANK, REINFORCE, DRILL AND TAP FRAMES FOR HARDWARE USING
- TEMPLATES PROVIDED BY FINISH HARDWARE SUPPLIER. - REINFORCE FRAMES FOR SURFACE MOUNTED HARDWARE
- PREPARE FRAME FOR DOOR SILENCERS, 3 PER DOOR - WELDING IN ACCORDANCE WITH CSA W59
- GRIND WELDED JOINTS AND CORNERS TO A FLAT PLANE, FILL WITH METALLIC PASTE AND SAND TO UNIFORM SMOOTH FINISH

DOOR HARDWARE:

- ALL LOCKS TO BE KEYED TO MATCH EXISTING DOORS AND THE CITY'S REQUIREMENTS.
- .1 CODE 1 HINGES CB191 NRP STANLEY SUPPLY AND INSTALLATION BY CITY ELECTRIC STRIKE PREP DOOR FRAME TO RECEIVE STRIKE **EXIT DEVICE** 88TP 629 VON DUPRIN CLOSER LCN 4111 689 OH STOP 100S SERIES 630 GLYNN JOHNSON WEATHERSTRIP W13 K.N. CROWDER BOTTOM SWEEP W13S K.N. CROWDER
- CODE 2 HINGES

CLOSER

THRESHOLD

THRESHOLD

CB179 114x101 PASSAGE SET D10S 4111 SURFACE BOLTS 1631/1632 WEATHERSTRIP W21

6mm CHECKERPLATE

CT45

26D 626 26D 26D STANLEY SCHLAGE LCN GLYNN JOHNSON K.N. CROWDER

K.N. CROWDER

ROOM / AREA FINISHING SCHEDULE

SEALANTS:

PAINTING:

- TO CAN/CGSB-19.24.

- TO CAN/CGSB-19.18.

- TO CGSB 19-GP-14M.

- COLOURS TO BE SELECTED

ONE-PART SILICONES (FOR METAL)

CONCRETE (PRECAST & CAST-IN-PLACE):

GALVANIZED AND ZINC COATED METAL:

GALVANIZED AND ZINC COATED METAL:

STRUCTURAL STEEL AND METAL FABRICATIONS:

MULTICOMPONENT URETHANES (FOR CONCRETE AND MASONRY)

- MPI SYSTEM INT 3.1A, PREMIUM GRADE, GLOSS LEVEL 3.

- MPI SYSTEM INT 5.1Q, PREMIUM GRADE, GLOSS LEVEL 3.

- MPI SYSTEM INT 5.3M, PREMIUM GRADE, GLOSS LEVEL 3.

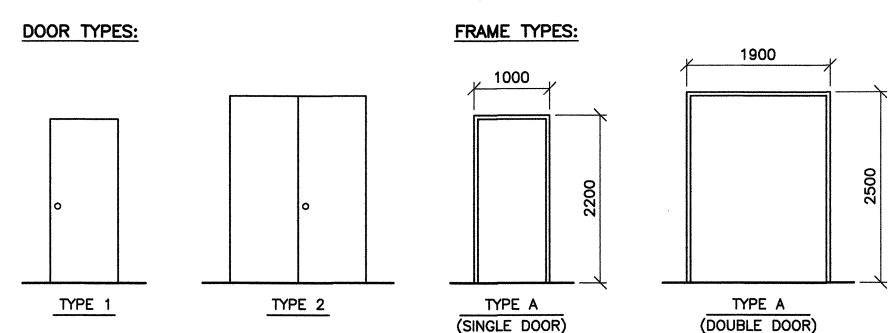
- MPI SYSTEM EXT 5.1C, PREMIUM GRADE, GLOSS LEVEL 3.

BUTYL SEALANT (SETTING ALUMINUM THRESHOLDS).

| | ROOM / AREA | | FLOOR | | NORTH | WALL | EAST | WALL | SOUTH | WALL | WEST | WALL | | CEILING | |
|--------|------------------|---------|---------|---------|---------|---------|----------|---------|---------|--------|----------|---------|--------|---------|-------|
| ROOM # | ROOM / AREA NAME | MAT | FIN | BASE | MAT | FIN | MAT | FIN | MAT | FIN | MAT | FIN | MAT | FIN | HT |
| 101 | MAINTENACE BAY | ပ | - | | C(e) | Р | С | Р | С | Р | С | Р | STR | Р | 7925± |
| | | PAINTIN | G TO IN | CLUDE A | LL CONC | CRETE W | ALLS, ST | EEL BEA | AMS, CO | LUMNS, | JOISTS A | ND STEE | L ROOF | DECK. | |

DOOR / WINDOW SCHEDULE

| | 000R / | WINDOW | • | | FRAMI | E | DOOR SIZE | HARDWARE CODE | F.R. RATING (HOURS) | REMARKS |
|--------|--------|---------|---------|------|-------|-----|-----------------------|------------------|------------------------|----------------------|
| NUMBER | TYPE | MAT | FIN | TYPE | MAT | FIN | | | | |
| D101A | INSULA | TED OVE | RHEAD [| OOR | | | 4270 x 4270 (14'x14') | | _ | |
| D101B | INSULA | TED OVE | RHEAD [| DOOR | | | 4270 x 4270 (14'x14') | _ | | |
| D101C | 1 | НМ | Р | Α | PS | Р | 900 x 2150 x 45 | 1 | _ | INSUL DOOR AND FRAME |
| D101D | 1 | НМ | Р | Α | PS | Р | 900 × 2150 × 45 | 1 | - | INSUL DOOR AND FRAME |
| D101E | 2 | НМ | Р | Α | PS | Р | 2 - 1050 x 2450 x 45 | 2 | 1.5 | |



ABBREVIATIONS:

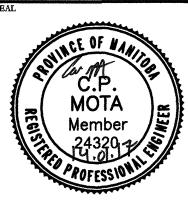
- CONCRETE BLOCK EXISTING - FINISH GALVANIZED **GALV** - GYPSUM BOARD - HOLLOW METAL HEIGHT INSUL - INSULATED - LAY-IN ACOUSTIC TILE MATERIAL MAT PAINT PRESSED STEEL - RUBBER BASE - RESILIENT SHEET FLOORING STR STRUCTURE

- THERMALLY BROKEN

- CONCRETE

REFERENCE DRAWINGS DESCRIPTION

PREPARED REVIEW DESIGN ANTHORIZE DATE DESCRIPTION REVISIONS/ISSUE DRAFTING ENGINEERING



APEGIN Certificate of Authorization TETRA TECH WEI Inc. No. 5313 Date: April 30, 2014

DLP DLP EV AS NOTED 13.11.06

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TRANSIT DEPARTMENT



BUILDING SPECIFICATIONS

1329720500-DWG-B0007

CITY OF WINNIPEG



TETRA TECH

CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE **BUS MAINTENANCE ADDITION**

50mm

GENERAL

- All WORK SHALL BE PERFORMED IN ACCORDANCE WITH MANITOBA BUILDING CODE 2011, THE MANITOBA WORKER SAFETY ACT, LOCAL CODES, BYLAWS, ORDINANCES.
- AND SAFETY REGULATIONS. THE COMPLETE WORK SHALL BE GOVERNED BY THE DICTATES OF GOOD PRACTICE IN ALL DETAILS OF MATERIALS AND METHODS EVEN IF NOT MINUTELY SPECIFIED.
- THE DRAWINGS DESCRIBE THE COMPLETED PROJECT AND DO NOT INDICATE COMPONENTS THAT MAY BE NECESSARY FOR CONSTRUCTION SAFETY. THE CONTRACTOR IS RESPONSIBLE FOR SAFETY IN AND ABOUT THE JOB SITE DURING CONSTRUCTION, AND THE DESIGN AND ERECTION OF ALL TEMPORARY AND PERMANENT STRUCTURES, FORMWORK, FALSEWORK, SHORING, ETC., REQUIRED TO COMPLETE THE PROJECT. MAINTAIN THE SITE, AT LEAST ON A DAILY BASIS, FREE FROM ACCUMULATIONS OF WASTE MATERIAL AND DEBRIS. DISPOSE OF WASTE MATERIAL IN ACCORDANCE WITH LOCAL REGULATIONS. DO NOT SCALE DRAWINGS. VERIFY ALL DIMENSIONS AND ELEVATIONS IN THE FIELD AND REPORT
- LOCATE AND PROTECT ALL MECHANICAL, ELECTRICAL AND MUNICIPAL SERVICES BEFORE COMMENCING CONSTRUCTION. COORDINATE THE WORK WITH THE REQUIREMENTS OF ARCHITECTURAL, MECHANICAL, ELECTRICAL, AND CIVIL DRAWINGS. VERIFY THE LOCATIONS OF ALL EQUIPMENT AND OPENINGS. DO NOT SEPARATE DRAWING SETS.
- THE CONTRACTOR WILL LEAVE THE SITE IN THE SAME OR BETTER CONDITION THAN IT WAS BEFORE CONSTRUCTION. SITE CLEAN-UP, DRAINAGE, SECURITY, ETC. AND CONDITION OF THE WORK WILL BE TO THE SATISFACTION OF THE ENGINEER BEFORE LEAVING THE SITE.
- ELEVATION 100.000 TO MATCH TOP OF EXIST CONC FLOOR ALONG GRID LINE H

LOADING

ALL LOADS AND FORCES SHOWN ARE SERVICE (UNFACTORED) KILOPASCALS (kPa) AND KN UNLESS NOTED OTHERWISE.

SELF WEIGHT. MATERIALS OF CONSTRUCTION, MECHANICAL, ELECTRICAL, PERMANENT EQUIPMENT AND PARTITIONS. ROOF ROOFING AND INSULATION 0.7 0.5 ROOF JOISTS AND BEAMS 1.0 HANGING MECHANICAL AND ELECTRICAL

SUPERIMPOSED MECHANICAL AND ELECTRICAL

250 THK INSULATED CONCRETE DL = 3.6 kPa

LIVE LOADS A) ENVIRONMENTAL LOADS GROUND SNOW LOAD Ss = 1.9 kPaSr = 0.2 kPaRAIN LOAD 108 mm ONE DAY RAIN UNIFORM SNOW S = 0.8 (1.9) + 0.2 = 1.72 kPaDRIFT SNOW ON LOW ROOFS - AS SHOWN ON PLANS WIND - BUILDING CATEGORY II Q(1/50) HOURLY PRESSURE WÌND LOADING (MAX SERVICE) A=1 SQ.M.. Ce=0.98. Z= 1.8 m INTÉRIOR AREAS EXTERIOR WALLS END ZONES 1.30 kPa INTERIOR (R) 1.03 kPa EDGES (S) 1.25 kPa CORNERS (C) 1.25 kPa

SUPERIMPOSED OCCUPANCY LIVE LOADS (UNFACTORED SERVICE) MAIN FLOOR

VEHICULAR LOADING DESIGNED TO ACCOMMODATE A NEW FLYER DEGOLF ARTICULATED BUS

| 4,345 kg (9,560 lbs) | 4,980 kg | (10,960 lbs) | | 10,410 kg (22,900 lbs) | - AXLE LOADS |
|-------------------------|----------|--------------|------|---------------------------|--------------|
| | 5790 | | 7680 | | |

SLAB AND GRATING CAN ACCOMMODATE MAX AXLE LOAD OF 11,360 kg (25,000 lbs).

SHOP DRAWINGS

- SUBMIT SHOP DRAWINGS, SKETCHES AND DESIGN CALCULATIONS (AS REQUIRED) FOR REVIEW. ALLOW MINIMUM TEN (10) WORKING DAYS FOR REVIEWS. SUBMISSIONS FOR THIS PROJECT INCLUDE:
 - PILING REINFORCING STEEL LAYOUT, CONCRTE MIX, LAYOUT, AND INSTALLATION - CONCRETE (MIX DESIGNS). REINFORCING STEEL LAYOUT AND EMBEDMENTS
 - STEEL ROOF DECK
 - OWSJ, STRUCTURAL STEEL AND METAL FABRICATIONS - PRECAST INSULATED CONCRETE WALL PANELS
 - SHOP DRAWINGS FOR COMPONENTS DESIGNED BY THE CONTRACTOR MUST BEAR THE STAMP OF A QUALIFIED PROFESSIONAL ENGINEER LICENCED IN THE PROVINCE OF MANITOBA.

FOUNDATIONS

- FOUNDATIONS HAVE BEEN DESIGNED BASED ON THE SOILS REPORT BY THE NATIONAL TESTING
- LABORATORIES LTD. DATED APRIL19, 2013. CAST-IN-PLACE CONCRETE FRICTION PILES HAVE BEEN DESIGNED BASED UPON AN ALLOWABLE SKIN FRICTION OF 17 kPa AND ULTIMATE SKIN FRICTION OF 20.4 kPa, EXCLUDING THE TOP 2.5m OF THE PILES.
- CONCRETE SHALL BE PLACED AS SOON AS POSSIBLE TO MINIMIZE ANY POTENTIAL PROBLEMS RELATED TO SOIL SLOUGHING AND GROUNDWATER SEEPAGE.
- TEMPORARY STEEL SLEEVES SHOULD BE AVAILABLE IN THE EVENT THAT GROUNDWATER SEEPAGE OR SLOUGHING OF PILE HOLES IS ENCOUNTERED DURING PILE INSTALLATTION.
- GROUNDWATER, IF ENCOUNTERED IN THE PILE HOLES, MUST BE REMOVED PRIOR TO CONCRETE PLACEMENT.

EXCAVATING AND BACKFILLING

- EXISTING CONDITIONS: VISIT THE SITE AND NOTE ALL CHARACTERISTICS AND IRREGULARITIES AFFECTING THE WORK, CONFIRM EXACT LOCATIONS OF ALL SERVICES AND UTILITIES AND PROTECT FROM DAMAGE. OBTAIN AND PAY FOR ANY NECESSARY PERMITS REQUIRED TO COMPLETE THE WORK.
- ALL MATERIALS TO BE SUBJECT TO ENGINEER'S APPROVAL. STOCKPILE FILL MATERIALS IN AREAS DESIGNATED BY ENGINEER. STOCKPILE GRANULAR MATERIALS TO PREVENT SEGREGATION. REMOVE FROM THE SITE AND DISPOSE OF SURPLUS OR UNSUITABLE MATERIAL. PROOF ROLL SUBGRADE, COMPACT TO 95 % STANDARD PROCTOR MAXIMUM DRY DENSITY
- (SPMDD). PLACE FILL WITHIN 2% OF OPTIMUM MOISTURE CONTENT TO THE REQUIRED ELEVATION IN LIFTS NOT EXCEEDING 150mm. COMPACT FILL TO FOLLOWING STANDARD DENSITIES (SPMDD).
 - UNDER SLAB-ON-GRADE A-BASE 100% (MINIMUM 150 THICK FOR EACH LAYER)

| METRIC SIEVE SIZE (µm) | A-BASE (% PASSING) |
|------------------------|-----------------------|
| 50,000 | · |
| 25,000 | 100 |
| 20,000 | 80 — 100 |
| 5,000 | 40 - 70 |
| 2,500 | 25 - 55 |
| 315 | 13 - 30 |
| 80 | 5 - 15 |

- .4 USE EXTREME CAUTION WHERE UNBALANCED LOADING MAY OCCUR ON WALLS AND STRUCTURES. MAXIMUM UNBALANCED ELEVATIONS 300mm, UNLESS APPROVED BY THE ENGINEER IN WRITING PREVENT BOTTOMS OF EXCAVATIONS FROM SOFTENING OR FREEZING. DO NOT OVER EXCAVATE IF SOFTENING OR OVER EXCAVATION OCCURS, REPLACE WITH A-BASE COMPACTED TO 100% MODIFIED PROCTOR MAXIMUM DRY DENSITY (MPMDD) A-BASE OPTIMUM MOISTURE CONTENT OR LEAN MIX CONCRETE.
- DEWATERING: PROVIDE AND/OR SUITABLE EQUIPMENT INCLUDING PUMPS, PIPING. TEMPORARY DRAINS, GRADING, TRENCHES AND SUMPS TO KEEP EXCAVATIONS FREE FROM WATER UNTIL CONCRETE IS PLACED, CURED, AND STRUCTURAL ADEQUACY IS ASSURED.
- INSPECTION AND TESTING; OWNER WILL PAY COSTS FOR INSPECTION AND TESTING. A) EXCAVATED SURFACES: MAKE A SERIES OF THREE TESTS FOR EACH 450 sq.m. WHEN UNDISTURBED EXCAVATED SURFACE IS BEING PREPARED.
- FILLS UNDER SLABS ON GRADE: MAKE 3 TESTS FOR EVERY 2 LIFTS OF COMPACTED FILL FOR EACH 450 sg.m. AREA.
- BACKFILL AGAINST WALLS: MAKE ONE TEST OF EACH DIFFERENT MATERIAL FOR APPROXIMATELY EACH 50m OF WALL BEING BACKFILLED AT DEPTH INCREMENTS OF 600mm.

<u>FORMWORK</u>

- FORMWORK TO CAN/CSA-S269.3-M92, "CONCRETE FORMWORK" FORM OIL TO BE NON-STAINING, NON-TOXIC, AND NON-VOLATILE,
- ACCESSORIES SUCH AS HI-CHAIRS, SPACERS, ETC., WILL BE SUPPORTED USING PADS OF PLYWOOD OR TEMPERED FIBREBOARD TO PREVENT PUNCTURING. POLYSTYRENE IS NOT AN ACCEPTABLE FORM MATERIAL BENEATH SLABS.
- PROVIDE ISOLATION JOINTS BETWEEN SLABS AND INTERIOR WALLS AND PEDESTALS WHERE SHOWN.
- BEFORE CONCRETE IS PLACED, REVIEWED EQUIPMENT SHOP DRAWINGS SHALL BE EXAMINED FOR THE PROVISION OF OPENINGS, ANCHOR BOLTS, INSERTS, ETC.

CAST-IN-PLACE CONCRETE

- .1 ALL CONCRETE MIXES, PLACING, CURING, AND TESTING WILL BE IN ACCORDANCE WITH CSA-A23.1-09/A23.2-09 CONCRETE MATERIALS AND METHODS OF CONCRETE CONSTRUCTION/ TEST METHODS AND STANDARD PRACTICES FOR CONCRETE.
- CONCRETE ADMIXTURES CONFORM TO CSA A3000-08 CEMENTITOUS MATERIALS COMPENDIUM CONCRETE MIXES TO BE IN ACCORDANCE WITH CSA-A23.1-09, ALTERNATIVE 1;

| NO. | LOCATION | CLASS OF EXPOSURE | MAX WATER TO CEMENTIOUS MATERIAL RATIO | MIN. f'c (MPa) | AIR CONTENT CATEGORY | CURING TYPE |
|-----|--|----------------------|--|-------------------|-------------------------|----------------|
| 1 | MAIN FLOOR SLAB/ APRON SLABS/ PRECAST WALL PANELS | C-2 | 0.45 | 32 © 28d | 1 | 2 |
| 2 | GRADE BEAMS/PILE CAPS/ PEDESTALS/CAST-IN-PLACE PILES | S-2 | 0.45 | 32 © 56d | 2 | 2 |

- BEFORE PLACING REVIEW SHOP DRAWINGS FOR EQUIPMENT, OPENINGS, ANCHOR BOLTS, EMBEDS, ETC. TO ENSURE COMPLETENESS.
- CONCRETE SLAB FINISH: a) ALL INTERIOR AREAS, BULL FLOATED AND RECEIVE A SHAKE APPLIED HARDENER APPLIED A RATE OF 100 POUNDS PER 100 SQ. FT AND A LIGHT BROOM FINISH. SLAB TO BE WET CURED
- METALLIC HARDENER: NON-OXIDIZING METALLIC AGGREGATE BY MASTER BUILDERS TECHNOLOGIES, ADJUVANTS EUCLID CANADA INC. OR APPROVED EQUAL.
- EXTERIOR SLABS. APRONS AND EQUIPMENT PADS: LIGHT BROOM FINISH. SLAB TOLERANCES SHALL BE AS FOLLOWS
- (1) FF25, FL17 EXTERIOR FACE OF GRADE BEAMS TO BE COATED WITH ASPHALTIC BITUMINOUS DAMPPROOFING.
- **TESTING:** A) AN INDEPENDENT INSPECTION/TESTING AGENCY WILL BE ENGAGED BY THE OWNER. RESULTS OF FIELD TESTS WILL BE REPORTED IMMEDIATELY TO THE CONTRACTOR. INSPECTION AND TESTING DOES NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY FOR QUALITY CONTROL AND
- CONTRACTUAL OBLIGATIONS. TESTING FIRM WILL PREPARE THREE TEST CYLINDERS FROM EACH 50 CU.m. OF CONCRETE, OR FRACTION THEREOF, FOR EACH DAY, TYPE OF CONCRETE, OR TYPE OF STRUCTURAL COMPONENT.
- ONE SLUMP TEST AND ONE ENTRAINED AIR TEST FOR EACH SET OF CYLINDERS. USE COLD WEATHER CONCRETING METHODS WHEN THE MEAN AMBIENT TEMPERATURE FALLS BELOW +5°C. ADDITIONAL TEST CYLINDERS WILL BE PREPARED DURING COLD WEATHER CONCRETING AND FIELD CURED UNDER SAME CONDITIONS AS CONCRETE WHICH THEY REPRESENT.

STRUCTURAL STEEL

- DESIGN, DETAILING, FABRICATION AND ERECTION OF STRUCTURAL STEEL TO CONFORM TO:
- CSA S16-09, DESIGN OF STEEL STRUCTURES. CSA S136-12, NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD-FORMED STEEL STRUCTURAL MEMBERS.
- CSA W59-03 (R2008), WELDED STEEL CONSTRUCTION.
- CSA G40.20-04 (R2009), GENERAL REQUIREMENTS FOR ROLLED OR WELDED STRUCTURAL QUALITY STEEL.
- CSA G40.21-04 (R2009), STRUCTURAL QUALITY STEELS. CSA W47.1-09, CERTIFICATION OF COMPANIES FOR FUSION WELDING OF STEEL STRUCTURES. ASTM A325M, HIGH STRENGTH BOLTS.
- CHANNELS, ANGLES, TEES AND PLATES: TO G40.21, 300 MPa. WELDED WIDE FLANGE: TO G40.21, 350W.
- W SHAPES. HSS: TO G40.21, 350W
- BOLTS: TO ASTM A325, MIN TWO PER CONNECTION U.N.O. ANCHOR RODS: TO ASTM A307.
- STRUCTURAL STEEL SUPPLIER IS RESPONSIBLE FOR DESIGN OF ALL CONNECTIONS NOT SHOWN. SUBMIT SHOP DRAWINGS BEARING SEAL OF A PROFESSIONAL ENGINEER REGISTERED IN MANITOBA FOR REVIEW PRIOR TO FABRICATION.
- .8 ALL BRACING TO BE CONNECTED FOR LOADS INDICATED ON DRAWINGS. .9 HOLES LARGER THAN 450×450 THROUGH ROOF DECK TO BE REINFORCED WITH C200x17 STEEL CHANNELS ALL AROUND, SPANNING TO ADJACENT MEMBERS, U.N.O.
- SUPPORT EDGES WHERE DECK CHANGES DIRECTION IN SPAN. .10 SUPPLY AND ERECT TEMPORARY GUYING AND BRACING TO PROVIDE STABILITY FOR STRUCTURE AS A WHOLE. THESE SHALL REMAIN IN PLACE UNTIL STEEL DECKING AND PERMANENT BRACING IS ERECTED AND FULLY SECURED AND ALL MASONRY
- WALLS ARE CONSTRUCTED. .11 SEE BUILDING DRAWINGS FOR PAINT SPECIFICATIONS.

CONCRETE REINFORCING

- CONCRETE REINFORCEMENT 400 MPa DEFORMED BARS. ALL STEEL TO BE DETAILED IN ACCORDANCE WITH CSA A23.1-09 CONCRETE MATERIALS AND METHODS OF CONCRETE CONSTRUCTION/ TEST METHODS AND STANDARD PRACTICES
- FOR CONCRETE. CLEAR COVER TO REINFORCING WILL BE: CONCRETE CAST AGAINST EARTH 75mm
- 50mm SLABS-ON-GRADE BEAMS AND SLABS: LAP TOP STEEL MIDSPAN AND BOTTOM STEEL OVER SUPPORTS
 - PROVIDE LAPS TO CSA A23.3 OR THE FOLLOWING MINIMUMS. 10M - 700mm
 - 15M 1000mm 20M - 1200mm
- 25M 1900mm .6 ALL REINFORCING TO BE HELD IN PLACE AND TIED WITH PROPER ACCESSORIES,
- HI-CHAIRS AND SPACERS. DETAIL, SUPPLY AND INSTALL ALL ACCESSORIES. HI-CHAIRS TO HAVE 4 LEGS AND TO BE STAPLED OR NAILED TO THE FORMWORK.
- ALL OPENINGS; (U.N.O) ADD 2-15M BARS EACH SIDE AND 2-15M BARS DIAGONAL 1200mm LONG EACH CORNER.
- ALL REQUIRED OPENINGS NOT SHOWN ON STRUCTURAL DRAWINGS SHALL BE APPROVED BY THE CONSULTANT PRIOR TO CONSTRUCTION.

CONCRETE GRADE BEAMS, PEDESTALS, PILE CAPS

- REINFORCING STEEL SHALL BE CLEAN AND FREE OF ALL DIRT, GREASE AND OTHER
- DELETERIOUS MATERIALS PRIOR TO PLACING CONCRETE. .10 REINFORCING STEEL SHALL BE DEFLECTED, NOT CUT AROUND INSERTS AND
- OPENINGS LESS THAN 450mm. REINFORCING STEEL SHALL NOT BE WELDED, HEATED OR BENT ON-SITE WITHOUT PRIOR
- APPROVAL OF THE CONSULTANT. .12 MISCELLANEOUS CONCRETE: REINFORCE WITH 15M AT 300mm O.C., E.W.

STEEL JOISTS

- DESIGN, DETAILING, FABRICATION AND ERECTION OF OPEN WEB STEEL JOISTS TO CONFORM TO:
- CSA S16-09, DESIGN OF STEEL STRUCTURES CSA S136-07 (R2012), COLD FORMED STEEL STRUCTURAL MEMBERS.
- CSA W59-03 (R2008), WELDED STEEL CONSTRUCTION. CSA W47.1 — CERTIFICATION OF COMPANIES FOR FUSION WELDING OF STEEL STRUCTURES DESIGN JOISTS TO DEPTHS SHOWN FOR LOADS INDICATED INCLUDING SNOW DRIFTING SHOWN. VERIFY LOCATIONS AND WEIGHTS OF ALL MECHANICAL EQUIPMENT. LINE UP WEB MEMBERS
- WHERE REQUIRED. MAXIMUM ROOF LIVE LOAD DEFLECTION TO BE LIMITED TO 1/300 OF THE SPAN (U.N.O.).
- PROVIDE JOIST BRIDGING IN ACCORDANCE WITH CSA S16-09. CONNECT ALL BRIDGING TO
- WALLS, BEAMS AND COLUMNS AS REQUIRED. JOISTS ARE TO BE CAMBERED FOR GREATER OF: FULL DEAD LOAD DEFLECTION OR NOMINAL CAMBER AS SPECIFIED IN CSA S16-09
- JOISTS BEARING ON BEAMS TO REST ON MIDDLE THIRD OF FLANGE. JOISTS IN LINE TO BEAR END TO END ON SUPPORTING BEAMS.
- ALL STEEL JOISTS TO BE HOT DIPPED GALVANIZED. FIELD WELD STEEL JOISTS TO BEAMS OR BEARING PLATES WITH A MINIMUM OF
- 50mm OF 6mm FILLET WELD BOTH SIDES. PROVIDE TIED ROOF JOISTS AT COLUMNS. CONNECT FOR 50% JOIST BENDING
- CAPACITY OR LOAD INDICATED. SUBMIT SHOP DRAWINGS FOR OWSJ BEARING SEAL OF A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF MANITOBA FOR REVIEW PRIOR TO FABRICATION.

STEEL DECK

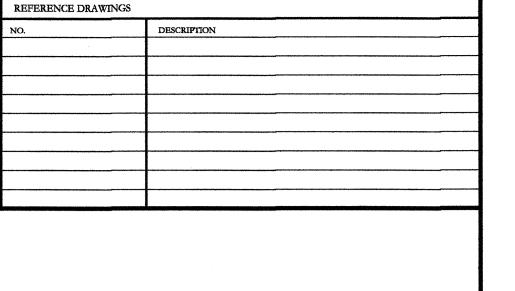
- DESIGN, FABRICATE, TRANSPORT, STORE AND ERECT STEEL DECK IN ACCORDANCE WITH CSA S136-07 (R2012) AND THE CANADIAN SHEET STEEL BUILDING INSTITUTE (CSSBI) 10M-08 STANDARD FOR STEEL ROOF DECK
- 12M-08 STANDARD FOR COMPOSITE STEEL DECK PROVIDE CLOSURE ANGLES AT EDGES AND SUPPORTS AS REQUIRED. PROVIDE L76x76x6.4 FRAMING FOR ALL OPENINGS 450mm OR LESS U.N.O.
- MAXIMUM LIVE LOAD DEFLECTION: ROOF DECK L/240 OF SPAN, FLOOR DECK L/360. ROOF DECK IS DESIGNED AS A DIAPHRAGM. PLACE DECK AND WELD THROUGH THE LOW RIB TO ALL SUPPORTING MEMBERS AS SHOWN ON PLANS. PROVIDE CONTINUOUS (BUTT WELDED) ANGLE AT ROOF PERIMETER (SEE ROOF PLANS).
- LAYOUT STEEL DECK SO THAT A VALLEY FALLS ON THE EDGE ANGLES AND SUPPORTING MEMBERS PARALLEL TO THE SPAN OF THE DECK TO ALLOW FOR LONGITUDINAL WELDS WELDING TO CSA W47.1. TOUCH UP WELDS WITH ZINC RICH PAINT.
- SHOP DRAWINGS: PROVIDE ENGINEERING DRAWINGS BEARING SEAL OF A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF MANITOBA FOR REVIEW PRIOR TO CONSTRUCTION.

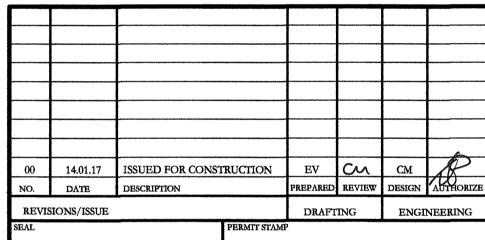
METAL FABRICATIONS

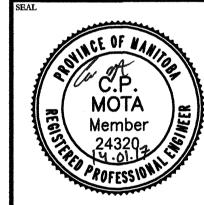
- SHOP DRAWINGS: PROVIDE ENGINEERING DRAWINGS BEARING SEAL OF A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF MANITOBA FOR REVIEW PRIOR TO CONSTRUCTION.
- MATERIAL: GALVANIZED STEEL U.N.O. WELDING: STEEL TO CSA W59-03 (R2012), ALUMINUM TO CSA W59.2-11
- W SHAPES, HSS: TO G40.21 GR 350W
- CHANNELS, ANGLES, TEES AND PLATES: TO G40.21, 300 MPa STEEL PIPE: TO ASTM A53.
- BOLTS AND ANCHOR BOLTS: TO ASTM A307. SHOP COAT PRIMER: TO CISC/CPMA 2075.

GRATING

- GRATING TO BE WELDED TYPE W30-102 CONFORMING TO THE METAL BAR GRATING MANUAL
- OF THE NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS. .2 ALL GRATING SHALL BE FASTENED WITH SADDLE CLIPS. METHODS OF FIXING SHALL
- CONFORM TO THE METAL GRATING INSTITUTE RECOMMENDATIONS. ALL LOOSE EDGES AND REMOVABLE PANELS TO BE BANDED WITH 4.8mmx32mm
- PLATE UNLESS NOTED OTHERWISE PROVIDE 6mmx150mm KICK PLATE AROUND ALL OPENINGS. KICK PLATES SHALL BE
- WELDED SIMILAR TO BANDING. GRATING SHALL BE CUT AND NEATLY FITTED AROUND COLUMNS, MACHINERY SUPPORTS, PIPING, DUCTS, ETC. TOUCH-UP PAINTING SHALL BE PERFORMED ON ANY FIELD
- BURNING AND WELDING. .6 ALL GRATING TO BE GALVANIZED UNLESS NOTED OTHERWISE.







APEGIT Certificate of Authorization TETRA TECH WEI Inc. No. 5313 Date: April 30, 2014

CMTHORIZEDB AS NOTED 13.11.06

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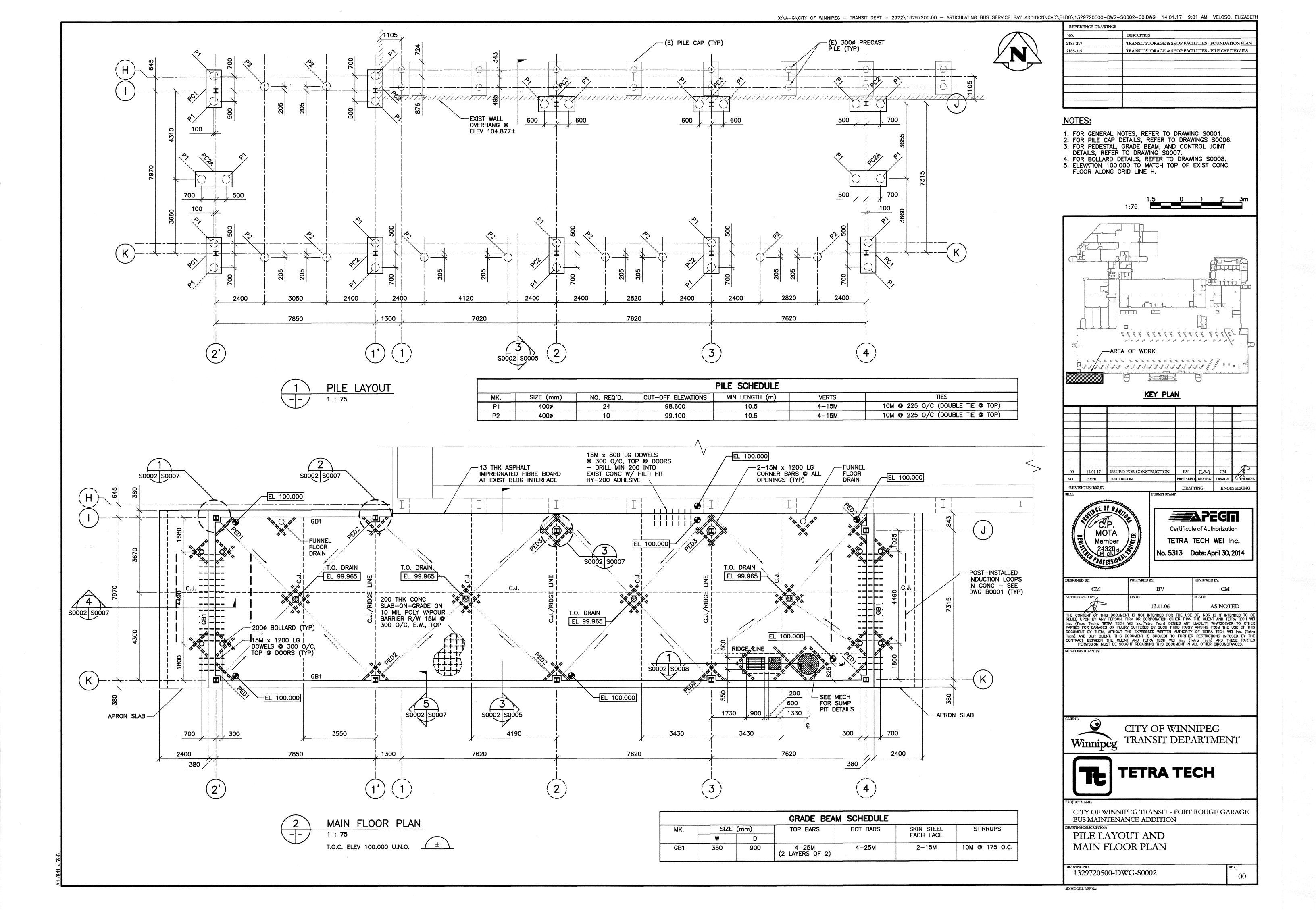
CITY OF WINNIPEG TRANSIT DEPARTMENT

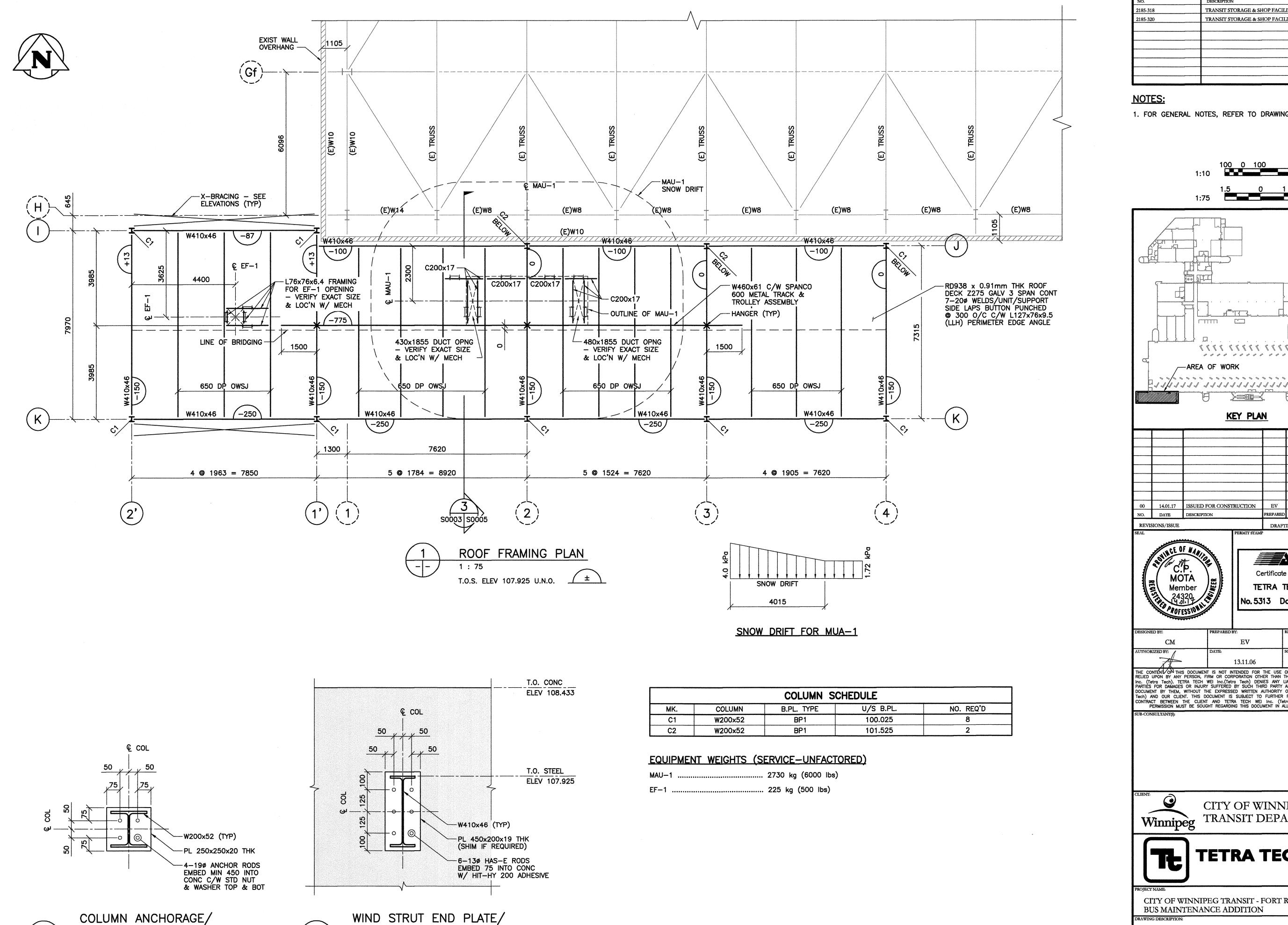


CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE **BUS MAINTENANCE ADDITION** RAWING DESCRIPTION:

GENERAL NOTES

1329720500-DWG-S0001





BASE PLATE BP1 DETAIL

1:10

ANCHORAGE DETAIL

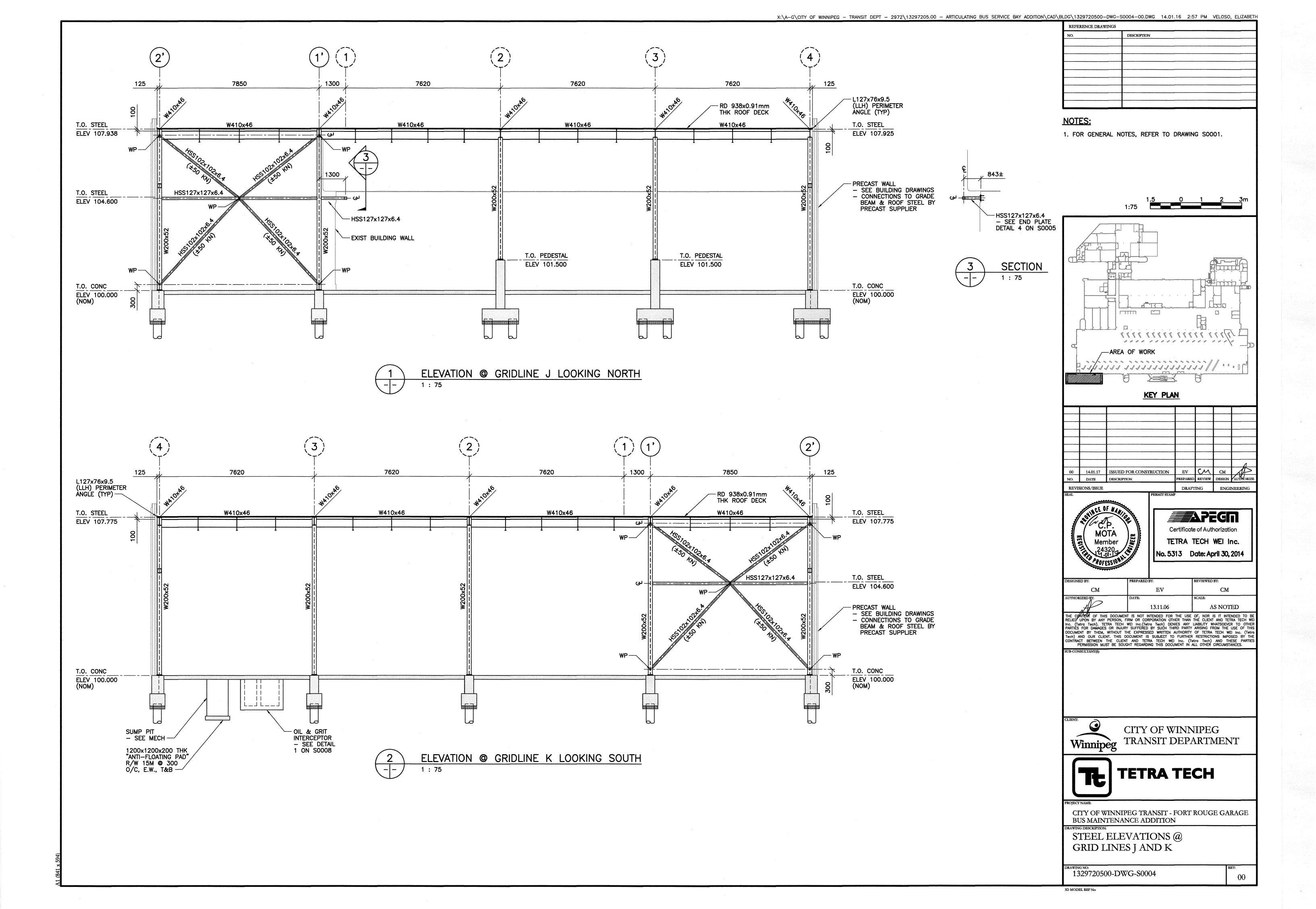
- 3 LOC'NS @ GRIDS J & 2, 3, 4

DESCRIPTION TRANSIT STORAGE & SHOP FACILITIES - ROOF FRAMING PLA 1. FOR GENERAL NOTES, REFER TO DRAWING SO001. D PREPARED REVIEW DESIGN AUTHORIZE DRAFTING **ENGINEERING APEGIN** Certificate of Authorization TETRA TECH WEI Inc. No. 5313 Date: April 30, 2014 CMAS NOTED THE CONTENT ON THIS DOCUMENT IS NOT INTENDED FOR THE USE OF, NOR IS IT INTENDED TO BE RELIED UPON BY ANY PERSON, FIRM OR CORPORATION OTHER THAN THE CLIENT AND TETRA TECH WEI Inc. (Tetra Tech). TETRA TECH WEI Inc. (Tetra Tech) DENIES ANY LIABILITY WHATSOEVER TO OTHER PARTIES FOR DAMAGES OR INJURY SUFFERED BY SUCH THIRD PARTY ARISING FROM THE USE OF THIS DOCUMENT BY THEM, WITHOUT THE EXPRESSED WRITTEN AUTHORITY OF TETRA TECH WEI Inc. (Tetra Tech) AND OUR CLIENT. THIS DOCUMENT IS SUBJECT TO FURTHER RESTRICTIONS IMPOSED BY THE CONTRACT BETWEEN THE CLIENT AND TETRA TECH WEI Inc. (Tetra Tech) AND THESE PARTIES PERMISSION MUST BE SOUGHT REGARDING THIS DOCUMENT IN ALL OTHER CIRCUMSTANCES. CITY OF WINNIPEG TRANSIT DEPARTMENT **TETRA TECH** CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE

ROOF FRAMING PLAN

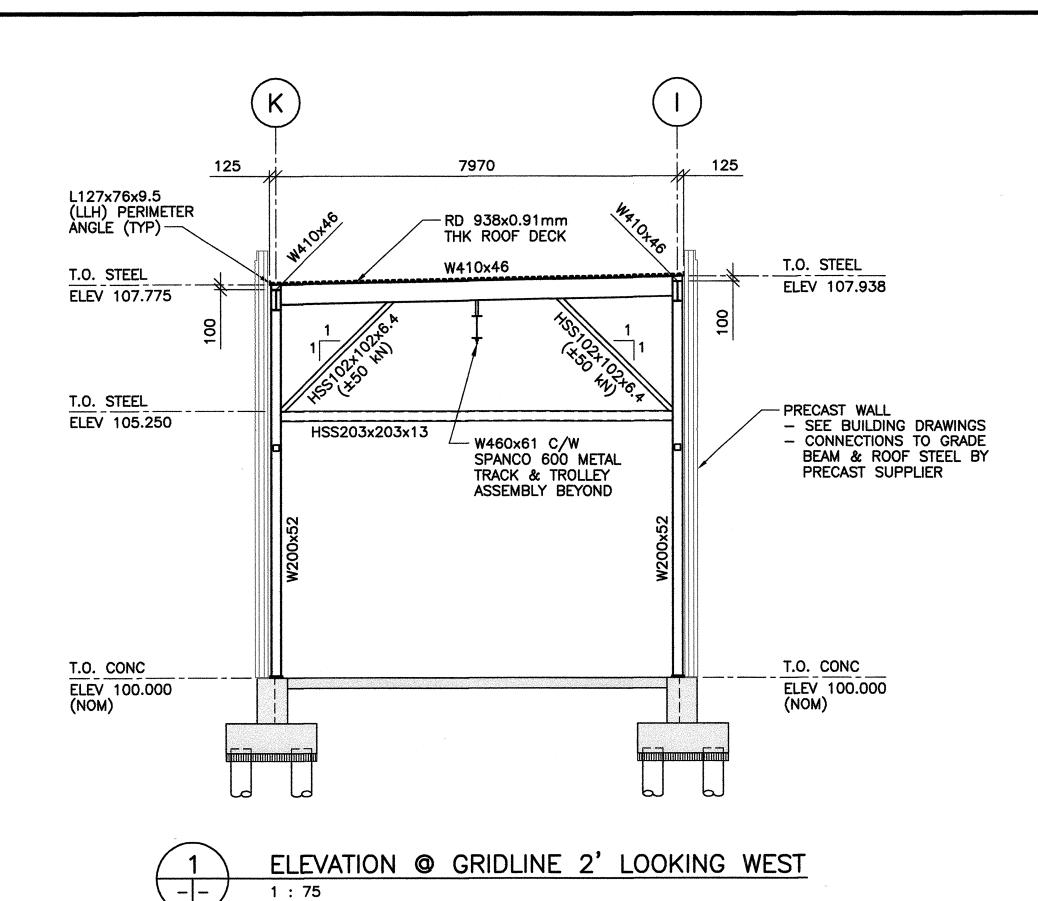
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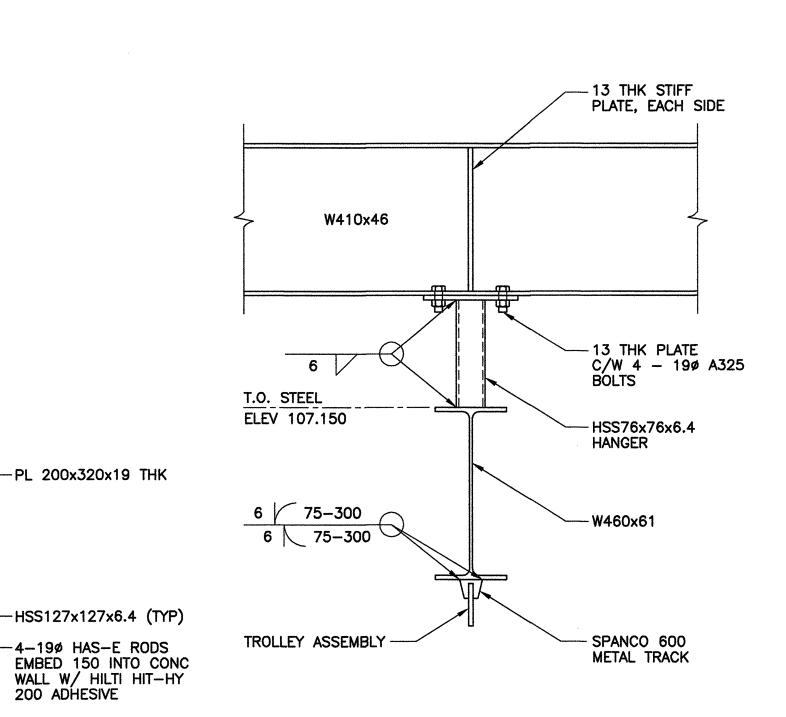
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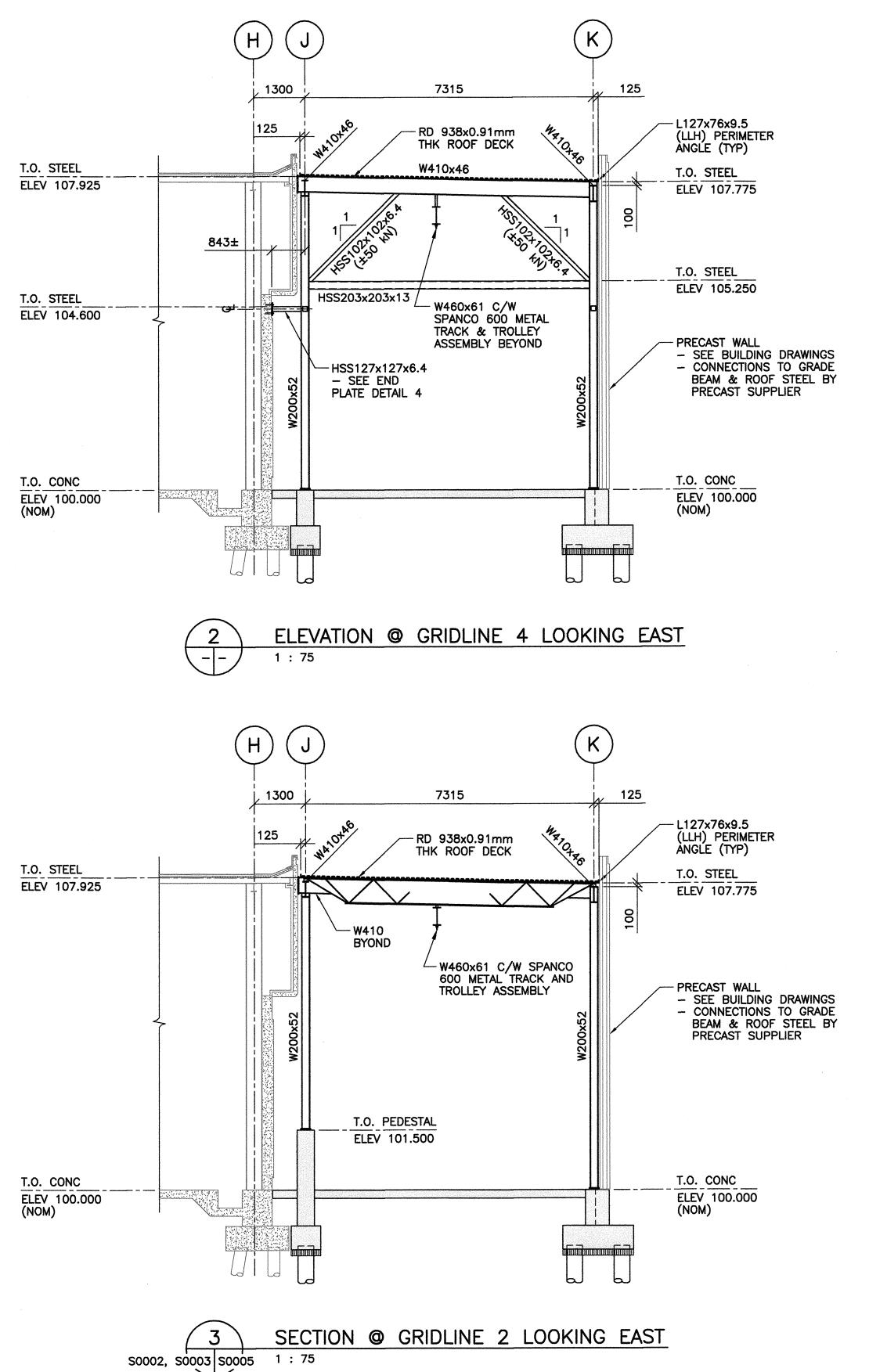


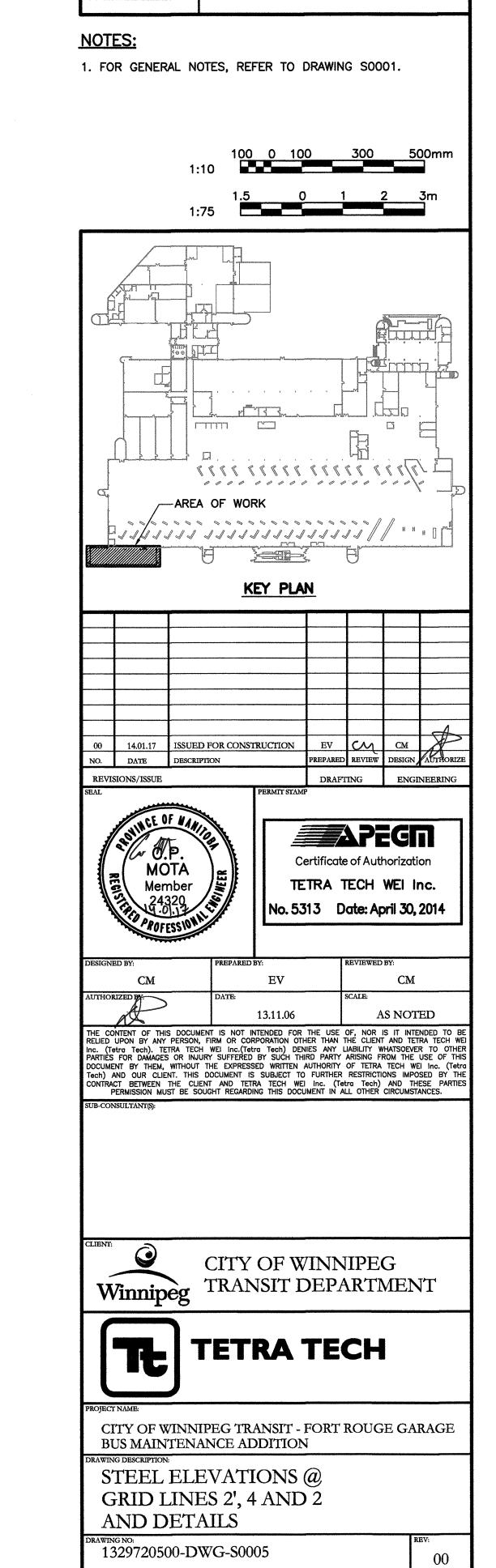
REFERENCE DRAWINGS

DESCRIPTION









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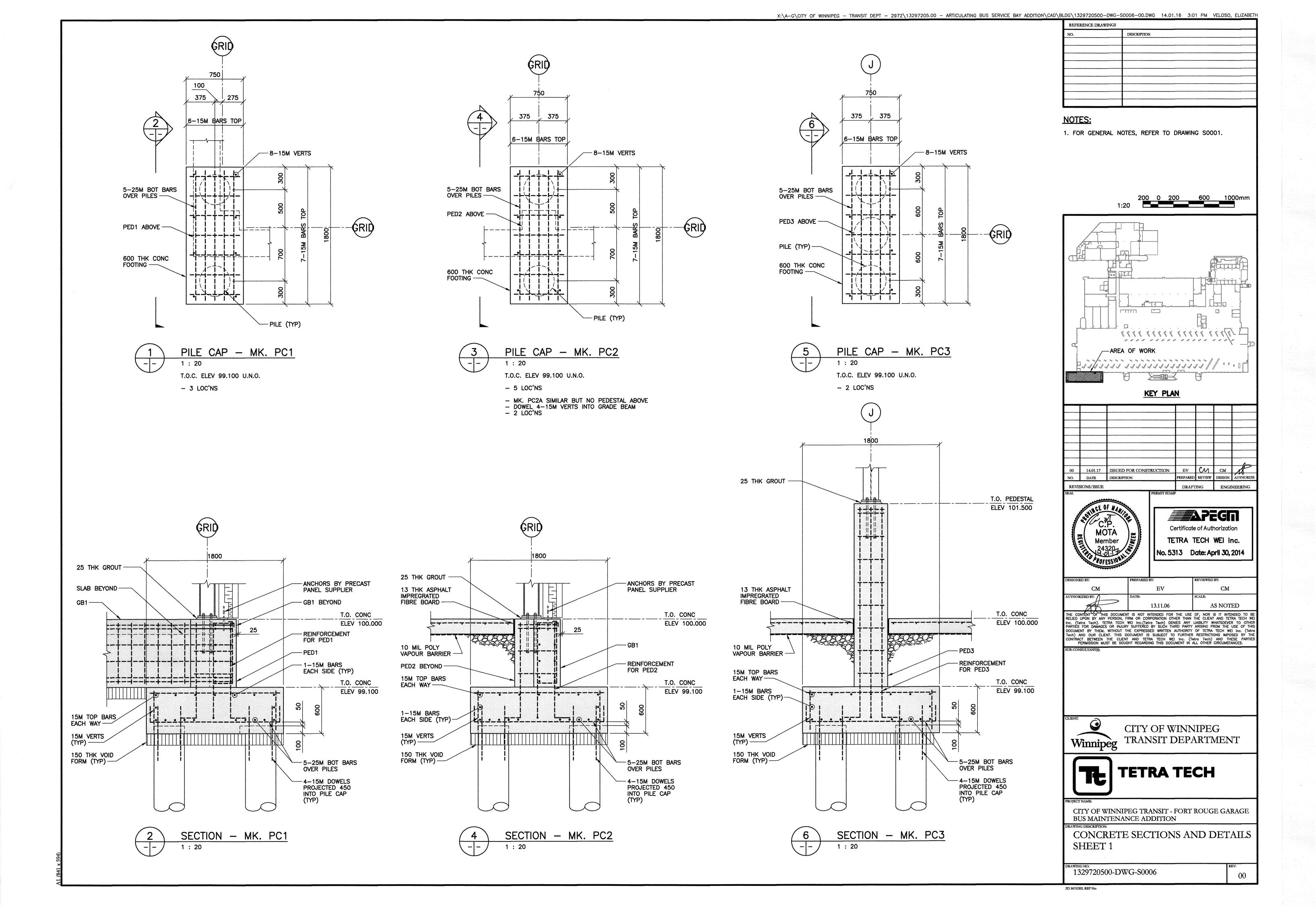
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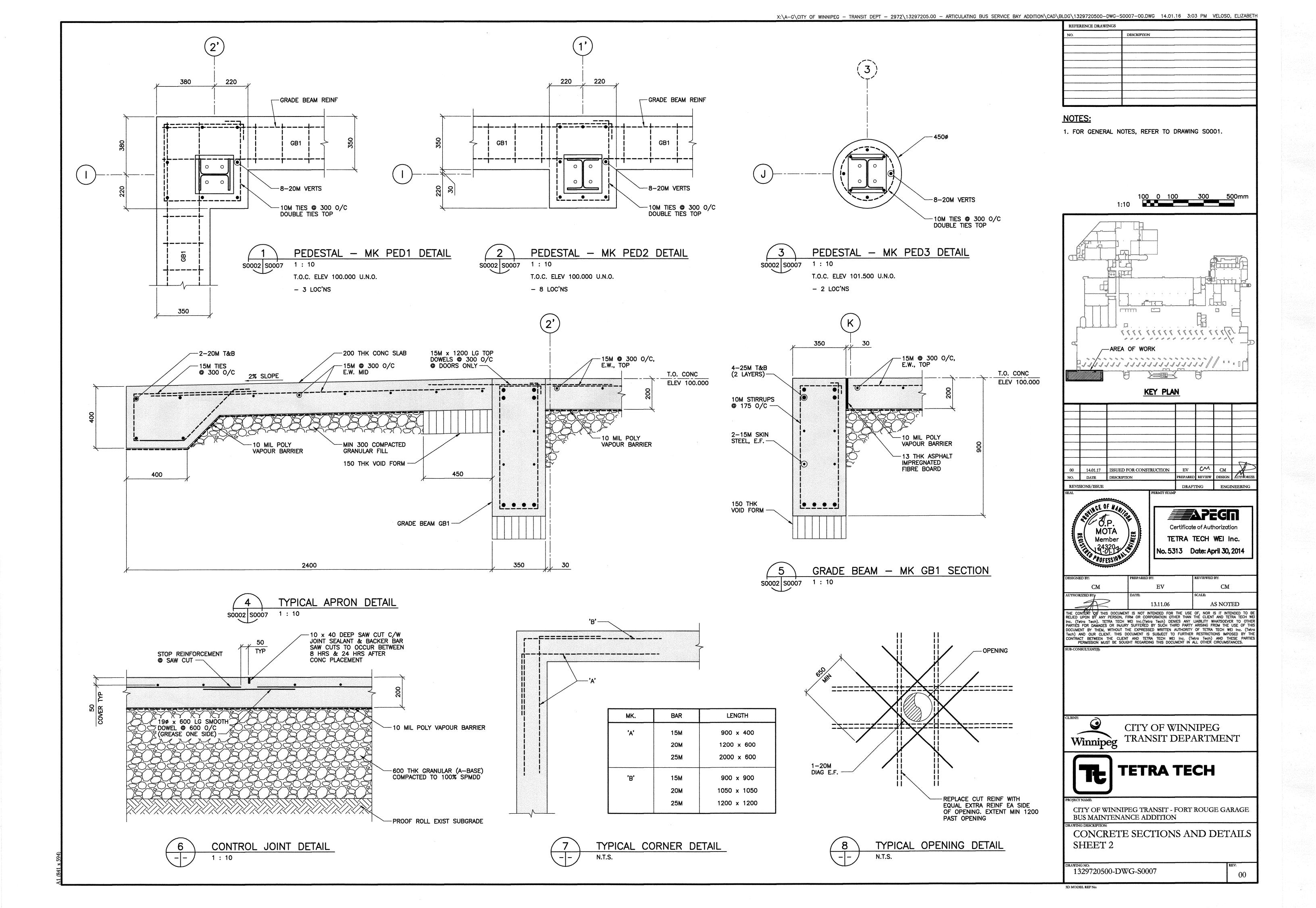
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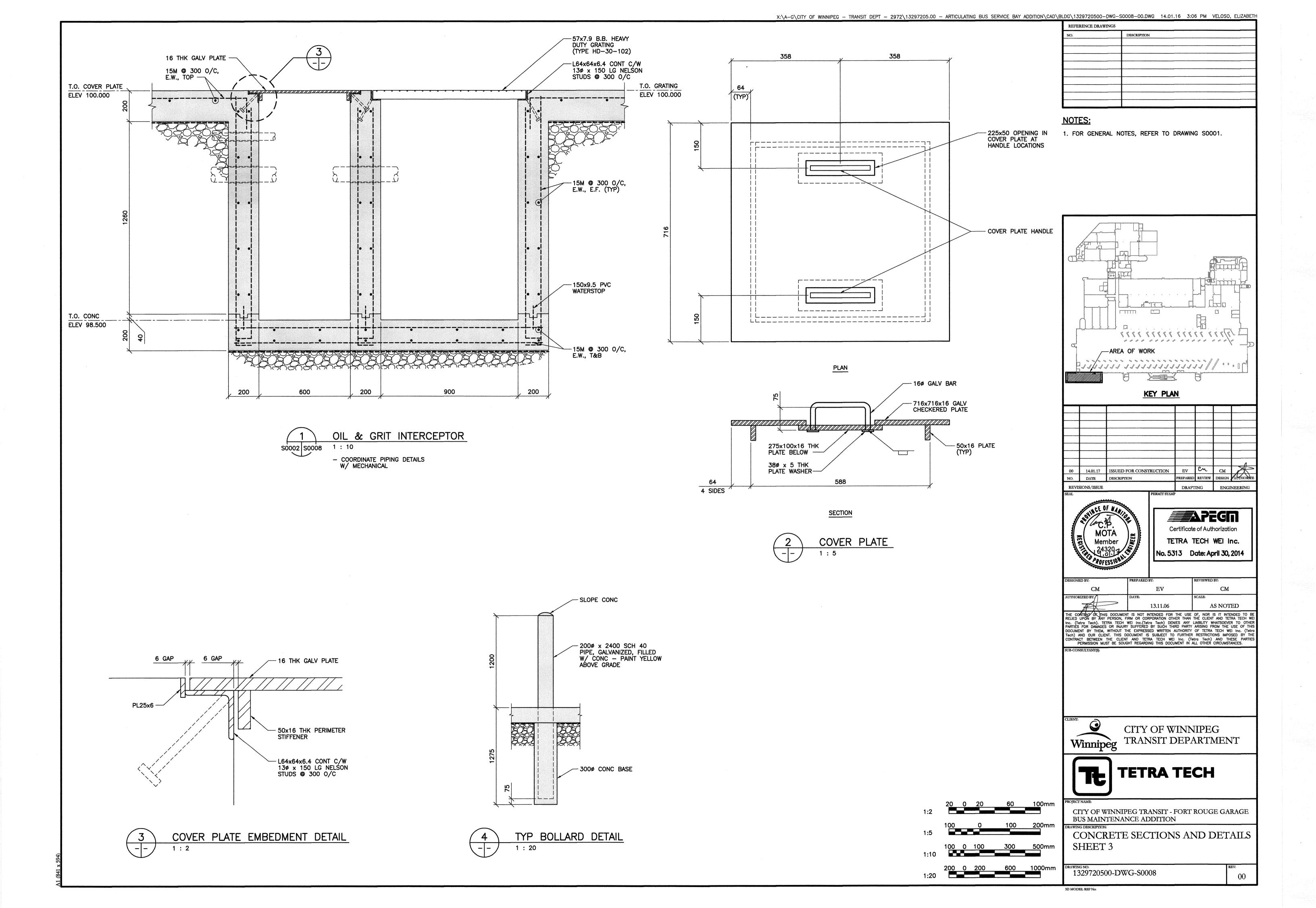
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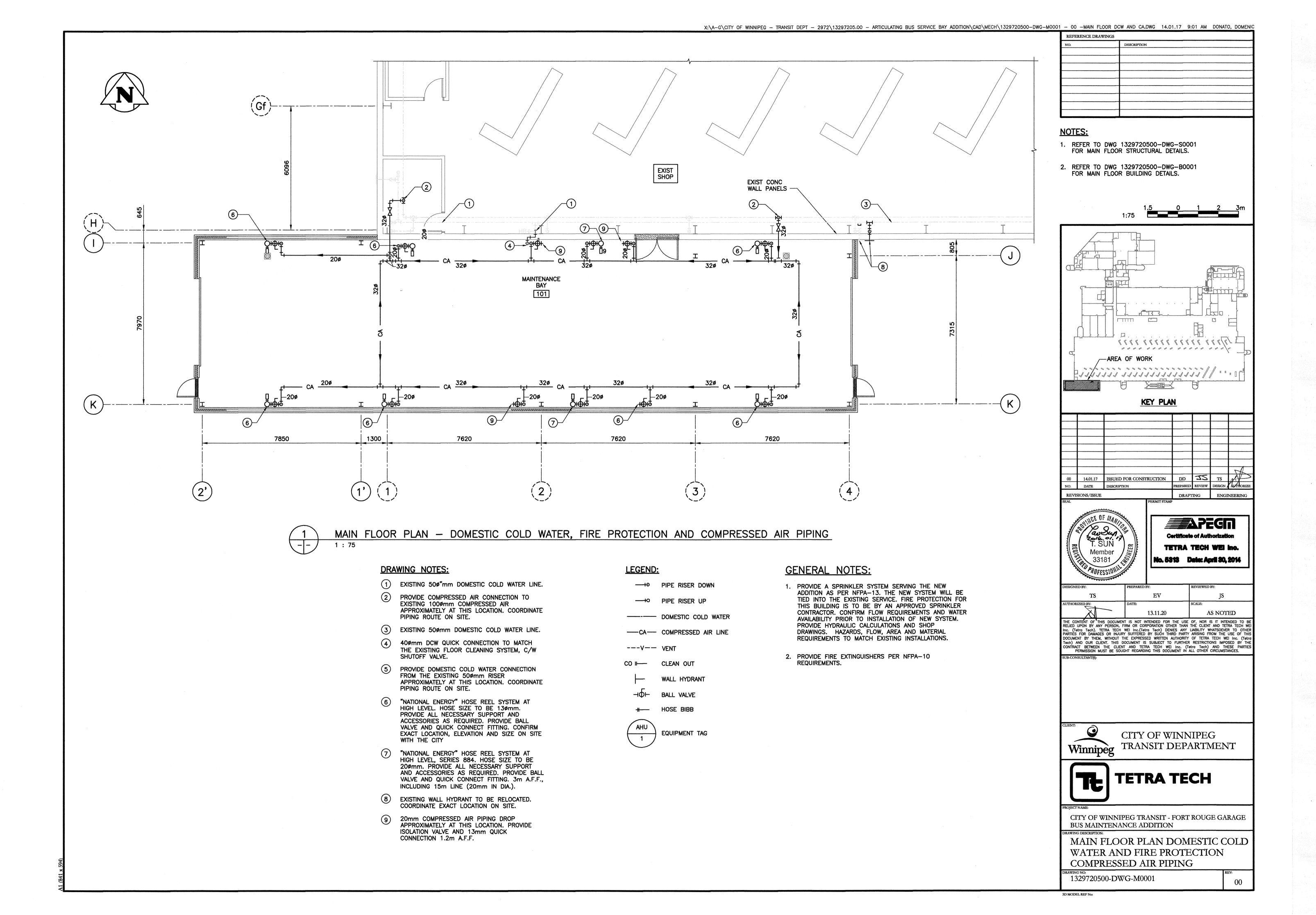
FALL ARREST HANGER DETAIL 1:10

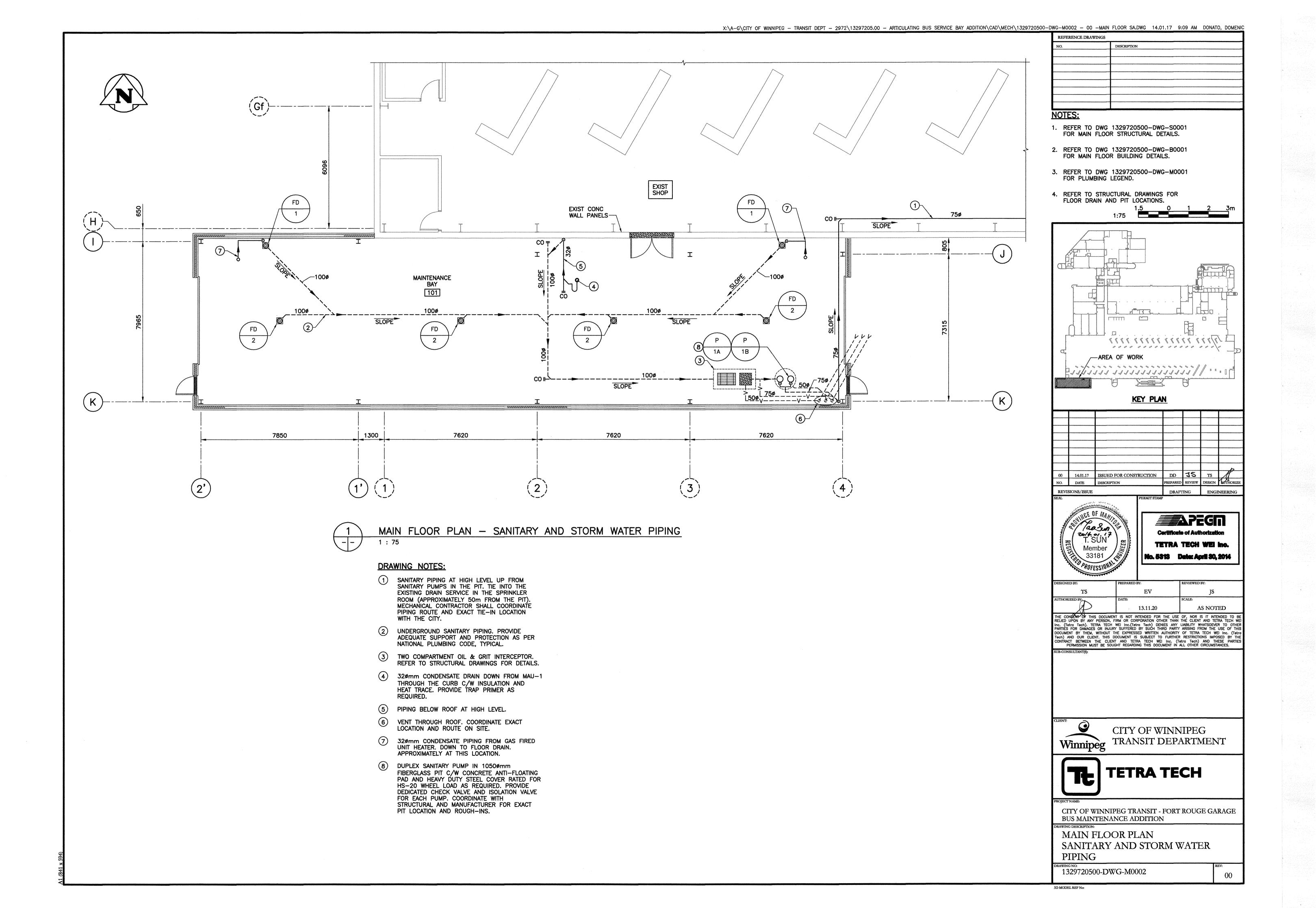
sooo2, sooo3 sooo5 1 : 75

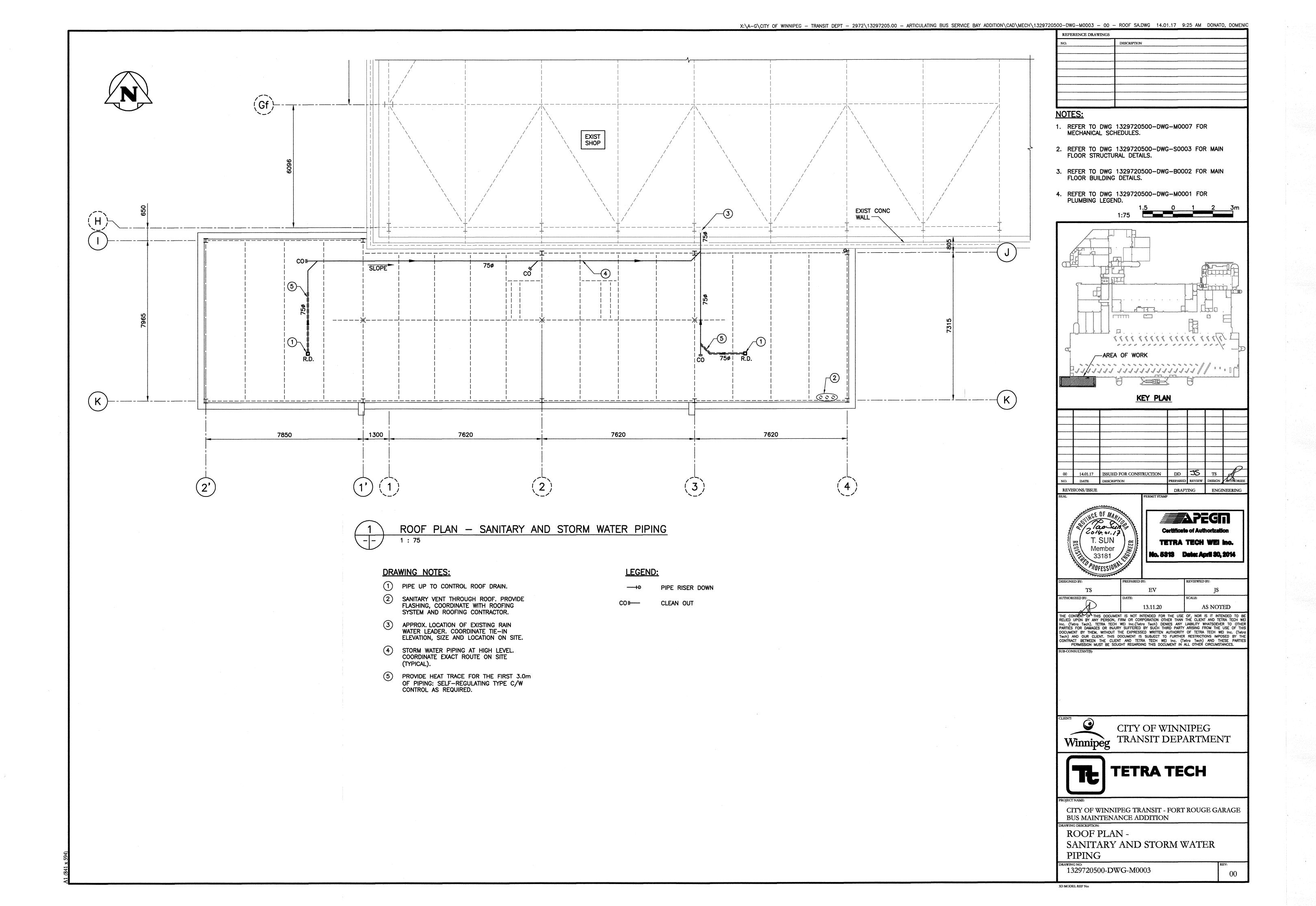


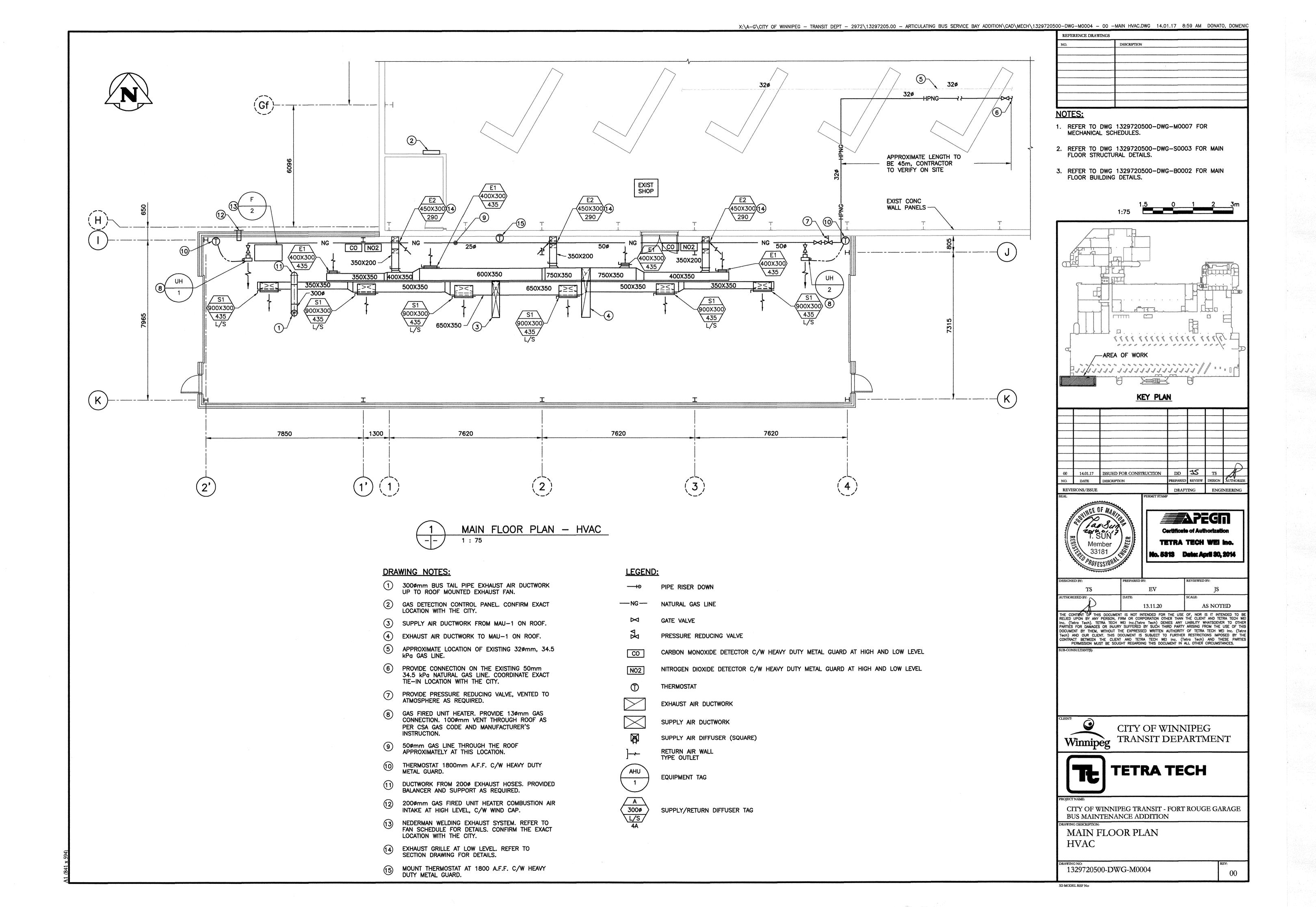


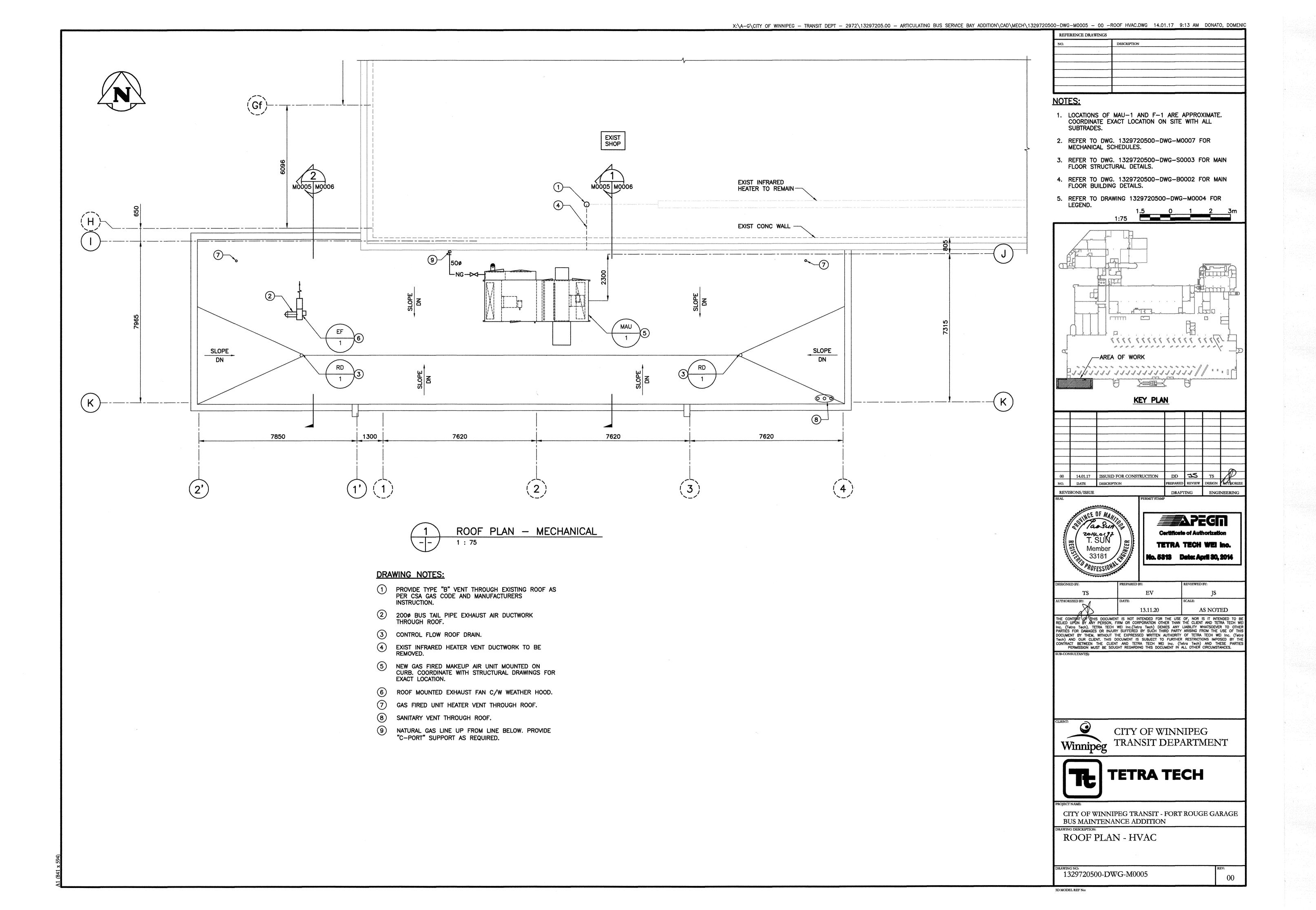


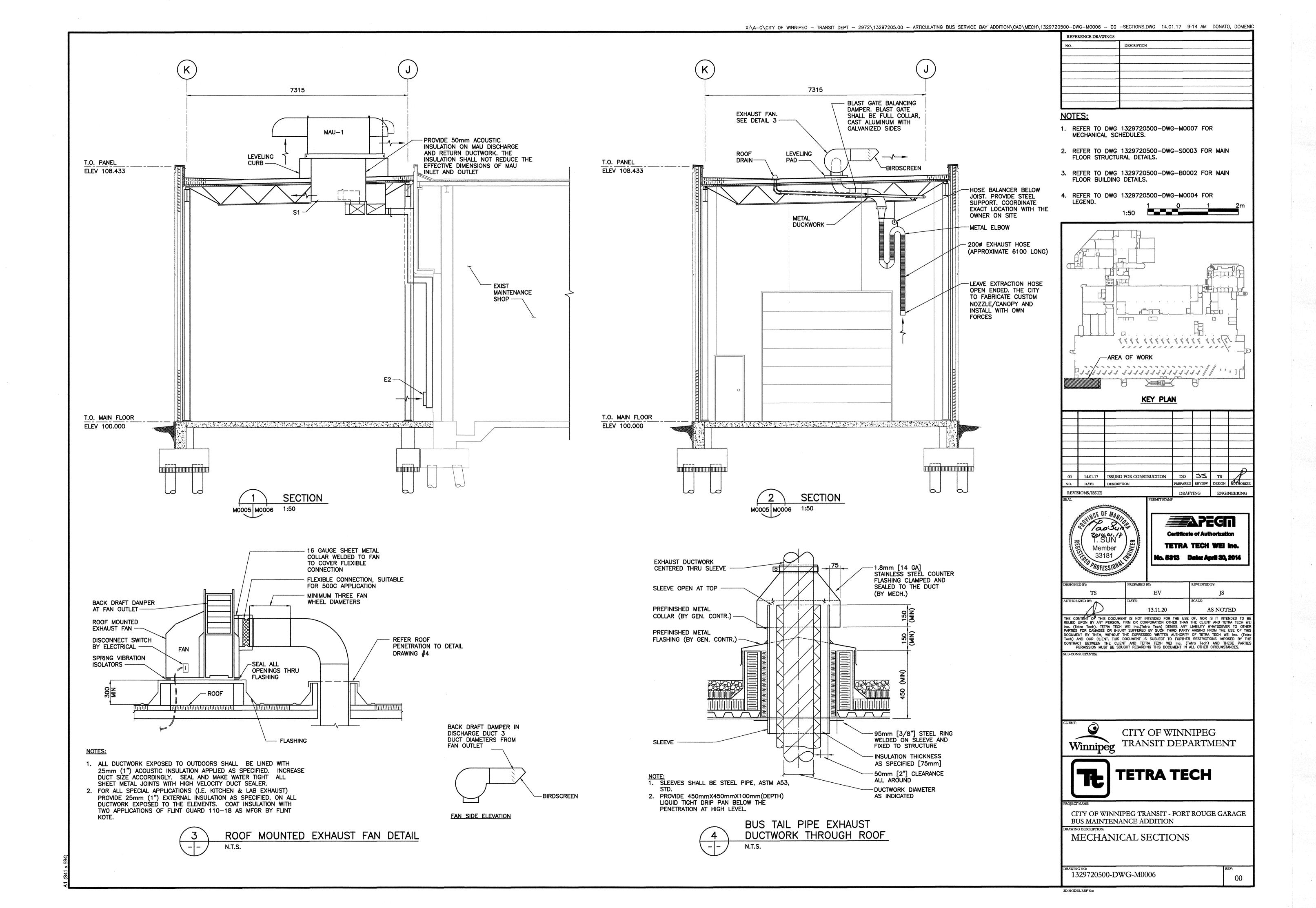












MECHANICAL SPECIFICATION:

MECHANICAL SUBCONTRACTOR SHALL SUBMIT PRICE BASED ON SUPPLY AND INSTALLATION OF EQUIPMENT AND MATERIAL NECESSARY TO PROVIDE A COMPLETE AND FULLY FUNCTIONAL MECHANICAL PACKAGE. MECHANICAL PACKAGE TO CONSIST OF EQUIPMENT AND MATERIALS AS DESCRIBED IN THE DRAWINGS AND SPECIFICATIONS.

DO NOT SCALE DRAWINGS.

SECTION 15010

GENERAL CONDITIONS

- PROVIDE ALL LABOR, MATERIALS, AND EQUIPMENT NECESSARY TO COMPLETE AND FULLY FUNCTIONAL MECHANICAL SYSTEM AS SHOWN ON THE DRAWINGS AND DESCRIBED IN THESE SPECIFICATIONS.
- 2. CONTRACT DOCUMENTS
- a. IN THE EVENT THAT AN ITEM IS SHOWN ON THE DRAWINGS BUT NOT SPECIFIED OR SPECIFIED AND NOT SHOWN ON THE DRAWING THE ITEM SHALL BE INCLUDED AS IF IT WERE SHOWN IN BOTH LOCATIONS.
- 3. ALL NECESSARY PERMITS SHALL BE OBTAINED AND ALL FEES SHALL BE PAID TO CARRY OUT THE SPECIFIED WORK.
- ALL WORK SHALL BE GUARANTEED FOR ONE YEAR FROM DATE OF COMPLETED WORK ACCEPTANCE BY THE CONTRACT ADMINISTRATOR. SUBMIT DOCUMENTATION IDENTIFYING ADDITIONAL EQUIPMENT WARRANTY COVERAGE AND TIME FRAMES.
- ALL WORK SHALL COMPLY IN EVERY RESPECT WITH ALL NATIONAL, PROVINCIAL, AND LOCAL BY-LAWS AND CODES, WHICH SHALL BE CONSIDERED PART OF THIS SPECIFICATION.
- ALL CUTTING, PATCHING, FLASHING FOR WORK AS REQUIRED HEREIN SHALL BE BY THE GENERAL CONTRACTOR.
- THE MECHANICAL SUBCONTRACTOR SHALL INSTALL THE SYSTEM IN COMPLETE ACCORDANCE WITH THE RECOMMENDATIONS OF THE ASHRAE, AND SMACNA-LATEST EDITION DUCT STANDARDS, TIAC BEST PRACTICES MANUAL AND LOCAL CODES.
- 3. CO-ORDINATE WORK WITH THE WORK OF OTHER TRADES TO AVOID CONFLICTS.
- ALTER THE LOCATION OF DUCTS OR PIPES AT THE DIRECTION OF THE CONTRACT ADMINISTRATOR WITHOUT CHARGE TO THE CITY, PROVIDED THE CHANGE IS MADE BEFORE INSTALLATION AND DOES NOT NECESSITATE ADDITIONAL MATERIALS.
- 10. BID SHALL BE BASED ON THE USE OF SPECIFIED MANUFACTURERS.
- 11. FURNISH TO CONTRACT ADMINISTRATOR ONE (1) HARD-COVERED 3-RING BINDER CONTAINING THEREIN ONE (1) COMPLETE SET OF MANUFACTURERS' OPERATING AND MAINTENANCE INSTRUCTIONS SHOWING ALL MAJOR EQUIPMENT, AND APPARATUS REQUIRING MAINTENANCE. INSTRUCTIONS SHALL BE COMPLETE FOR INSTALLATION, OPERATION, AND MAINTENANCE AND SHALL INCLUDE PERTINENT INFORMATION SUCH AS DETAILED DRAWINGS AND OPERATION CURVES. SUPPLIER PARTS, SUPPLIER LISTS AND ADDRESSES SHALL BE PROVIDED. INSTRUCTIONS SHALL BE PROVIDED FOR THE CITY REPRESENTATIVE TO ENSURE A THOROUGH UNDERSTANDING OF THE EQUIPMENT AND ITS OPERATION.
- 12. ALL WIRING, SUPPLY AND INSTALLATION OF DISCONNECT SWITCHES FOR EQUIPMENT SPECIFIED HEREIN SHALL BE PERFORMED BY THE ELECTRICAL SUBCONTRACTOR, UNLESS OTHERWISE NOTED.
- 13. ALL CONTROL WIRING SHALL BE BY THE MECHANICAL SUBCONTRACTOR.
- PRIOR TO SUBMITTING BID, BIDDERS SHALL EXAMINE THE SITE AND CONDITIONS AFFECTING WORK, METHODS OF CONNECTION AND LOCATION OF ALL SERVICES INVOLVED UNDER THIS CONTRACT. FAILURE TO MAKE THIS VISIT IN NO WAY ALLEVIATES THE MECHANICAL SUBCONTRACTOR FROM RESPONSIBILITY FOR COMPLETING THE MECHANICAL WORK OF THIS CONTRACT IN A WORKMANLIKE MANNER. NO ALLOWANCE WILL BE MADE AFTER CONTRACT AWARD FOR ANY EXPENSE INCURRED THROUGH A FAILURE TO MAKE THIS EXAMINATION AND INVESTIGATION.
- 15. PROVIDE ONE SET OF SPECIAL TOOLS REQUIRED TO SERVICE EQUIPMENT AS RECOMMENDED BY MANUFACTURERS.
- 16. PROVIDE DIELECTRIC COUPLINGS WHEREVER PIPES OF DISSIMILAR METALS ARE JOINED.
- 17. THE MECHANICAL SUBCONTRACTOR SHALL SUBMIT SHOP DRAWINGS VIA E-MAIL IN PDF FORMAT. HARD COPIES WILL NOT BE ACCEPTED. FOR ALL EQUIPMENT FOR REVIEW BY THE CONTRACT ADMINISTRATOR. NOT WITHSTANDING ANY COMMENTS CONTAINED WITHIN THE CONTRACT ADMINISTRATORS REVIEW OF THE SHOP DRAWINGS. THE MECHANICAL SUBCONTRACTOR AND/OR EQUIPMENT SUPPLIER REMAIN FULLY RESPONSIBLE FOR THE SUPPLY AND INSTALLATION OF ALL MATERIALS EQUIPMENT IN COMPLIANCE WITH THE DRAWINGS AND SPECIFICATIONS. THE MECHANICAL SUBCONTRACTOR AND/OR EQUIPMENT SUPPLIER SHALL BE FULLY RESPONSIBLE FOR ANY CHANGES TO EQUIPMENT DELIVERED TO THE JOB SITE INCLUDING BUT NOT LIMITED TO COMPLETE REPLACEMENT OF MATERIALS AND EQUIPMENT AFTER THE FACT IF EQUIPMENT DELIVERED IS FOUND NOT TO COMPLY WITH THE DRAWINGS AND SPECIFICATIONS IN EVERY RESPECT AT A LATER DATE EVEN IF THE MATERIALS AND EQUIPMENT DELIVERED TO THE JOB SITE ARE IDENTICAL TO THAT SHOWN ON THE REVIEWED SHOP DRAWINGS. IT SHALL BE MUTUALLY UNDERSTOOD THAT THE CONTRACT ADMINISTRATORS REVIEW OF THE SHOP DRAWINGS IS A GENERAL REVIEW OF THE EQUIPMENT SUPPLIED BY THE CONTRACTOR WITH RESPECT TO GENERAL DESIGN CONCEPTS ONLY. THE CONTRACT ADMINISTRATORS REVIEW IN NO WAY RELIEVES THE MECHANICAL SUBCONTRACTOR OF THE RESPONSIBILITY OF VERIFYING THAT THE EQUIPMENT MEETS ALL SPECIFIED REQUIREMENTS. THE MECHANICAL SUBCONTRACTOR SHALL BE FULLY RESPONSIBLE FOR ANY COSTS ASSOCIATED WITH ERRORS OR OMISSIONS IN THE SHOP DRAWINGS.
- 8. MECHANICAL SUBCONTRACTOR TO CONFIRM ALL DIMENSIONS AND LOCATIONS OF ALL EQUIPMENT. LAYOUTS. AND SERVICES ETC. PRIOR TO COMMENCEMENT OF WORK.
- 19. HOISTING OF ALL MECHANICAL EQUIPMENT SHALL BE BY THE MECHANICAL SUBCONTRACTOR.
- 20. ASSUME FULL RESPONSIBILITY FOR LAYING OUT ALL WORK AND ENSURING THAT NO DAMAGE IS CAUSED TO THE EXISTING EQUIPMENT AND PREMISES DUE TO IMPROPER LOCATION AND EXECUTION OF WORK UNTIL WORK HAS BEEN COMPLETED AND ACCEPTED BY THE CITY. STORE ALL MATERIALS AS REQUIRED FOR PROTECTION AND CLEAN UP REFUSE CAUSED BY ALL WORK.
- 21. APPLY EXISTING PIPE IDENTIFICATION SYSTEMS TO ALL NEW PIPING IN THIS CONTRACT, SHOWING SERVICE, PIPE SIZE, AND FLOW DIRECTION.
- 22. PROVIDE, AT COMPLETION OF CONSTRUCTION, ALL NECESSARY CERTIFICATIONS, REPORTS, ETC. REQUIRED TO CONFIRM CONSTRUCTION HAS BEEN INSPECTED AND INSTALLATIONS PERFORMED IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS, CODES AND REGULATIONS, AND REQUIREMENTS OF ALL AUTHORITIES HAVING JURISDICTION ARE MET.
- 23. COORDINATE ALL WORK WITH THE CITY. SHUTDOWN OF EXISTING SERVICES IS NOT ACCEPTABLE WITHOUT PERMISSION.
- 24. PIPE SLEEVES AND FLOOR PLATES 24.1. SUPPLY GALVANIZED IRON PIPE SLEEVES OF 18 GAUGE GALVANIZED IRON FOR ALL FLOORS. WHERE PIPES PASS THROUGH THE WALLS, PIPE SLEEVES MADE OF STANDARD WEIGHT STEEL PIPE SHALL BE USED. AT FIRE WALL OR FLOOR SEPARATION, CONTRACTOR TO FILL VOID WITH ASBESTOS ROPE.

25. PIPE HANGERS

25.1. ALL PIPE HANGERS USED ON THE JOB SHALL BE SUBSTANTIAL HANGERS DRILLED FOR HANGING FROM THE CEILING OR WALLS. NO PERFORATED IRON HANGERS WILL BE ACCEPTED. THEY SHALL BE SPACED NOT OVER THREE METERS APART AND SHALL BE OF SUCH CONSTRUCTION AS TO ALLOW FOR MOVEMENT OF PIPING DUE TO EXPANSION. HANGERS FOR PIPE 100 MILLIMETRES AND UNDER SHALL BE EQUAL TO CRANE #55-M AND 24-M FOR PIPES ABOVE 100 MILLIMETRES. FOR COVERED PIPES, USE PIPE COVERING PROTECTION SADDLES EQUAL TO CRANE #46-M COPPER PLATE FINISH FOR ALL COPPER PIPES. PROVIDE EQUIVALENT JOIST CLAMPS AND HANGERS AS REQUIRED BY SITE CONDITIONS. ALL HANGERS TO BE PRIME COATED.

- 26. MAINTENANCE AND OPERATING MANUALS
- 26.1. PREPARE AND ASSEMBLE THREE (3) COPIES OF HARD COVER MANUALS ENTITLED "CARE AND OPERATION OF THE MECHANICAL SYSTEMS", CONTAINING THE FOLLOWING SECTIONS:
 - DESCRIPTION OF ALL SYSTEMS AND EQUIPMENT
 - DESCRIPTION OF CONTROL SYSTEM. 26.1.2.
 - A DETAILED MAINTENANCE AND LUBRICATION SCHEDULE FOR ALL EQUIPMENT.
 - A COMPLETE SET OF MANUFACTURER'S OPERATING AND MAINTENANCE INSTRUCTIONS.
 - PARTS LIST OF EACH PIECE OF EQUIPMENT.
 - TEST DATA ON ALL MOTORS GIVING MOTOR H.P., CURRENT DATA, MOTOR R.M.P., VOLTAGE AND PHASE.
- 26.2. THIS CONTRACTOR SHALL BE PRESENT, TOGETHER WITH APPLICABLE SUB-CONTRACTORS 10. FOR SYSTEMS OPERATING BELOW 345 KPg (50 PSIG), COPPER PIPING MAY BE USED UP TO AND MANUFACTURERS WHEN THE INSTRUCTIONS ARE GIVEN TO THE OWNERS.
- 26.3. ALL OF THE ABOVE DOCUMENTS SHALL BE SUBMITTED TO THE CONTRACT ADMINISTRATOR FOR APPROVAL PRIOR TO BEING TURNED OVER TO THE CITY.

27. CUTTING AND PATCHING

27.1. ALL CUTTING, DRILLING AND PATCHING REQUIRED TO INSTALL PLUMBING PIPING. SHALL BE THE RESPONSIBILITY OF THE MECHANICAL SUBCONTRACTOR. ALL PATCHING SHALL MATCH EXISTING FINISHES. THE PAINTING FINISH SHALL BE THE RESPONSIBILITY OF THE PAINTING SUBCONTRACTOR. THE MECHANICAL SUBCONTRACTOR SHALL ACCURATELY LOCATE OPENINGS REQUIRED FOR HIS WORK AND OBTAIN APPROVAL PRIOR TO CUTTING OR DRILLING. ALL OPENINGS THROUGH FIRE WALLS SHALL BE FILLED WITH APPROVED FIRE RESISTANT MATERIALS.

28. EXCAVATION AND BACKFILLING

- 28.1. THIS CONTRACTOR SHALL CAREFULLY READ THIS SECTION OF THE SPECIFICATION COVERING EXCAVATION, TRENCHING AND BACKFILLING; ALSO BE GUIDED AS FOLLOWS: DO ALL NECESSARY EXCAVATION INSIDE THE LIMITS OF THE BUILDING AND BACKFILL WITH SAND OR OTHER APPROVED MATERIAL TO A MINIMUM OF 300 MILLIMETRES OVER THE PIPE OR AS NECESSARY TO PROTECT THE MECHANICAL WORK; MECHANICAL SUBCONTRACTOR TO BACKFILL THE REMAINDER OF THE EXCAVATION. ALL EXCAVATION AND BACKFILLING OUTSIDE THE BUILDING NOT INCLUDED IN THIS CONTRACT.
- ALL EXCAVATION SHALL BE PROTECTED AND SHORED AS REQUIRED AND/OR DIRECTED BY THE CONTRACT ADMINISTRATOR; PROVIDE ADEQUATE TEMPORARY CROSS-OVERS FOR PEDESTRIAN AND VEHICULAR TRAFFIC INCLUDING GUARD RAILS, LAMPS, AND FLAGS IF NECESSARY. ALL PIPING SHALL BE TESTED, INSPECTED AND APPROVED. ALL EXCESS MATERIALS SHALL BE REMOVED FROM THE PREMISES AND LEGALLY DISPOSED OF.
- FROZEN EARTH SHALL NOT BE USED FOR BACKFILLING NOR ANY BACKFILLING BE PLACED AGAINST FROZEN EARTH.
- AFTER A PERIOD ADEQUATE TO REVEAL SETTLEMENT HAS PASSED, FILL ALL DEPRESSIONS TO RESTORE THE CORRECT GRADE. THE CONTRACTOR RESPONSIBLE FOR BACKFILLING SHALL BE RESPONSIBLE FOR MAKING GOOD ANY SUBSEQUENT SETTLEMENT OF FILL PLACED BY HIM AND SHALL PAY ALL COSTS INVOLVED IN MAKING GOOD PAVING. SURFACING LAWNS, CURBS AND ALL OTHER SURFACES DAMAGED BY THE EXCAVATION AND BACKFILLING AND BY SUBSEQUENT SETTLEMENT.
- ALL CONDUITS OR PIPING SUCH AS NATURAL GAS, SEWERS, ELECTRICAL CONDUITS, FIRE ALARM LINES, ETC., IN THE VICINITY OF OR CROSSING THE LINE OF THE TRENCH SHALL 14. CLEANOUTS AND TRAPS BE EXPOSED BY HAND EXCAVATION.
- EXCAVATE BOTTOMS OF TRENCHES SO THAT PIPES ARE SUPPORTED ON A SOLID BED OF UNDISTURBED EARTH, DO ALL PLUMBING REQUIRED TO KEEP EXCAVATION FREE OF WATER. IF THE TRENCH IS EXCAVATED BEYOND THE PROPER DEPTH IT SHALL BE FILLED WITH SAND AND WELL TAMPED TO BRING THE BOTTOM OF THE TRENCH TO THE PROPER ELEVATION; NO LOOSE SOIL WILL BE PERMITTED UNDER THE PIPES.
- IN BACKFILLING, TAMP OR FLUSH EARTH SOLIDLY IN PLACE; BACKFILL INSIDE THE BUILDING WITH SAND AND PIT RUN GRAVEL UNLESS PERMISSION IS OBTAINED TO USE STANDARD BACKFILL. UNDER DRIVEWAYS AND PAVED AREAS, BACKFILL TO BE TAMPED LEVEL MECHANICALLY OR BY HAND IN MAXIMUM 150 MILLIMETRE LIFTS TO A MINIMUM 95 PROCTOR. THE BACKFILL SHALL BE INSPECTED PRIOR TO BACKFILL PROCEDURES. CARE SHALL BE EXERCISED AND IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO SEE THAT THE PIPES ARE NOT DAMAGED BY THE LATERAL FORCE IMPOSED DURING
- SUPPORT ALL PIPING BELOW GRADE AND UNDER FLOOR SLABS IN 3.2mm (10 GAUGE) CONTINUOUS CADMIUM PLATED CHANNEL. SUPPORT CHANNEL WITH CADMIUM PLATED CLEVIS HANGERS AND RODS. EXTEND CADMIUM PLATED HANGER RODS 450mm (18") ABOVE SLAB REBAR AND BEND BACK OVER REBAR SO AS TO PROVIDE A MINIMUM OF 450mm (18") OF SUPPORT IN SLAB. DO NOT STRESS ROD WHEN BENDING. INSTALL SUPPORTS ON CENTERS AS FOLLOWS:

| NOMINAL PIPE SIZE mm (in) | DISTANCE BETWEEN mm (in) | SUPPORTS | HANGER ROD DIAMTER mm (in) |
|--|--|--|---|
| 15 (1/2") TO 20 (3/4") 25 (1") TO 40 (1/2") 50 (2") TO 65 (2-1/2") 80 (3") TO 100 (4") 150 (6") TO 300 (12") | STEEL 1800 (72") 2100 (84") 3000 (120") 3600 (144") 4200 (168") | COPPER 1500 (60") 1800 (72") 2400 (96") 3000 (120") 4000 (160") | 10 (3/8") 10 (3/8") 10 (3/8") 16 (1/2") 22 (3/4") |

INSULATION SECTION 15180

- 1. INSTALLATION OF INSULATION SHALL COMPLY WITH TIAC BEST PRACTICES GUIDELINES.
- 2. PROVIDE 2" (50mm) THICK FLEXIBLE DUCT INSULATION C/W RFFRK REINFORCED FOIL-FACED VAPOUR SEAL DUCT INSULATION PF335 (3/4 LB./CU/FT) DENSITY ON ALL DUCTWORK PENETRATING EXTERIOR WALL OR ROOF FOR 10FT INTO BUILDING.
- 3. USE WELDED PINS TO SECURE INSULATION TO BOTTOM AND SIDES OF ALL DUCTWORK UNLESS NOTED OTHERWISE. DO NOT USE STAPLES OR ADHESIVE PINS TO SECURE INSULATION TO DUCT.

4. PLUMBING INSULATION

MATERIAL: ON PIPES 50MM (2") DIAM. AND UNDER, USE 12MM (1/2") FIBERGLAS 112 KG/M(7 LB./CU. FT.) DENSITY PIPE INSULATION WITH ASJ JACKET. 13MM (1/2") ARMSTRONG ARMAFLEX AP OR RUBATEX EQUAL MAY BE USED FOR DOMESTIC COLD WATER AND COOLING 18. SANITARY AND STORM DRAINAGE COIL CONDENSATE DRAINS PIPING ONLY; ON PIPES 62MM (2-1/2") DIAM. AND LARGER, USE 25MM (1") FIBREGLAS 88 KG/M(5-1/2 LB./CU. FT.) DENSITY PIPE INSULATION WITH ASJ JACKET, C/W VAPOR BARRIER; VENT PIPING IN COLD ATTICS SHALL BE LESS VAPOR BARRIER JACKET AND WIRED ON.

LOCATION: ALL DOMESTIC COLD WATER PIPING; ROOF HOPPERS, VERTICAL AND HORIZONTAL STORM SECTION 15600 DRAINS; VENT PIPING FOR A DEVELOPED LENGTH OF 3M FROM ROOF TERMINALS: SUMP PUMP DISCHARGE LINES THAT PASS THROUGH CEILING SPACES.

SECTION 15400

COMPRESSED AIR PIPING:

1. PIPE TO BE SCHEDULE 40 CARBON STEEL PIPE TO ASTM A120.

PLUMBING

- SYSTEMS OPERATING UP TO 340 kPa (49 PSIG) TO BE THREADED. SYSTEMS OPERATING AT 345 kPa (50 PSIG) AND ABOVE TO BE WELDED. SOCKET WELD UP TO 50mm (2") AND BUTT WELD 65mm (2½ ") AND ABOVE.
- 3. FITTINGS TO BE 1035 kPa (150 PSIG) MALLEABLE IRON.
 - WELDING MATERIALS, FABRICATION STANDARDS AND LABOUR QUALIFICATIONS MUST CONFORM TO ANSI/ASME B31-1, ANSI B16.25, ASME SECTION 17C, AND THE PROVINCIAL DEPARTMENT OF LABOUR REGULATIONS.

- 5. THE MECHANICAL SUBCONTRACTOR SHALL HAVE APPROVAL OF THE DEPARTMENT OF LABOUR TO 4. GAS HEAT SECTION WORK ON HIGH-PRESSURE COMPRESSED AIR SYSTEMS. THE CONTRACTOR SHALL OBTAIN ALL NECESSARY DEPARTMENT OF LABOUR PERMITS AND APPROVAL OF THE DESIGN OF THE
- COMPRESSED AIR SYSTEM PRIOR TO CONSTRUCTION. 6. ALL WELDS SHALL HAVE 100% PENETRATION TO THE ROOT OF THE JOINTS. PROJECTION OF METAL INTO THE PIPE SHALL NOT EXCEED 1.5mm. WELDS HAVING A LACK OF PENETRATION OR
- 7. ALL BRANCH PIPING SHALL BE TAKEN FROM THE TOP OF THE MAIN PIPE. BOTTOM OR SIDE CONNECTIONS ARE NOT PERMITTED.
- 8. COMPRESSED AIR PIPING SHALL BE SLOPED DOWN IN THE DIRECTION OF FLOW A MINIMUM OF
- 1" PER 40 FEET. 9. PROVIDE 300mm (12") DRIP LEG AT END OF RUN AND AT ALL LOW POINTS WITH A PRESSURE
- RATED 20mm (34") BALL VALVE INSTALLED A MAXIMUM OF 2m (6'-0") ABOVE THE FLOOR. PROVIDE THREADED END AND CAP ON VALVE.
- 100mm (4"). LARGER SIZES MUST BE STEEL PIPE. COPPER PIPING TO BE TYPE L HARD DRAWN, ASTM B 88 WITH WROUGHT COPPER FITTINGS TO ANSI B16.22. JOINTS TO BE SOLDERED THROUGH 50mm (2") AND BRAZED FOR 65mm (21/2") THROUGH 100mm (4").
- 11. ALL PIPING IN AREAS SUBJECTED TO PHYSICAL ABUSE SHALL BE BLACK STEEL.
- 12. SITE FABRICATED WELD FITTINGS AND TAKE-OFFS ARE NOT ACCEPTABLE

EXCESSIVE PROJECTION SHALL BE CUT OUT AND RE-WELDED.

- 13. PIPE AND FITTINGS ALL BURIED DRAINAGE PIPING, INCLUDING FITTINGS, INSIDE THE BUILDING SHALL BE PVC OR CAST IRON AS REQUIRED BY CODE.
- ALL UNBURIED DRAINAGE PIPING AND FITTINGS INSIDE THE BUILDING, INCLUDING MAIN VENT PIPING SHALL BE CODE COMPLIANT PVC DARIN AND WASTE PIPE.
- BRANCH VENTS MAY BE STANDARD WEIGHT GALVANIZED STEEL WITH STANDARD WEIGHT GALVANIZED MALLEABLE IRON FITTINGS OR TYPE DWV HARD DRAWN COPPER WITH CAST BRONZE OR WROUGHT COPPER SOLDER TYPE FITTINGS. ULC APPROVED PVC DRAIN, WASTE, VENT PIPING ARE ALSO APPROVED.
- 13.4. ALL WATER PIPING INCLUDING HOT AND COLD INSIDE THE BUILDING SHALL BE TYPE 'L' HARD DRAWN COPPER TUBING WITH CAST BRONZE OR WROUGHT COPPER SOLDER FITTINGS. NO COPPER PIPING SHALL CONTACT FERROUS METALS.
- 13.5. FITTINGS FOR VARIOUS PIPING TO BE AS FOLLOWS:

13.5.1. <u>PIPE</u>:

CAST IRON COPPER DWV 50-50 SOLDER

BELL & SPIGOT OR PLAIN END WITH MJ CLAMPS

PLASTIC ABS-DWV OR PVC-DWV PLASTIC C/W SOLVENT WELD JOINTS-PERMITTED BURIED BELOW GRADE ONLY.

COPPER TYPE L 95-5 SOLDER GROOVED, SCREWED, WELDED OR FLANGED JOINTS SCHEDULE 40 BLACK

(HYDRONIC SERVICE)

STEEL.

- 14.1. PROVIDE AND SET CLEANOUTS FOR DRAINS AT 15 M APART FOR PIPE SIZES BELOW 150 DIA., AND AT 30 M FOR PIPE SIZES IN EXCESS OF 100 DIA.; IN ALL STRAIGHT RUNS OF SEWERS. AT LOCATIONS AS DIRECTED BY THE CONSULTANT, AT THE END OF ALL BRANCHES, AT THE BASE OF ALL RISERS, ON ALL EXPOSED OR ACCESSIBLE TRAPS, AND FURTHER, AT ALL POINTS ON THE SYSTEM WHEN SO INDICATED OR CALLED FOR, OR WHERE NECESSARY BECAUSE OF INTERRUPTION OF GENERAL LINE OF FLOW
- 14.2. THE SCREW CAPS FOR ALL CLEANOUTS SHALL BE APPROVED TYPE. THE CLEANOUTS SHALL BE THE FULL SIZE OF THE PIPE UP TO 100 DIA. FOR CLEANOUTS ON HOUSE DRAINS AND THEIR BRANCHES.
- ALL CLEANOUTS SHALL BE MADE ACCESSIBLE AND WHENEVER NECESSARY BRANCH CONNECTION SHALL EXTEND TO FINISHED SURFACES OF FLOORS, WALLS, ETC. WITH CAST BRASS FLOOR PLATES AND FRAME FOR EACH SET FLUSH WITH FINISHED SURFACE.

15. VALVES

- ALL VALVES SHALL BE SUITABLE FOR 860 KPA WATER PRESSURE AND UP TO AND INCLUDING 65 DIA. SHALL BE ALL BRASS. LARGER SIZES SHALL HAVE IRON BODIES AND BRASS TRIM.
- ALL GATE AND GLOBE VALVES SHALL HAVE DEEP STUFFING BOXES WITH BRONZE FOLLOWING RING. GLOBE VALVES SHALL HAVE RENEWABLE COMPOSITION DISCS. ALL VALVES SHALL BE GATE VALVES WITH RISING STEM UNLESS OTHERWISE NOTED OR
- 15.3. ALL CHECK VALVES SHALL BE 15' SWING TYPE WITH BRASS DISC.
- VALVES SHALL BE CRANE, JENKINS OR APPROVED EQUAL

16. PLUMBING FIXTURES

- 16.1. SUPPLY AND INSTALL ALL PLUMBING FIXTURES AS SHOWN ON THE DRAWINGS. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THEIR PROTECTION UNTIL THE BUILDING IS ACCEPTED BY THE ENGINEER.
- ALL FIXTURES SHALL BE FREE OF FLAWS OR BLEMISHES WITH FINISHED SURFACES CLEAR, SMOOTH AND BRIGHT.
- ALL FINISHED PARTS OF TRIMMINGS OF THE FIXTURES INCLUDING FAUCETS. WASTES. TRAPS, ETC. SHALL BE CHROME PLATED.
- 16.4. COLD WATER SUPPLIES TO EACH FIXTURE SHALL BE EQUIPPED WITH SHUTOFF VALVES.

17. TESTING

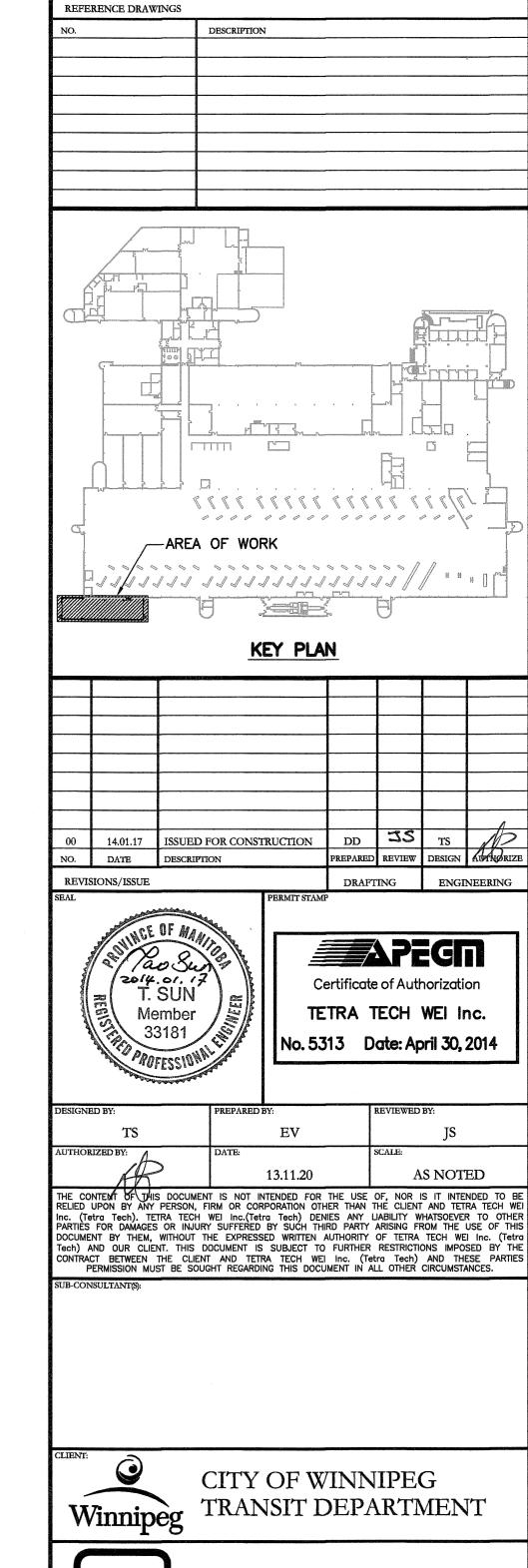
- 17.1. ALL WATER PIPING SHALL BE TESTED AT A HYDRAULIC PRESSURE OF 860 KPA FOR A PERIOD OF EIGHT (8) HOURS.
- 17.2. ALL DRAINS SHALL BE TESTED FOR TIGHTNESS AND GRADE IN THE PRESENCE OF THE LOCAL PLUMBING INSPECTOR.
- 17.3. TEST ALL VALVES FOR SHUT-OFF AND OPERATION AND CHECK PARKING FOR LEAKAGE.
- 18.1. SUPPLY AND INSTALL A NEW SEWAGE SYSTEM FROM THE BUILDING AS INDICATED ON THE PLANS. CHECK ALL INVERTS WITH THE CITY ENGINEER AND PAY ALL COSTS INVOLVED TO CONNECT TO THE CITY SERVICES. SUPPLY AND INSTALL A CLEANOUT ON THE SANITARY MAIN AT THE BUILDING EXIT.

GAS FIRED HEATING MAKE UP AIR UNIT (MAU-1)

- 1. THE UNIT SHALL SERVE AS A 100% O/A MAKEUP AIR UNIT, AND WILL BE REVISED TO A MIXING AIR UNIT IS THE FUTURE (NOT IN CONTRACT).
- 2. UNIT CASING SHALL BE OF MINIMUM 18 (1.3mm) GAUGE SATIN COAT GALVANIZED SHEET METAL. ALL UNITS SHALL BE INTERNALLY INSULATED WITH 2" (50mm) THICK 1 1/2 LB./CU.FT. (24 KG./CU.M.) DENSITY, NEOPRENE COATED FIBRE GLASS THERMAL INSULATION AND 22 GAUGE SATIN COAT SOLID LINERS. PROVIDE HINGED ACCESS DOORS WITH A MINIMUM OF TWO LEVERLOK FASTENERS. COOLING COIL CAVITY DRAIN PANS SHALL BE STAINLESS STEEL WITH A 1" (25mm) M.P.T. DRAIN CONNECTION (TRAPS BY OTHERS). PROVIDE FULL PERIMETER ROOF MOUNTING CURB MINIMUM OF 12 INCHES HIGH.

- a. FORWARD CURVED FANS SHALL BE EQUIPPED WITH GREASEABLE PILLOW BLOCK BEARINGS. SUPPORTED ON A RIGID STRUCTURAL STEEL FRAME. FAN-MOTOR ASSEMBLIES SHALL BE PROVIDED WITH VIBRATION ISOLATORS.
- b. AMCA 'A' SPARK RESISTANT CONSTRUCTION.

- a. HEATING UNITS SHALL HAVE AN INDIRECT NATURAL GAS FIRED HEATING SECTION THAT IS C-ETL APPROVED FOR BOTH SEA LEVEL AND HIGH ALTITUDE
- b. HEAT EXCHANGER SHALL BE A PRIMARY DRUM AND MULTI-TUBE SECONDARY ASSEMBLY CONSTRUCTED OF TITANIUM STAINLESS STEEL WITH MULTI-PLANE METAL TURBULATORS. AND SHALL BE OF A FLOATING STRESS RELIEVED DESIGN. CLAM-SHELL TYPE HEAT EXCHANGERS NOT ACCEPTABLE. HEAT EXCHANGER SHALL BE PROVIDED WITH CONDENSATE DRAIN CONNECTION.



TETRA TECH

CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE

BUS MAINTENANCE ADDITION RAWING DESCRIPTION: MECHANICAL SPECIFICATIONS

SHEET 1

1329720500-DWG-M0007

- c. THE BURNER ASSEMBLY SHALL BE A BLOW THROUGH POSITIVE PRESSURE TYPE WITH AN INTERMITTENT PILOT IGNITION SYSTEM TO PROVIDE A HIGH SEASONAL EFFICIENCY. FLAME SURVEILLANCE SHALL BE WITH A SOLID STATE PROGRAMMED FLAME RELAY C/W FLAME ROD. THE BURNER AND GAS TRAIN SHALL BE IN A CABINET ENCLOSURE. INSULATION IN THE BURNER SECTION SHALL BE COVERED BY A HEAT REFLECTIVE GALVANIZED STEEL LINER. ATMOSPHERIC BURNERS, OR BURNERS REQUIRING POWER ASSISTED VENTING ARE NOT ACCEPTABLE.
- d. UNITS SHALL INCLUDE 15:1 TURNDOWN (HT BURNER)
- 1. FILTERS
- a. FILTER SECTIONS SHALL BE PROVIDED WITH ADEQUATELY SIZED ACCESS DOORS TO ALLOW EASY REMOVAL OF FILTERS. FILTER REMOVAL SHALL BE FROM ONE SIDE AS NOTED ON THE DRAWINGS. PROVIDE 2". 30% EFFICIENT PLEATED FILTER.
- DAMPERS
- a. DAMPERS CONSTRUCTION SHALL INCLUDE BLADE ENDS SEALED WITH AN ADHESIVE BACKED FOAMED POLYURETHANE GASKETTING. OUTDOOR AIR DAMPERS ALSO INCLUDE AN ALL WEATHER PVC SEAL.
- b. CAP OFF MIXING DAMPER BETWEEN EXHAUST/RETURN AND INTAKE TO AVOID CROSS CONTAMINATION.
- 6. PACKAGED COOLING
- RESERVE SUFFICIENT SPACE FOR FUTURE DX COOLING AS REQUIRED.
- 7. ELECTRICAL
- a. PROVIDE A UNIT MOUNTED NON-FUSED DISCONNECT SWITCH.
- 8. CONTROLS
- a. PROVIDE DJM DISCHARGE AIR CONTROLLERS TO PROVIDE HEATING, ECONOMIZER (SET AT 100% OA) AND MECHANICAL COOLING (FUTURE) WITH SPACE RESET THROUGH THE DDC SYSTEM. UNIT SHALL BE COMPLETELY FACTORY WIRED & TESTED. THE FACTORY MOUNTED BACNET COMPATIBLE CONTROLLER SHALL BE USED AS AN INTERFACE.
- b. VFD ACCEPTABLE MANUFACTURER: ABB.
- c. EXHAUST FAN AND SUPPLY FAN SHALL BE INTERLOCKED
- MAKE/MODEL
- a. ACCEPTABLE MAKE SHALL BE AN ENGINEERED AIR UNIT, DJ SERIES.

SECTION 15800 HEATING, VENTILATION & AIR CONDITIONING

- 1. PROVIDE SUPPLY AIR, RETURN AIR, AND EXHAUST AIR DUCT SYSTEMS AS SHOWN.
- PROVIDE 4" FLEXIBLE DUCT CONNECTIONS ON BOTH INLET AND OUTLET DISCHARGE SIDES OF EACH FAN, AIR HANDLING ROOFTOP UNIT, ETC.
- 3. ALL DUCTWORK INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH SMACNA LATEST EDITION DUCT STANDARDS.
- 4. ALL OUTDOOR DUCTWORK SHALL BE TWO GAUGES HEAVIER THAN INDOOR DUCTWORK OF EQUAL
- 5. THE MECHANICAL SUBCONTRACTOR SHALL SUPPLY AND INSTALL ALL DUCTWORK INCLUDING
 - a. ALL EXPOSED ROUND DUCTWORK SHALL BE ROUND SPIRAL CONDUIT CONSTRUCTED OF ZINC COATED STEEL: ACCEPTABLE PRODUCT: UNITED SHEET METAL CO. SHOP FABRICATED DUCTWORK AND FITTINGS CONSTRUCTED IN A MANNER SIMILAR TO THE FACTORY TYPE SPECIFIED WILL BE ACCEPTED.

CONDUIT SIZE GAUGE OF METAL

8" AND SMALLER

9" TO 22" 24

b. RECTANGULAR DUCTWORK SHALL BE CONSTRUCTED FROM GALVANIZED SHEET METAL OF THE FOLLOWING U.S. STANDARD GAUGES:

DUCTS UP TO 12" ON LONGEST DIMENSION 24 GA. DUCTS 13" TO 28" ON LONGEST DIMENSION

6. BALANCING DAMPERS SHALL BE CONSTRUCTED FROM GALVANIZED STEEL TWO GAUGES HEAVIER THAN THE DUCTWORK IN WHICH THEY ARE INSTALLED C/W LOCKING QUADRANT AND INDICATING DEVICE. INSTALL ON ALL TAKE-OFFS AT MAIN SUPPLY AND EXHAUST DUCTING AND/OR WHERE REQUIRED TO PROVIDE AN ADJUSTABLE, PROPERLY BALANCED SYSTEM. LOCATE DAMPERS TO ENSURE EASY ACCESS TO FINISHED SYSTEM.

7. ALL DUCTWORK SHALL BE SEALED USING DURO-DYNE S-2 DUCT SEALER THROUGHOUT ALL SEAMS AND JOINTS.

- 8. PROVIDE ACCESS DOORS WHERE REQUIRED FOR SERVICING OR OPERATING OF MECHANICAL EQUIPMENT.
- 9. ELECTRIC DUCT HEATERS CONSTANT VOLUME SYSTEM
- a. SUPPLY AND INSTALL CSA APPROVED PM WRIGHT OPEN COIL ELECTRIC DUCT HEATERS AS PER PLANS, AND COIL SCHEDULES.
- b. FRAME SHALL BE OF GALVANIZED COLD ROLLED STEEL C/W INTEGRAL CONTROL CABINET c. OPEN-COIL NICKEL-CHROMIUM RESISTANCE WIRE ELEMENTS, DESIGNED FOR MINIMUM AIR
- FLOW, SHALL BE SUPPORTED ON CERAMIC BUSHINGS HELD IN RIGID SUPPORT BRACKETS. d. DUCT HEATERS SHALL BE EITHER FLANGE TYPE (WXF) FOR ATTACHMENT TO EXTERNAL DUCT FLANGES OR INSERT TYPE FOR INSERTION INTO SIDE OF DUCT.
- e. BUILT-IN PRIMARY, AUTOMATIC RECYCLING CUTOUTS SHALL BE SUPPLIED IN ALL HEATERS. HEATERS BELOW 30KW AND BELOW 300 VOLTS SHALL BE SUPPLIED WITH BUILT-IN SECONDARY MANUAL RESET CUTOUTS. THEY SHALL BE OF DISC TYPE FOR HORIZONTAL AIRFLOW INSTALLATION AND LINEAR IN ALL HEATERS OVER 20 SQ.FT. ON IN VERTICAL AIR FLOW APPLICATIONS.
- 10. THE FOLLOWING DEVICES SHALL BE SUPPLIED WITH THE UNITS AND PRE-WIRED BY THE MANUFACTURER.
- a. PRIMARY AUTOMATIC AND SECONDARY MANUAL THERMAL HIGH LIMIT SAFETY CUTOUTS. b. SAFETY INLET SCREEN
- c. FUSED 24V CONTROL TRANSFORMER
- d. MAGNET CONTACTORS
- e. DUCT PRESSURE DIFFERENTIAL SWITCH
- f. SCR C/W MODULATING OUTPUT CONTROLLED BY SPACE THERMOSTAT.
- g. ALL NECESSARY PNEUMATIC/ELECTRIC TRANSDUCERS, RELAYS AND SWITCHES AS REQUIRED

TO INTERFACE WITH NEW OR EXISTING BUILDING CONTROL SYSTEMS. CONTRACTOR/EQUIUPMENT SUPPLIER SHALL COORDINATE WITH CONTROLS CONTRACTOR PRIOR TO SUBMITTING SHOP DRAWINGS.

- h. C/W NON-FUSED DISCONNECT SWITCH.
- 11. VEHICLE TAIL EXHAUST AIR DUCTWORK 11.1. SIZES UP TO 914mm (36") TO BE ZINC-COATED STEEL STRIP, SPIRAL CONDUIT OR
- 11.2. CONSTRUCT SPIRAL SIZES UP TO 203mm (8") OF .50mm (#26 GA.) WITH RIBS SPACED 63mm (2-1/2") TO 100mm (4") APART. SIZES FROM 228mm (9") TO 609mm (24") TO BE OF .60 (#24 GA.) WITH RIBS SPACED 150mm (6") APART. SIZES 660MM (26") TO 914mm (36") OF .80 (#22 GA.) WITH RIBS SPACED 150MM (6") APART.
- ROUND DUCT TO HAVE GROOVED LONGITUDINAL SEAMS WITH CONTINUOUS WELD.
- SECTIONS JOINED BY 200mm (8") COUPLING SLEEVES.
- FITTING MANUFACTURED BY UNITED. ALL TEES SHALL BE CONICAL
- DUCTWORK SHALL BE CONSTRUCTED OF NOT LESS THAN 1.2mm (#18 GA.) GALV. IRON SHEETS.
- ALL COMPONENTS AND ACCESSORIES SHALL BE SUITABLE FOR 500°C APPLICATION.

SECTION 15900 CONTROLS AND SEQUENCES

- ALL CONTROLS SHALL BE SUPPLIED AND INSTALLED BY MECHANICAL SUBCONTRACTOR. ALL WIRING 50 VOLTS AND ABOVE FOR MECHANICAL EQUIPMENT SHALL BE PERFORMED BY ELECTRICAL SUBCONTRACTOR. MECHANICAL SUBCONTRACTOR TO PROVIDE WIRING DIAGRAMS.
- 2. ALL THERMOSTATS SHALL BE PROGRAMMABLE TYPE DIGITAL READOUT AND DISPLAY C/W LOCKABLE TAMPERPROOF METAL COVERS, NIGHT-SETBACK, AND SUB-BASE.
- 3. PROVIDE ALL TRANSFORMERS, SOLENOIDS, WIRING, AND ANY OTHER HARDWARE (SPECIFICALLY INDICATED OR NOT) AS REQUIRED IN ORDER TO COMPLETE A FULLY FUNCTIONING CONTROL SYSTEM COMPATIBLE WITH THE NEW AND EXISTING SYSTEMS AND EQUIPMENT RELATED TO THIS PROJECT.
- 4. CO/NO2 GAS DETECTION
 - CENTRALIZED CONTROL PANEL
 - 4.1.1. PANEL SHALL BE 120 VAC. CONFIRM THE EXACT LOCATION WITH THE CITY.
 - 4.1.2. THE PANEL SHALL BE COMPATIBLE TO JOHNSON METASYS CONTROL SYSTEM.
 - 4.1.3. PANEL SHALL BE INTERLOCKED WITH MAU-01 EXHAUST/SUPPLY FAN.
 - 4.1.4. PANEL TO INCLUDE:
 - 4.1.4.1. GREEN LIGHT LABELLED 'POWER' INDICATING PANEL IS POWERED AND
 - OPERATING CORRECTLY. 4.1.4.2. GREEN LIGHT INDICATING CONTAMINANT LEVELS ARE BELOW 1ST LEVEL SET POINT (50 PPM CO AND/OR 1 PPM NO2) AT ALL SENSORS.
 - AMBER LIGHT INDICATES THAT GAS CONCENTRATIONS HAVE EXCEEDED 1ST
 - LEVEL SET POINT AT A MINIMUM OF ONE SENSOR. 4.1.4.4. RED LIGHT INDICATES THAT GAS CONCENTRATIONS HAVE EXCEEDED 2ND LEVEL SET POINT (200PPM CO AND/OR 4 PPM NO2) AT A MINIMUM OF
 - 4.1.4.5. SENSOR STATUS, AND GAS CONCENTRATION INDICATORS
 - DESIGN OPERATING CONDITIONS: 5-95% RELATIVE HUMIDITY AND TEMPERATURE RANGES OF -20° C TO 40° C.
 - 4.2. GAS DETECTORS
 - 4.2.1. DETECTORS TO BE 24VDC, COMPLETE WITH 120/24V TRANSFORMER. REFER TO MANUFACTURER'S INSTRUCTION FOR LOCATION AND QUANTITY REQUIREMENT.
 - 4.2.2. SINGLE SENSOR BODY SHALL BE CAPABLE OF DETECTING BOTH CO AND NO2.
 - 4.2.3. TO BE CONNECTED TO CENTRALIZED CONTROL PANEL
 - 4.2.4. DESIGN OPERATING CONDITIONS: 5-95% RELATIVE HUMIDITY AND TEMPERATURE RANGES OF -20° C TO 40° C.
 - 4.3. SET POINTS (ADJUSTABLE) AS FOLLOWS:
 - 4.3.1. 1ST ALARM SETPOINT: CO @ 50 PPM/ NO2 @ 0.7 PPM
 - 4.3.2. 2ND ALARM SETPOINT: CO @ 100 PPM/ NO2 @ 2.0 PPM
 - ACCEPTABLE MANUFACTURERS:
 - 4.4.1. CRITICAL ENVIRONMENT TECHNOLOGIES
 - 4.4.2. HONEYWELL

4.4.3. ENMET

- GENERIC INPUT/OUTPUT FOR METASYS CONTROL
- CONTROLS MUST BE ABLE TO INTERFACE TO MSEA TECHNOLOGY ON THE FIELD DEVICE NETWORK USING BACNET PROTOCOLS.
- CONTROLS CONTRACTOR TO PROVIDE COMMISSIONING SHEETS FOR ALL POINTS ON FIELD DEVICES AS WELL AS HEAD END EQUIPMENT.
- CONTROLS CONTRACTOR TO COMMUNICATE WITH EQUIPMENT PROVIDER TO ENSURE PROPER FIELD POINT INTEGRATION AS WELL AS CONTROLLABILITY OF THE EQUIPMENT AND PROVIDE FIELD CONTROLLER AS REQUIRED.
- IF NOT A METASYS PRODUCT INSTALLED. THE CONTROLS CONTRACTOR MUST SHOW SEAMLESS INTEGRATION INTO THE EXITING METASYS EXTENDED ARCHITECTURE OPERATOR INTERFACE THAT IS ACCEPTABLE TO CITY STAFF PRIOR TO THE AWARD OF THE CONTRACT.
- CONTROLS CONTRACTOR TO SUPPLY ALL DRAWINGS/GRAPHICS/SEQUENCE OF OPERATIONS IN BOTH A HARD AND SOFT COPY. DRAWINGS AND GRAPHICS TO BE ABLE TO BE READ AND MODIFIED BY CITY OF WINNIPEG STAFF. USER INTERFACE GRAPHICS TO BE COMPLETED USING GRAPHIC GENERATION TOOL SOFTWARE. GRAPHICS MUST USE CITY OF WINNIPEG GRAPHIC TEMPLATES. CONTRACTOR TO SUPPLY AS-BUILT DRAWINGS IN AN EDITABLE FORMAT, ABLE TO BE EASILY EDITED BY CITY OF WINNIPEG STAFF.
- THE USE OF EITHER N2OPEN OR BACNET TO BE DETERMINED BASED ON TYPE OF BUILDING WHERE THE WORK IS BEING PERFORMED. IF THE CONSTRUCTION IS A BRAND NEW FACILITY, THEN BACNET CAN BE USED. THE TERM BACNET SHOULD THEN BE DEFINED PROPERLY IN IT'S USE. IF THE WORK IS AN ADDITION TO AND THE NEW WORK IS TO BE TIED INTO THE EXISTING CONTROLS, THEN THE CONTRACTOR SHOULD CONTACT CITY OF WINNIPEG TECHNICAL STAFF TO DETERMINE THE BEST PROTOCOL TO USE BASED ON EXISTING EQUIPMENT.
- IF OTHER VENDOR (NON-JCI) CONTROLS ARE TO BE USED THEN A SEAMLESS INTEGRATION MUST BE PROVÉN BEFORE APPROVAL WILL BE GIVEN.
- THE TERM BACNET REFERS TO AN INDUSTRY STANDARD PROTOCOL THAT BASICALLY STATES THAT ALL DEVICES USING THE BACNET TECHNOLOGY WILL BE ABLE TO COMMUNICATE TO EACH OTHER. THIS IS NOT NECESSARILY THE CASE. THE BACNET PROTOCOL IS COMPRISED OF SEVERAL LAYERS OF INTEROPERABILITY AND INTERCOMMUNICATIONS. THE CONTROLS CONTRACTOR PERFORMING THE SUPERVISORY CONTROLLER INSTALLATION SHOULD CONFIRM THAT ALL DEVICES SPECIFIED ARE ABLE TO COMMUNICATE TO THE PROPOSED DEVICES USING THE BACNET PIC STATEMENT AND THEN SUPPLY DOCUMENTATION SUCH THAT ALL DEVICES SUPPLIED WILL COMMUNICATE TO EACH OTHER AS REQUIRED FOR PROPER OPERATION OF THE SYSTEM. THIS INCLUDES INTEGRATION INTO THE ADX SERVER.
- IF METASYS NETWORK AUTOMATION ENGINES (NAE/NIE/NCE) ARE TO BE INSTALLED ON THE PROJECT THEN THE VERSION OF THESE DEVICES AND THEIR SOFTWARE MUST BE SUCH THAT THE CITY OF WINNIPEG DOES NOT BE REQUIRED TO UPDATE/UPGRADE THE EXISTING ADX SERVER IN ORDER FOR ALL USER VIEWS, ALARMS, AND POINT MONITORING

TO OCCUR. THE CONTRACTOR MUST CO-ORDINATE WITH CITY STAFF TO DETERMINE THE CORRECT VERSION TO BE INSTALLED. ALL USER VIEWS AND GRAPHICS MUST NOT BE INSTALLED IN THE LOCAL SUPERVISORY CONTROLLER (NAE/NIE/NCE). ALL SUCH ITEMS MUST BE PROGRAMMED INTO THE EXISTING ADX SERVER. USER VIEWS AND GRAPHICS MUST BE APPROVED FOR USE BY CITY STAFF BEFORE IMPLEMENTATION OF SUCH ITEMS.

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- 5.10. ALL MONITORED POINTS THAT HAVE ALARMS MUST HAVE OPERATING INSTRUCTIONS AND ALARM MESSAGES. THESE WILL BE CO-ORDINATED WITH THE TECH SHOP AND OPERATIONS SUPERVISOR.
- 6. FAN SYSTEM CONTROLS GENERAL
- 6.1. PROVIDE "FAIL—SAFE HARDWARE" (HARDWIRED) INTERLOCKS (CSR'S, DIFFERENTIAL PRESSURE SWITCHES, ETC.) TO ENSURE SYSTEM CONTROLS ENERGIZE AND ASSOCIATED EXHAUST FANS RUN WHEN SUPPLY FAN RUNS.
- PROVIDE ALL FAN SYSTEMS THAT INTRODUCE OUTSIDE AIR WITH LOW LIMIT CONTROL IN DISCHARGE AIR TO SHUT DOWN SUPPLY FAN WHEN DISCHARGE AIR TEMPERATURE DROPS BELOW 3°C. PROVIDE A PRESSURE DIFFERENTIAL SWITCH ON FILTER TO INDICATE FILTER PRESSURE STATUS AND ALARM AT THE BMS. 5% ACCURACY IS REQUIRED FOR FILTER STATIC SENSOR. FILTER ALARMS SHALL NOT BE REGISTERED WHEN FAN SYSTEM IS OFF.
- ON 100% O.A. SYSTEMS PROVIDE END SWITCH ON O.A. DAMPER BLADE TO ENSURE O.A. DAMPER IS FULLY OPEN PRIOR TO STARTING FAN.
- LOW LIMIT CONTROLLERS MOUNTED ON FAN SYSTEMS WILL BE WIRED TO SHUTDOWN THE FAN SYSTEM, INDEPENDENT OF THE BMS (HARDWIRED TO BOTH 'AUTO' AND 'HAND' POSITION OF THE FAN STARTER). THE LOW LIMIT WILL ALSO PROVIDE CONTACT TO THE BMS WHICH WILL INITIATE A LOW TEMPERATURE ALARM. WHEN THE LOW LIMIT CONDITION OCCURS, ALL OTHER ALARMS ON THE FAN SYSTEM, SUCH AS FAN FAIL ALARMS WILL NOT BE GENERATED BY THE BMS.
- ALL FAN SYSTEMS WILL HAVE A TIME SCHEDULE PROGRAM. ALL THE START/STOP TIMES WILL BE DISPLAYED ON THE SYSTEM GRAPHIC WHICH WILL BE IDENTIFIED AS 'TIME SCHEDULE'. THE SYSTEM OPERATORS WILL BE ABLE TO SELECT AND ADJUST ONLY START AND STOP TIME FOR ANY DAY OF THE WEEK. THE SYSTEM OPERATORS WILL BE ABLE TO SELECT THE FAN SYSTEM TO OPERATE FROM THE TIME SCHEDULE CONTINUOUS ON, OR CONTINUOUS OFF (HOA) THROUGH THE SYSTEM GRAPHICS.
- ALL VALUES STATED SHALL BE FIELD ADJUSTABLE. LOCAL CONTROLLERS SHALL ALLOW OPERATOR TO ACCESS ALL CONNECTED INPUT POINTS, OPERATOR COMMANDABLE POINTS AND OPERATOR SELECTABLE PARAMETERS AND SET POINTS.
- THE BMS SHALL PROVIDE FOR HIGH/LOW TEMPERATURE ALARMS ON ALL TEMPERATURE SENSORS LISTED IN THE ANALOG INPUT LIST.
- 7. VEHICLE EXHAUST SYSTEM
- 7.1. VEHICLE TAIL EXHAUST FAN (F-1)
 - 7.1.1. EXHAUST FANS ON EXHAUST HOSE SHALL BE ACTIVATED BY WALL MOUNTED HAND SWITCHES. CONFIRM SWITCH LOCATIONS WITH THE CITY.

INPUT/OUTPUT POINTS F-1:

- .1 BINARY INPUTS:
- .1 EXHAUST FAN STATUS
- .2 BINARY OUTPUTS .1 EXHAUST FAN ON/OFF
- 7.2. GAS DETECTION (CO, NO2)
- GAS DETECTORS ARE TO BE CONNECTED TO A MAIN CONTROL PANEL WITH TWO LEVEL ALARM OUTPUTS.
- 7.2.2. GAS DETECTOR LOCATIONS
 - 7.2.2.1. DETECTOR AT 1.2 M A.F.F. 7.2.2.2. DETECTOR AT TRUSS LEVEL
- 7.3. GAS DETECTOR PANEL (CONFIRM LOCATION WITH THE CITY)
- 7.3.1. ANY GAS DETECTOR READING 50 PPM CO AMBER LIGHT: ON
- ANY GAS DETECTOR READING 100 PPM CO RED LIGHT: ON AND HORN/STROBE:
- ANY GAS DETECTOR READING 0.7 PPM NO2 AMBER LIGHT: ON
- ANY GAS DETECTOR READING 2 PPM NO2 RED LIGHT: ON AND HORN/STROBE:
- 7.3.5. ANALOG OUTPUT SHALL BE INTERLOCKED WITH THE BMS AND FIREALARM SYSTEM.
- 8. BUILDING STATIC PRESSURE CONTROL
- THE STATIC PRESSURE TIP SHALL BE PROVIDED AT THE EXTERIOR OF THE BUILDING TO SENSE LOCAL STATIC PRESSURE OF THE BUILDING.
- PRESSURE TIP USED ON THE BUILDING EXTERIOR SHALL ISOLATE THE STATIC PRESSURE FROM VELOCITY (WIND) PRESSURE TO PROVIDE A RELIABLE AND ACCURATE STATIC PRESSURE REFERENCE.

PROVIDE SHOP DRAWINGS OF PROPOSED TIP ASSEMBLY AND MOUNTING INCLUDING ALL

BRACING AS PART OF SHOP DRAWING PACKAGE. EXHAUST FAN SPEED (IN MAU-1) WILL BE MODULATED TO MAINTAIN THE PRESSURE IN EXHAUST AIR PLENUM. THE RELIEF AIR DAMPER POSITION WILL BE ADJUSTED TO

MAINTAIN NEUTRAL PRESSURIZATION BETWEEN THE CONDITIONED SPACE AND THE

- ATMOSPHERE. 9. FIRE ALARM INTEGRATION - GENERAL
- 9.1. HARDWIRED FIRE ALARM INTERLOCKS SHALL BE PROVIDED MAU-01 MOTOR STARTERS.
- INTERCONNECTION TO FIRE ALARM INTERLOCK RELAYS SHALL BE PROVIDED TO ALLOW THE BMS TO BE NOTIFIED OF A FIRE ALARM CONDITION.
- MAKEUP AIR UNIT
- 10.1. MAU-1 IS A 100% FRESH AIR UNIT THAT PROVIDES VENTILATION AIR TO THE NEW ADDITION. THE UNIT IS MADE UP OF A VARIABLE VOLUME FAN SYSTEM AND INDIRECT GAS FIRED HEAT EXCHANGER.
- 10.2. THE MANUFACTURER OF THE EQUIPMENT SHALL PROVIDE BACNET PROTOCOL PACKAGED CONTROLLER COMMUNICATING WITH BMS SEAMLESSLY.
- 10.3. INPUT/OUTPUT POINTS MAU-01:
 - 10.3.1. ANALOG INPUTS:
 - 10.3.1.1. OUTSIDE AIR TEMPERATURE
 - 10.3.1.2. SUPPLY AIR TEMPERATURE 10.3.1.3. SUPPLY FAN STATIC PRESSURE
 - 10.3.1.4. OUTSIDE AIR STATIC PRESSURE

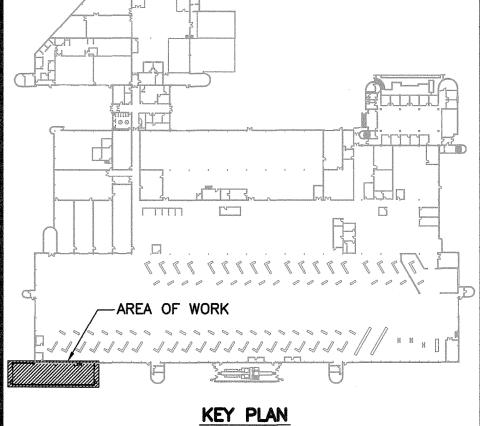
10.3.1.7. EXHAUST FAN PLENUM PRESSURE

- 10.3.1.5. SPACE STATIC PRESSURE 10.3.1.6. SUPPLY AIR FLOWRATE
- 10.3.1.8. SUPPLY FAN VFD OUTPUT
- 10.3.2. ANALOG OUTPUTS:
 - 10.3.2.1. GAS CONTROL VALVE POSITION

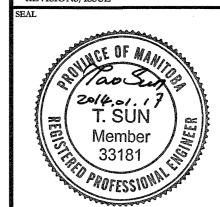
10.3.1.9. EXHAUST FAN VFD OUTPUT

- 10.3.2.2. SUPPLY FAN VFD CONTROL 10.3.2.3. EXHAUST FAN VFD CONTROL
- 10.3.2.4. RELIEF AIR DAMPER

REFERENCE DRAWINGS DESCRIPTION



JS TS ISSUED FOR CONSTRUCTION 14.01.17 PREPARED REVIEW DESIGN AUTHORIZE NO. DATE DESCRIPTION REVISIONS/ISSUE ENGINEERING DRAFTING



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CITY OF WINNIPEG TRANSIT DEPARTMENT



BUS MAINTENANCE ADDITION DRAWING DESCRIPTION: MECHANICAL SPECIFICATIONS

SHEET 2

3D MODEL REF No:

1329720500-DWG-M0008

CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE

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Winnipeg

10.4.3. BINARY INPUTS:

10.4.3.1. SUPPLY FAN STATUS

10.4.3.2. EXHAUST FAN STATUS

10.4.3.3. AIR FILTER STATUS

10.4.3.4. BUILDING FIRE ALARM STATUS 10.4.3.5. OUTSIDE AIR DAMPER POSITION (OPEN/CLOSED)

10.4.4. BINARY OUTPUTS

10.4.4.1. OUTSIDE AIR DAMPER OPEN/CLOSED

10.4.4.2. RELIEF AIR DAMPER OPEN/CLOSE

10.4.4.3. SUPPLY FAN START/STOP

10.4.4.4. EXHAUST FAN START/STOP

11. MAU-1 SEQUENCE OF OPERATION 11.1. THE SUPPLY FAN WILL BE STARTED UNDER THE FOLLOWING CONDITIONS:

11.1.1. THE SOFTWARE HAND-OFF-AUTO SWITCH (HOA) IS SWITCHED TO ON POSITION; OR,

11.1.2. THE SOFTWARE HAND-OFF-AUTO SWITCH (HOA) IS IN AUTO POSITION AND

11.1.3. THE BUILDING OCCUPANCY SCHEDULE IS INDICATING THAT THE SYSTEM SHOULD BE OPERATING; OR,

11.1.4. SPACE TEMPERATURE SENSOR INDICATES SPACE TEMPERATURE FALLING BELOW UNOCCUPIED SET POINT. IN THIS CASE THE SUPPLY FAN WILL RUN UNTIL THE NIGHT SETBACK TEMPERATURE PLUS 1°C (ADJUSTABLE) IS ACHIEVED.

11.1.5. VENTILATION RATE SETBACK WILL ADJUST THE FAN SPEED.

11.2. WHEN A FIRE ALARM SIGNAL IS DETECTED, THE FAN WILL SHUT DOWN UNTIL THE FIRE ALARM SYSTEM IS RESET.

11.3. THE SPEED CONTROL PROGRAM WILL BE ENABLED WHENEVER THE SUPPLY FAN OUTPUT

11.4. WHEN THE VFD IS ENABLED, THE SUPPLY FAN WILL HAVE A MINIMUM SPEED OF 30% (ADJUSTABLE)

11.5. THE STATIC PRESSURE AT THE FAN DISCHARGE WILL BE LIMITED TO THE DISCHARGE PRESSURE HIGH LIMIT SET POINT.

11.6. THE FOLLOWING CONDITIONS WILL CAUSE AN ALARM IN THE SYSTEM:

11.6.1. HIGH OR LOW DUCT STATIC PRESSURE

11.6.2. HIGH OR LOW DISCHARGE AIR STATIC PRESSURE

11.6.3. SUPPLY FAN FAILURE

11.6.4. EXHAUST FAN FAILURE

11.6.5. HIGH OR LOW DISCHARGE AIR TEMPERATURE

11.6.6. AIR FILTER TROUBLE

11.7. SUPPLY AIR TEMPERATURE CONTROL:

11.7.1. GAS FIRED HEAT EXCHANGER WILL MODULATE SUPPLY AIR TEMPERATURE TO ACCOMMODATE SPACE HEATING LOAD CHANGES.

11.7.2. ON SYSTEM SHUT DOWN GAS FIRED HEAT EXCHANGER WILL BE DISABLED AND OUTSIDE/EXHAUST AIR DAMPERS WILL GO TO FULLY CLOSE.

11.8. EXHAUST/SUPPLY AIRFLOW CONTROL:

THE NEW ADDITION HAS LOW/HIGH SETPOINTS OF CO AND NO2 CONCENTRATION (REFER TO THE PARAGRAPH OF "GAS DETECTION"). WHEN ANY CONCENTRATION EXCEEDS A THRESHOLD (PPM LEVEL IN AIR) THE FOLLOWING SHALL HAPPENED:

11.8.1. 1ST ALARM:

SUPPLY FAN IN MAU-1 WILL BE AT THE SPEED CARRYING 50% (ADJUSTABLE) DESIGN AIRFLOW TO REDUCE THE CO/ NO2 LEVEL.

11.8.2. 2ND ALARM:

11.8.2.1. USE THE ANALOG OUTPUT OF GAS DETECTION PANEL ASSOCIATED WITH THE SUPPLY FAN IN MAU-1 TO RAMP UP THE VFD BETWEEN FIRST ALARM SETPOINTS AND 125PPM(CO)/1.4PPM(NO2) PROPORTIONALLY TO THE DESIGN AIRFLOW. IF CONCENTRATIONS ARE REDUCED AND LOWER THAN FIRST ALARM SETPOINTS. SUPPLY FAN VFD WILL BE BACK TO MINIMUM SPEED AT 35% OF DESIGN AIRFLOW.

11.8.2.2. TURN ON REMOTE HORNS/STROBES LOCATED IN AREA WHERE SECURITY OR MAINTENANCE PERSONNEL CAN BE WARNED OF HIGH CO NO2

11.8.2.3. NOTIFY HIGH ALARM LEVEL CONDITION TO THE BMS.

12. MISCELLANEOUS SYSTEMS MONITORING

12.1. PROVIDE THE FOLLOWING MONITORING POINTS:

12.1.1. PIT HIGH LEVEL ALARM

SECTION 15990 TESTING AND BALANCING OF MECHANICAL SYSTEMS

11. INDEPENDENT RECOGNIZED AIR BALANCE CONTRACTOR SHALL BE AABC CERTIFIED.

12. TEST AND BALANCE MAU-1 AND F-1 AIR SYSTEMS. TEST ALL NEW AND FIRE DAMPERS. INCLUDE FIRE DAMPER VERIFICATION REPORT IN TAB REPORT.

| | | | | · · · · · · · · · · · · · · · · · · · | | PLUI | MBING I | FIXTURE | SCHED | ULE |
|------|-------------|---------|--------------|---------------------------------------|---------------|------|-----------|-------------|-------|---|
| | | | | | | PIPI | E CONNECT | TONS | | DEMA DVO |
| TAG | DESCRIPTION | MANUFR. | MODEL | TRAP | DCW | DHW | TW | WASTE | VENT | REMARKS |
| TP-1 | TRAP PRIMER | MIFAB | M2-500 | - | 15Ø (1/2") | - | | - | • | PRESSURE DROP ACTIVATED BRASS TRAP SEAL PRIMER C/W VIEW HOLES AND REMOVABLE FILTER SCREEN AND SERVE UP TO 3 FLOOR DRAINS. |
| RD-1 | ROOF DRAIN | ZURN | е | - | - | | - | 75Ø (3") | - | DURA-COATED CAST IRON BODY. "CONTROL-FLO" WEIR SHALL BE LINEAR FUNCTIONING WITH INTEGRAL MEMBRANE FLASHING CLAMP/GRAVEL GUARD AND POLY-DOME. ALL DATA SHALL BE VERIFIED PROPORTIONAL TO FLOW RATES. C/W ALUMINUM DOME AND WATERPROOFING FLANGE. |
| FD-1 | FLOOR DRAIN | ZURN | FD-100-C | 75Ø (3") | - | - | - | 75Ø (3") | - | EPOXY-COATED CAST IRON FLOOR DRAIN WITH ANCHOR FLANGE, REVERSIBLE MEMBRANE CLAMP WITH PRIMARY AND SECONDARY WEEPHOLES, ADJUSTABLE NICKEL BRONZE ROUND HEAVY-DUTY STRAINER AND TRAP PRIMER CONNECTION. |
| FD-2 | FLOOR DRAIN | ZURN | Z 534 | - | - | - | - | 100ø (4") | - | 305Ø DIAMETER PARKING DECK DRAIN, DURA-COATED CAST IRON BODY WITH BOTTOM OUTLET, HEAVY DUTY GASKETED DRAIN SUPPORT FLANGE, WITH HEAVY DUTY SLOTTED GRATE. |

| | | | | | UNIT HEA | TER SC | HEDUI | E. | | | | | | | | | | | | | |
|---------|---------------------|--------------------------|--------|--------|--------------|--------|-------|-----|-------|--------|------|-------|---------|-------------|---------|---------|------|-------|-------|--------|---------|
| | | | UEATIN | | THERMAL EFF. | | | | | AIR SI | DE | | | | | GAS SI | DE | | WE | IGHT | |
| TAG | LOCATION | MODEL | HEATIN | GINPUI | INERWAL EFF. | FLOW | RATE | F | AN MO | OR | ENT. | TEMP. | COMBUST | . AIR INLET | GAS CON | NECTION | VENT | ΓDIA. | 77 | | NOTES |
| | | | (kW) | (MBH) | (%) | (L/s) | (CFM) | (W) | (HP) | (RPM) | (°C) | (°F) | (mm) | (in.) | (mm) | (in.) | (mm) | (in.) | (kg.) | (lbs.) | ` |
| UH-1, 2 | MAINTENANCE BAY 101 | REZNOR MODEL UEAS 180 | 52.8 | 180 | 91 | 1,160 | 2,458 | 187 | 0.25 | 1050 | 15.6 | 60 | 152 | 6 | 13 | 0.50 | 102 | 4 | 111 | 245 | 1, 2, 3 |

NOTES: 1. UNIT HEATER SHALL HAVE OPEN FAN MOTOR AND PSC VENTER MOTOR. 2. UNIT HEATER MOUNTING HEIGHT SHALL BE 3.7m (12 ft.) MINIMUM.

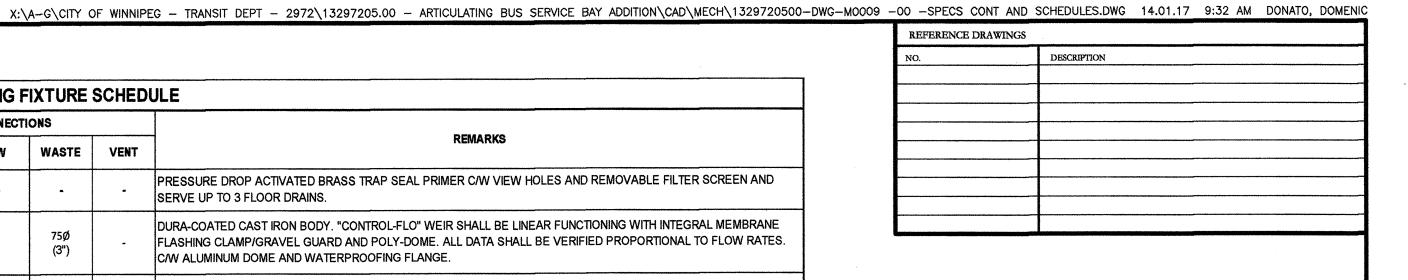
3. UNIT HEATER SHALL HAVE BUILT-IN DISCONNECT SWITCH AND SUPPLIED WITH A REMOTE THERMOSTAT C/W GUARD AND LOCKING COVER.

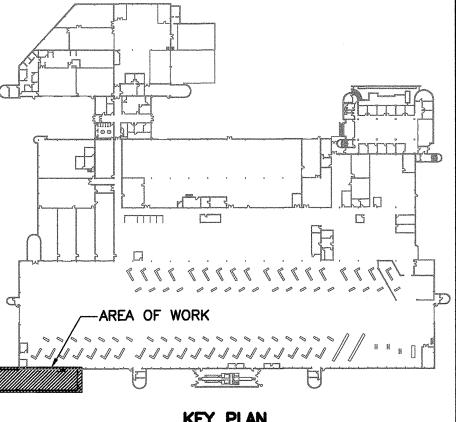
| | | | | FAN SCI | HEDUL | E | | | | | | | | |
|--------|------------------------------------|-----------------------|-----------------------|--------------------|----------|----------|-----------|---------|----------|----------|---------|------------|---------------------------|-------------|
| TAG | SERVICE | MANUFACTURER | TYPE | MODEL | RPM | AIR FLC | OW RATE | E. | S.P. | MO | TOR | SONES | ACCESSORIES | NOTES |
| IAG | SERVICE | WANOFACTORER | ITPE | IVIODEL | KEW | (L/s) | (CFM) | (Pa) | (in.WC) | (kW) | (HP) | SOINES | | Notes |
| F-1 | BUS TAIL PIPE EXHAUST | TWINCITY | CENTRIFUGAL | ROB909 | 2,658 | 566 | 1,200 | 2250 | 9.00 | 3.73 | 5.00 | - | | 1 |
| F-2 | WELDING EXHAUST | NEDERMAN | PORTABLE | FILTERBOX 12M | N/A | 330 | 700 | N/A | N/A | 1.49 | 2.00 | - | | 2 |
| NOTES: | 1. ROOF MOUNTED, CONSTRUCTION SU | JITABLE TO HANDLE 600 | F DEG. VEHICLE ENGINE | EXHAUST, BELT DRI | VE, C/W | WEATHE | R COVER | AS REC | UIRED. C | ONNECT | ED HOSE | TO BE 150 | Omm "PLYMOVENT" (TEMP. UP | TO 1200 F). |
| | 2. MOBILE UNIT ON WHEELS. C/W INTE | GRATED SILENCER, 3 M | (10 FT.) EXTRACTION A | RM NEX MD, HEPA FI | LTER (EF | FICIENCY | Y 99.95 % |), ERGO | NOMIC HA | NDLE, SI | PARK PF | ROTECTION, | , ETC. | |

| | | | | T | MODULE | SIZE | | |
|-----|------------------------------------|-----------|-------|-------|---------------|-----------|----------|-------|
| TAG | EQUIPMENT TYPE | MFR. | MODEL | COLOR | [in x in] | [mm x mm] | MOUNTING | NOTES |
| S-1 | HIGH CAPACITY DRUM LOUVER DIFFUSER | E.H.PRICE | HCD2 | B12 | REFER TO DWG. | | DUCTWORK | |
| E-1 | EGG CRATE FACE RETURN | E.H.PRICE | 80 | B12 | REFER TO DWG. | | DUCTWORK | |
| E-2 | HEAVY DUTY GYM GRILLES | E.H.PRICE | 91 | B12 | REFER TO DWG. | | DUCTWORK | |

| | | | PLUMBING PUMF | SCHEDU | LE | | | | | | | | | |
|--------|--------------------|---------------------------------|----------------------------------|--------------|----------|----------|-------|----------|--------|---------|--------|--------|--------|-------|
| | | OF D. // OF | 73/05 | SUCTION | DISC | HARGE | FLO | W RATE | Н | EAD | | MOTOR | | NOTES |
| TAG | MFR. | SERVICE | TYPE | (mm) (in.) | (mm) | (in.) | (LPS) | (US GPM) | (kPa) | (ftWC) | (kW) | (H.P.) | RPM | NOTES |
| P-1A | LIBERTY | SEWAGE PIT | SUBMERSIBLE - LE100 | | 75 | 3 | 1.26 | 20 | 105 | 35 | 0.75 | 1.00 | - | 1, 2 |
| P-1B | LIBERTY | SEWAGE PIT | SUBMERSIBLE - LE100 | | 75 | 3 | 1.26 | 20 | 105 | 35 | 0.75 | 1.00 | - | 1, 2 |
| NOTES: | 1. C/W 1050mm DIA. | /1700mm DEEP PACKAGED FIBERGL/ | ASS PIT. PROVIDE HEAVY DUTY SEA | LED STEEL CO | OVER, GL | JIDERAIL | SYSTE | M AND AN | Π-FLOA | TING CO | VCRETE | PAD A | S REQU | IRED. |
| | 2. PROVIDE DUPLEX | K PUMP WITH CONTROLS PUMP #1 ON | N, PUMP #2 ON AND A HIGH WATER A | LARM, MONIT | ORED BY | BMS. | | | | | | | | |

| TAG | MAU-0 | 1 |
|-------------------------------|---|--|
| SERVICE | ARTICULATING BUS | |
| MODEL | | |
| VOLT/PH/Hz | 575/3/6 | 0 |
| SUPPLY FAN | VAV | |
| AIR FLOW RATE (L/s / CFM) | 2,612 | 5,537 |
| E.S.P. (Pa / in.WC) | 200 | 0.80 |
| TYPE | 18/18 FC D | NDW |
| MOTOR TYPE | ODP - PREMIUM E | EFFICIENCY |
| MOTOR SIZE (KW / HP) | 3.73 | 5.00 |
| MOTOR SPEED (RPM) | | |
| OUTSIDE AIR | | |
| MAX AIR FLOW RATE (L/s / CFM) | 2,612 | 5,537 |
| EXHAUST FAN | VAV | |
| AIR FLOW RATE (L/s / CFM) | 2,612 | 5,537 |
| E.S.P. (Pa / in.WC) | 250 | 1.00 |
| TYPE | 18/18 FC D | DIDW |
| MOTOR TYPE | ODP - PREMIUM E | FFICIENCY |
| MOTOR SIZE (KW / HP) | 3.73 | 5.00 |
| MOTOR SPEED (RPM) | | ************************************** |
| HEATING COIL | | |
| MODEL | | |
| TYPE | INDIRECT, GA | S FIRED |
| TURNDOWN (BURNER CONTROL) | 15:1 | |
| OUTPUT (Kw / MBH) | 187.6 | 640 |
| INPUT (Kw / MBH) | 234.5 | 800 |
| COOLING COIL | SPACE RESERVED | FOR FUTURE |
| FILTERS | | |
| O/A FINAL FILTER DEPTH / TYPE | 50mm / PLE | ATED |
| O/A FINAL FILTER EFFICIENCY | MERV | 8 |
| E/A FILTER DEPTH / TYPE | N/A | |
| E/A FILTER EFFICIENCY | N/A | |
| PHYSICAL DATA | APPROXIM | MATE |
| WEIGHT (kg / lbs) | 2,676 | 5,900 |
| LENGTH (m / ft.) | 5.15 | 16.90 |
| WIDTH (m / ft.) | 2.06 | 6.75 |
| HEIGHT (m / ft.) | 1.19 | 3.92 |
| NOTES: | 1. PROVIDE 600 (24") HI 2. CAP OPENING BETWI EXHAUST FOR FUTURE 3. PROVIDE BACNET CO | EEN SUPPLY A |





KEY PLAN

| | 14.01.17 | ISSUED FOR CONSTI | RUCTION | DD | 75 | TS | A |
|-----|-------------|-------------------|--------------|----------|--------|----------|---------|
| | DATE | DESCRIPTION | | PREPARED | REVIEW | DESIGN , | AUTHORI |
| VI: | SIONS/ISSUE | | | DRAFT | ING | ENGI | NEERING |
| | | | PERMIT STAMP | | | | |
| | | | | | | | |



APEGII **Certificate of Authorization** TETRA TECH WEI Inc. No. 5313 Date: April 30, 2014

| ESIGNED BY: | PREPARED BY: | REVIEWED BY: |
|--|---|---|
| TS | EV | JS |
| UTHORIZED BY: | DATE: | SCALE: |
| | 13.11.20 | AS NOTED |
| RELIED UPON BY ANY PERSON, FI nc. (Tetra Tech). TETRA TECH ' PARTIES FOR DAMAGES OR INJURY DOCUMENT BY THEM, WITHOUT TH Tech) AND OUR CLIENT. THIS DI CONTRACT BETWEEN THE CLIENT | T IS NOT INTENDED FOR THE US IRM OR CORPORATION OTHER THA WEI INC. (Tetra Tech) DENIES AN 'SUFFERED BY SUCH THIRD PAR HE EXPRESSED WRITTEN AUTHORI OCUMENT IS SUBJECT TO FURTH T AND TETRA TECH WEI INC. SHT REGARDING THIS DOCUMENT IN | N THE CLIENT AND TETRA TECH LIABILITY WHATSOEVER TO OT Y ARISING FROM THE USE OF Y OF TETRA TECH WEI Inc. (T ER RESTRICTIONS IMPOSED BY (Tetra Tech) AND THESE PAR |



CITY OF WINNIPEG TRANSIT DEPARTMENT

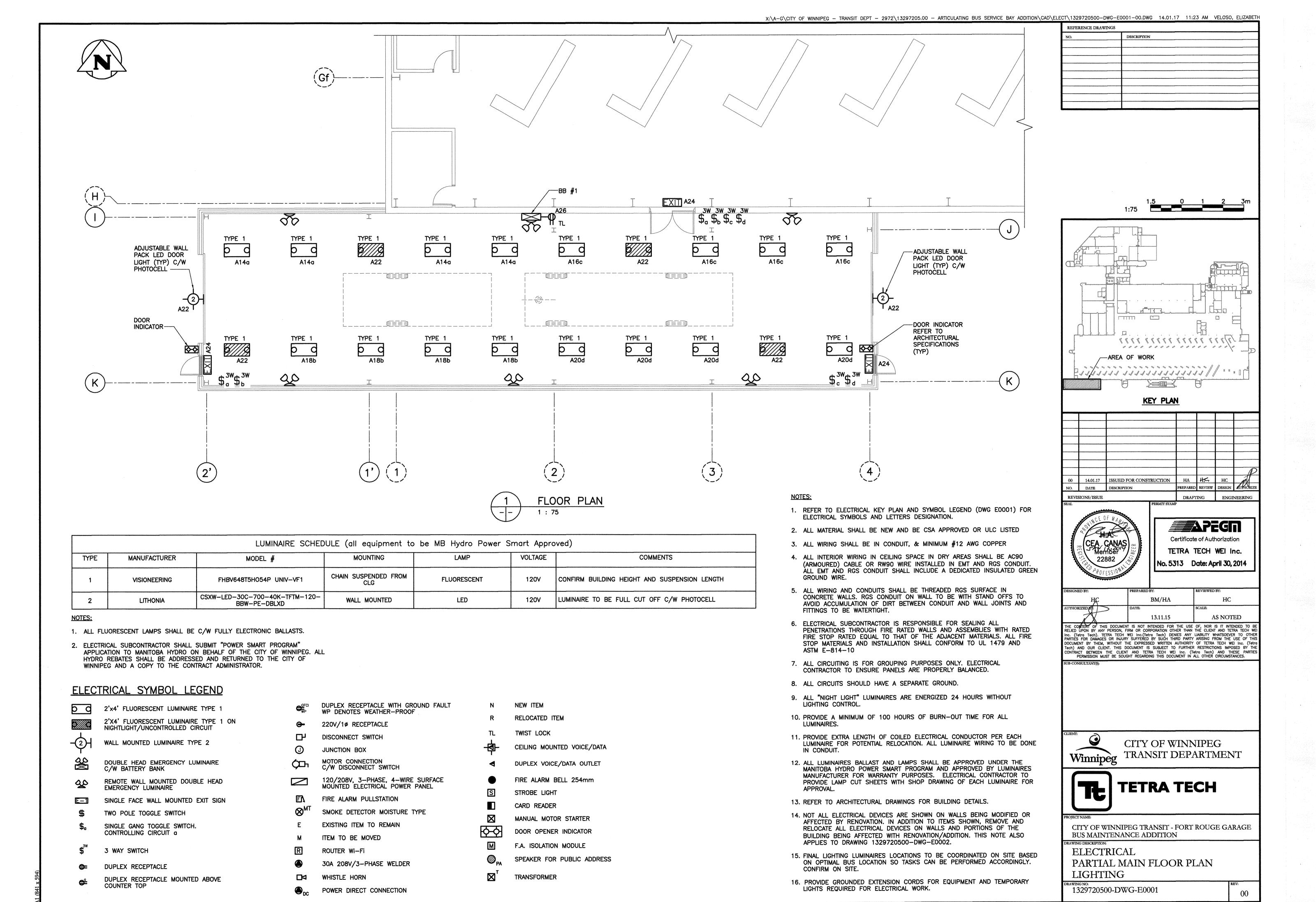


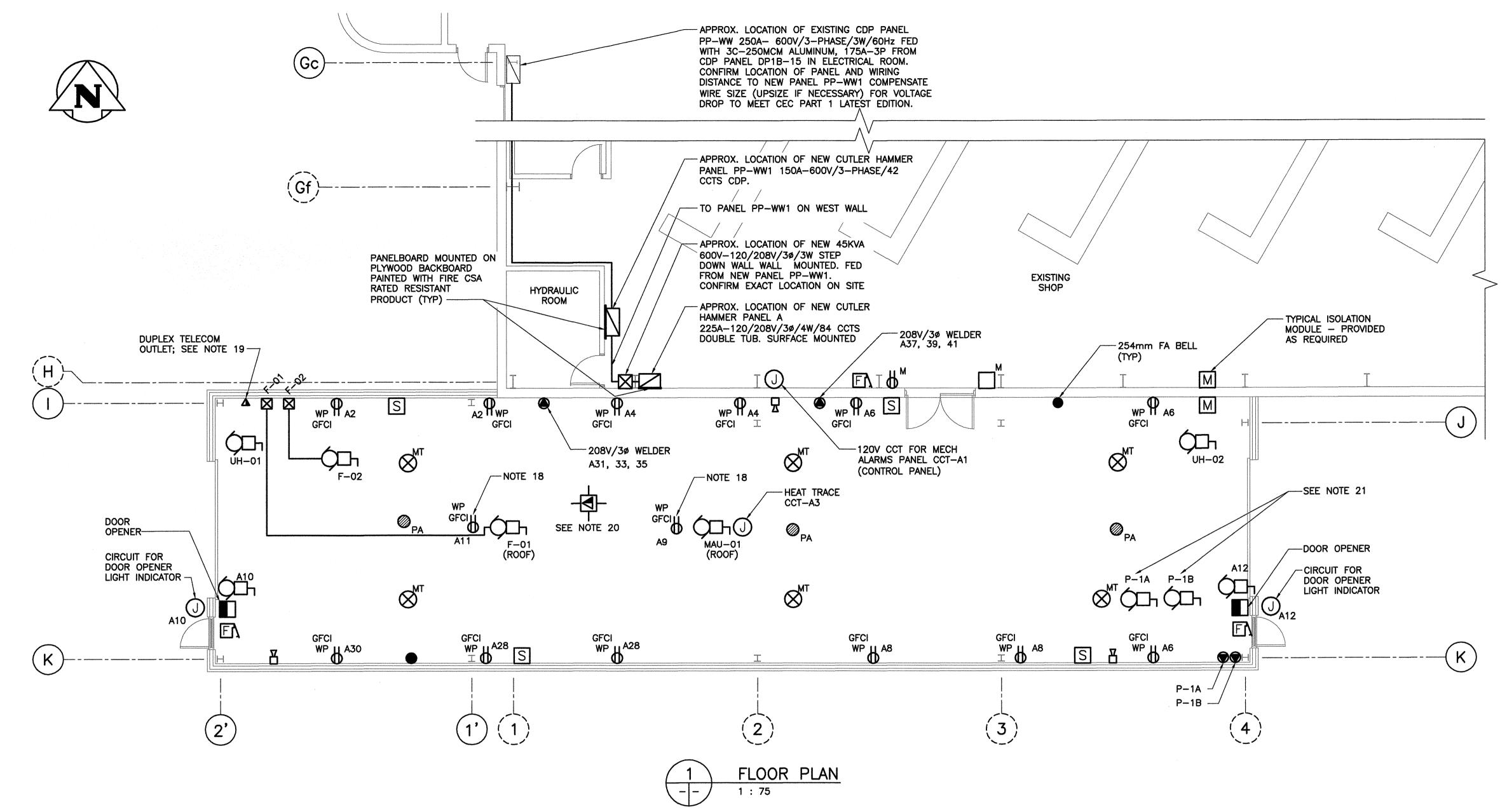
TETRA TECH

CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE BUS MAINTENANCE ADDITION

MECHANICAL SPECIFICATIONS AND SCHEDULES

1329720500-DWG-M0009





NOTES:

- 1. REFER TO ELECTRICAL KEY PLAN AND SYMBOL LEGEND DWG E0001 FOR ELECTRICAL SYMBOL SCHEDULE AND LETTERS DESIGNATION
- 2. ELECTRICAL SUBCONTRACTOR TO CONFIRM EXPANDABILITY AND CAPACITY OF EXISTING FIRE ALARM SYSTEM. INCLUDE ALL COSTS FOR PROGRAMMING, EXPANSION AND MODIFICATIONS TO COMPLY WITH DESIGN AND APPLICABLE CODES TO MAKE THE SYSTEM OPERATIONAL.
- 3. ELECTRICAL SUBCONTRACTOR TO SUPPLY, INSTALL WIRE AND CONNECT NEW FIRE ALARM DEVICES TO EXISTING ZONES. COORDINATE LOCATIONS WITH MECHANICAL SUBCONTRACTOR AND TRADES INVOLVED. NEW FIRE ALARM DEVICES TO MATCH EXISTING IN ALL RESPECTS.
- 4. MOUNTING HEIGHT OF DEVICES AND SPACING BETWEEN HVAC DIFFUSERS AND FIRE ALARM DEVICES TO BE AS PER CAN/ULC-S524 LATEST EDITION.
- 5. ALL DEVICES TO HAVE DEDICATED GROUNDING.
- 6. ELECTRICAL SUBCONTRACTOR TO PROVIDE ALL WIRING AND RELAYS REQUIRED TO INTERLOCK MECHANICAL AND FIRE ALARM SYSTEMS.
- 7. INCLUDE ALL COSTS FOR FIRE ALARM TESTING, VERIFICATION AND REPLACEMENT OF EXISTING DEVICES NOT PERFORMING WITHIN THE AREA OF RENOVATION.
- 8. TESTING AND VERIFICATION TO INCLUDE MAIN NOTIFIER FIRE ALARM PANEL (LOCATED AT THE MAIN ENTRANCE), DEVICES, LOOPS AND ZONES AFFECTED BY THIS RENOVATION/ADDITION.
- 9. ELECTRICAL CONTRACTOR TO PROVIDE WALL AND CEILING MOUNTED FRAME STRUCTURALLY CAPABLE TO ACCOMMODATE TRANSFORMER. CONFIRM SIZE AND WEIGHT PREVIOUS TO INSTALLATION.
- 10. REFER TO ARCHITECTURAL DRAWINGS FOR BUILDING DETAILS.
- 11. ELECTRICAL CONTRACTOR TO WIRE NEW PANELS AND TELECOM SERVICES USING PORTIONS EXISTING CABLE TRAY (NEW POWER WIRING TO BE RUN IN UNDERSIDE OF CABLE TRAY) AND ADD SECTIONS AS NECESSARY. APPROXIMATE DISTANCE BETWEEN EXISTING PANEL PP—WW AND NEW PANEL PP—WW1 IS 200 FT. CONFIRM WITH PANEL MANUFACTURER HARDWARE AVAILABILITY FOR PANEL PP—WW TO ACCOMMODATE NEW 125A BREAKER FOR NEW PANEL PP—WW1.

- 12. ALL TELECOM CONDUITS TO BE 27mm MIN UNLESS NOTED OTHERWISE.
- 13. ELECTRICAL SUBCONTRACTOR SHALL CONTACT THE CONTRACT ADMINISTRATOR FOR A PHYSICAL INSPECTION OF THE CONDUIT SYSTEM PRIOR TO THE PLACEMENT OF CABLING. INSPECTION SHALL BE CONDUCTED AT THE SAME TIME AS A SITE MEETING.
- 14. ALL TELECOM OUTLET LOCATIONS TO BE CONFIRMED ON SITE AND APPROVED BY THE CITY OF WINNIPEG. ALL PHONE SYSTEMS TO BE DONE BY MTS. THE ELECTRICAL SUBCONTRACTOR TO HIRE MTS, COORDINATE WORK IN ADVANCE TO MEET ALL THE CITY OF WINNIPEG REQUIREMENTS AND CARRY ALL COSTS ASSOCIATED TO A COMPLETE AND OPERATIONAL SYSTEM.
- 15. THE CITY OF WINNIPEG SHALL SUPPLY, INSTALL AND TERMINATE ALL DATA AND NETWORKING WIRING AND SUPPLY AND INSTALL ALL ACTIVE EQUIPMENT (COMPUTERS, SWITCHES, ROUTER, TELEPHONES, ETC.)
- 16. ELECTRICAL SUBCONTRACTOR TO INCLUDE ¾" EMT EMPTY CONDUIT FOR ADDITIONAL SPEAKERS FOR PUBLIC ADDRESS SYSTEM AND RELOCATE ANY EXISTING CONFLICTING SPEAKERS AS PER CITY OF WINNIPEG DESIGNATED LOCATIONS. SPEAKERS TO BE ADDED TO EXISTING 800 WATTS AMPLIFIER. SPEAKERS, WIRING AND CONNECTIONS BY THE CITY OF WINNIPEG. CONFIRM HEAD EQUIPMENT CAPACITY AND ADVISE IF UPGRADE IS REQUIRED BEFORE PRICING THE PROJECT.
- 17. ELECTRICAL SUBCONTRACTOR TO ADD WHISTLE HORNS FOR WORK SHIFTS AND BREAKS. ELECTRICAL SUBCONTRACTOR TO PROVIDE ADDITIONAL ¾" EMT EMPTY CONDUIT FOR ADDITIONAL DEVICES AS INDICATED BY THE CITY OF WINNIPEG. THE CITY OF WINNIPEG TO PROVIDE ALL WIRING, TERMINATIONS AND ADDITIONAL DEVICES.
- 18. EQUIPMENT MAINTENANCE RECEPTACLE (FOR ROOF MOUNTED EQUIPMENT):
 PROVIDE AND INSTALL WEATHERPROOF DUPLEX RECEPTACLE CSA
 - CONFIGURATION 5-20R, PROTECTED WITH A GFCI CLASS A CIRCUIT BREAKER 15A-1P. DEDICATED CIRCUIT A9, A11 TO BE WIRED WITH 2-#12 RW90+G CONDUCTORS IN 27mm EMT CONDUIT.

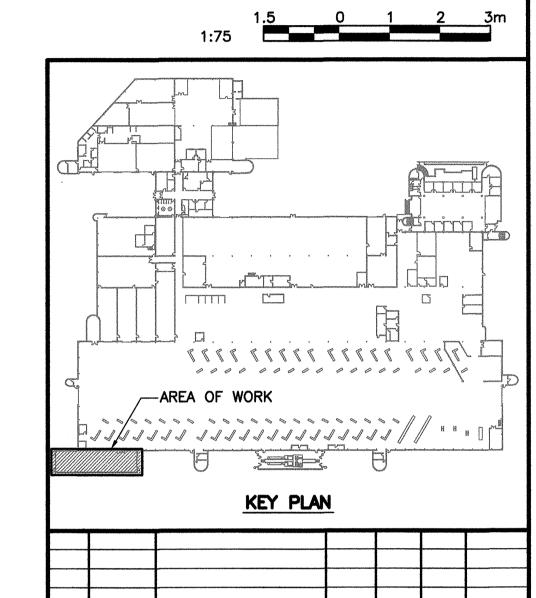
 RECEPTACLE TO BE LOCATED WITHIN 7.5m OF THE ROOF TOP ELECTRICAL EQUIPMENT AND MINIMUM OF 750mm ABOVE
 - FINISHED ROOF.

 RECEPTACLE TO BE PROTECTED FROM MECHANICAL DAMAGE.

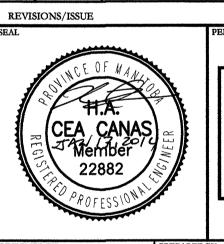
 UPDATE PANEL BOARDS DIRECTORY AND AS—BUILT DRAWINGS TO BE INCORPORATED IN O&M MANUALS.
- 19. DUPLEX TELECOM OUTLET. PROVIDE ALL CABLES, TERMINATIONS AND CONNECTIONS TO MAKE JACKS OPERATIONAL.

- 20. SUPPLY CEILING MOUNTED TELECOMMUNICATIONS OUTLET FOR OWNERS' SUPPLIED AND INSTALLED ACCESS POINT (FOR WI—FI) CONFIRM EXACT LOCATION WITH CITY OF WINNIPEG IT DEPARTMENT. ELECTRICAL CONTRACTOR TO PROVIDE ALL CONDUIT, WIRING, JACKS, COVERPLATES AND TERMINATIONS TO MAKE SYSTEM OPERATIONAL. COORDINATE ACTIVATION WITH CITY OF WINNIPEG IT DEPARTMENT.
- 21. INSTALL ISOLATION MODULES AS PER CAN/ULC-S524 LATEST EDITION.

| | | | EMERGENCY LIGHTIN | G SCHEDU | JLE |
|--------------------|--------|--------------|-------------------|-------------|---|
| TYPE | DESIGN | MANUFACTURER | CATALOGUE NO. | VOLTS | REMARKS |
| EXIT SIGN | E-1 | LUMACELL | LER3-500-WH-120 | 120V | 4X RATED EXIT SIGN |
| EMERGENCY HEADS | | LUMACELL | MQM-2-LD13 | 24VDC | MICRO LIGHT SERIES, C/W 24V-4W LED LAMP. CSA CERTIFIED. |
| BATTERY UNITS | BB1 | LUMACELL | RG24S-144-2-LD13 | 120V 24V | SUPPLY VOLTAGE: 120VAC OUTPUT VOLTAGE: 24VDC OPERATING TIME: 30 MINUTES BATTERY: SEALED, MAINTENANCE FREE. CHARGER: SOLID STATE, MULTI—RATE, VOLTAGE/CURRENT REGULATED, INVERSE TEMP. COMPENSATED, SHORT CIRCUIT PROTECTED, MODULAR CONSTR. SOLID STATE TRANSFER, LOW VOLTAGE DISC. SIGNAL LIGHTS "LED". HEAD: C/W TWO ADJUSTABLE EMERG. LTG. HEADS. MOUNTING: C/W T.L. RECEPTACLE, AND MOUNTING SHELF. |



DESCRIPTION



DATE

ISSUED FOR CONSTRUCTION

Certificate of Authorization
TETRA TECH WEI Inc.
No. 5313 Date: April 30, 2014

DRAFTING ENGINEERING

| DESIGNED BY: | PREPARED BY: | REVIEWED BY: |
|-----------------------------|--------------------------------|------------------------------|
| HC | BM/HA | HC |
| AUTHORIZED BY: | DATE: | SCALE: |
| A | 13.11.15 | AS NOTED |
| THE CONTENT OF THIS DOCUMEN | IT IS NOT INTENDED FOR THE USE | OF, NOR IS IT INTENDED TO BE |

RELIED UPON BY ANY PERSON, FIRM OR CORPORATION OTHER THAN THE CLIENT AND TETRA TECH WEI Inc. (Tetra Tech). TETRA TECH WEI Inc. (Tetra Tech) DENIES ANY LIABILITY WHATSOEVER TO OTHER PARTIES FOR DAMAGES OR INJURY SUFFERED BY SUCH THIRD PARTY ARISING FROM THE USE OF THIS DOCUMENT BY THEM, WITHOUT THE EXPRESSED WRITTEN AUTHORITY OF TETRA TECH WEI Inc. (Tetra Tech) AND OUR CLIENT. THIS DOCUMENT IS SUBJECT TO FURTHER RESTRICTIONS IMPOSED BY THE CONTRACT BETWEEN THE CLIENT AND TETRA TECH WEI Inc. (Tetra Tech) AND THESE PARTIES PERMISSION MUST BE SOUGHT REGARDING THIS DOCUMENT IN ALL OTHER CIRCUMSTANCES.



CITY OF WINNIPEG
TRANSIT DEPARTMENT



TETRA TECH

CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE
BUS MAINTENANCE ADDITION

AWING DESCRIPTION:
ELECTRICAL

PARTIAL MAIN FLOOR PLAN

1329720500-DWG-E0002

ODEL BEEN.

.

REFERENCE DRAWINGS

| | NEW | PANEL | A C, | /W B | UILT- | IN TVSS | | | ON: SOUTH—WEST WALL EXIST. SHOP |
|----------|--|--|--|--|--|--------------------------------------|--|---|---------------------------------------|
| | | | | | | | | MOUNT | ING: SURFACE |
| 4 WIRE | | 22 | 25 AM | P MAI | NS | | | | POWER: NORMAL |
| LOAD (W) | BREAKER | CCT | Α | В | С | CCT | BREAKER | LOAD (W) | DESCRIPTION |
| 300 | 15A-1P | 1 | | | | 2 | 20A-1P | 500 | GENERAL RECS |
| 100 | 15A-1P | 3 | | | | 4 | 20A-1P | 500 | GENERAL RECS |
| 70 | 15A-1P | 5 | | | | 6 | 20A-1P | 500 | GENERAL RECS |
| 70 | 15A-1P | 7 | | | | 8 | 20A-1P | 500 | GENERAL RECS |
| 250 | 15A-1P | 9 | | | | 10 | 20A-1P | 500 | DOOR OPENER |
| 250 | 15A-1P | 11 | | | | 12 | 20A-1P | 500 | DOOR OPENER |
| | | 13 | | | | 14 | 20A-1P | 1440 | LIGHTING |
| 720 | 20A-3P | 15 | | | | 16 | 20A-1P | 1440 | LIGHTING |
| | | 17 | | | | 18 | 20A-1P | 1440 | LIGHTING |
| | | 19 | | | | 20 | 20A-1P | 1440 | LIGHTING |
| 360 | 15A-3P | 21 | | | | 22 | 20A-1P | 1440 | NIGHT LIGHTS |
| | | 23 | | | | 24 | 20A-1P | 24 | EXIT SIGNS |
| | | 25 | | | | 26 | 15A-1P | 72 | EMT LTG. |
| 360 | 15A-3P | 27 | | | | 28 | 20A-1P | | GENERAL RECS |
| | | 29 | | | | 30 | 20A-1P | | GENERAL RECS |
| | | 31 | | | | 32 | | | |
| 860 | 30A-3P | 33 | | | | 34 | | | |
| | | 35 | | | | 36 | | | |
| | | 37 | | | | 38 | | | |
| 860 | 30A-3P | 39 | | | | 40 | | | |
| | | 41 | | | | 42 | | | |
| | | 43 | | | | 44 | | | |
| | | 45 | | | | 46 | | | |
| | | 47 | | | | 48 | | | |
| | | 49 | | | | 50 | | | |
| | | 51 | | | | 52 | | | |
| | | 53 | | | | 54 | | | |
| | | 55 | | | | 56 | | | |
| | | 57 | | | | 58 | | | |
| | | 59 | | | | 60 | | | |
| | | | | | | | | | |
| | LOAD (W) 300 100 70 70 250 250 720 360 360 | 4 WIRE LOAD (W) BREAKER 300 15A-1P 100 15A-1P 70 15A-1P 70 15A-1P 250 15A-1P 250 15A-1P 720 20A-3P 360 15A-3P 360 15A-3P | 4 WIRE 25 LOAD (W) BREAKER CCT 300 15A-1P 1 100 15A-1P 3 70 15A-1P 5 70 15A-1P 7 250 15A-1P 9 250 15A-1P 11 720 20A-3P 15 17 360 15A-3P 21 23 360 15A-3P 27 29 31 860 30A-3P 39 41 43 45 47 49 51 53 55 57 | A WIRE COAD (W) BREAKER CCT A | 4 WIRE LOAD (W) BREAKER CCT A B | LOAD (W) BREAKER CCT A B C | LOAD (W) BREAKER CCT A B C CCT 300 15A-1P 1 2 2 100 15A-1P 3 4 4 4 4 4 4 4 4 4 | LOAD (W) BREAKER CCT A B C CCT BREAKER 300 15A-1P 1 2 20A-1P 100 15A-1P 3 4 20A-1P 70 15A-1P 5 6 20A-1P 70 15A-1P 7 8 20A-1P 250 15A-1P 9 10 20A-1P 250 15A-1P 11 12 20A-1P 250 15A-1P 11 12 20A-1P 250 15A-1P 11 12 20A-1P 17 18 20A-1P 17 18 20A-1P 18 20A-1P 19 20 20A-1P 23 24 20A-1P 23 24 20A-1P 25 26 15A-1P 25 26 15A-1P 26 26 26A-1P 27 28 20A-1P 28 20A-1P 29 30 20A-1P 360 30A-3P 33 34 34 34 34 34 34 | NEW PANEL A C/W BOILT-IN IVSS MOUNT |

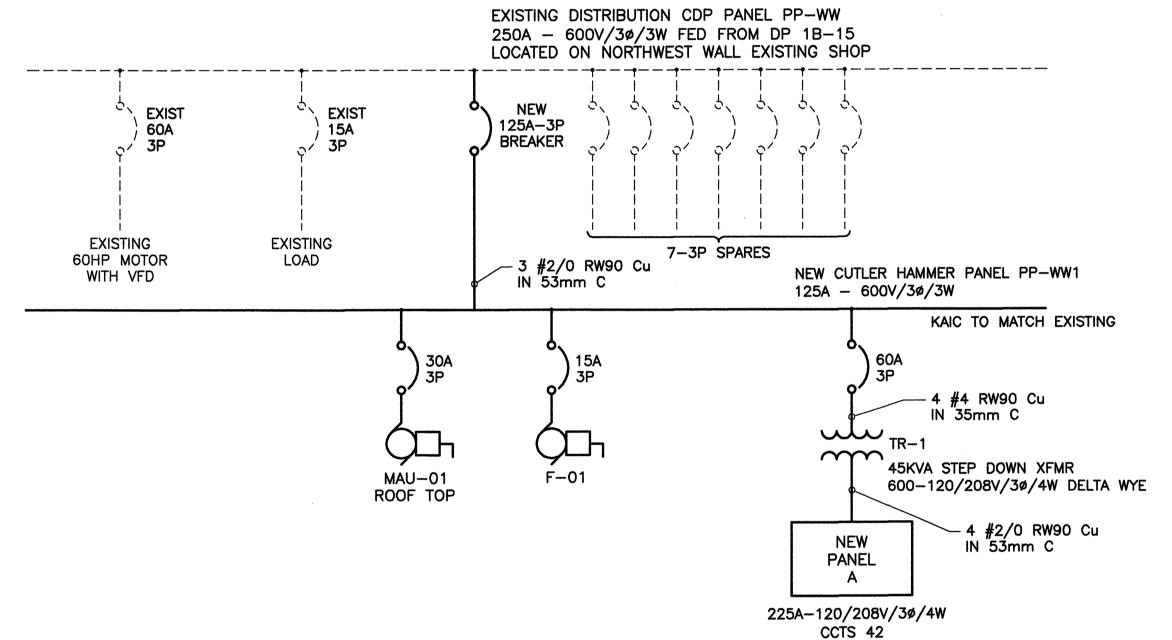
. ELECTRICAL SUBCONTRACTOR SHALL REFER TO MECHANICAL DRAWINGS FOR ALL NEW AND EXISTING MOTOR LOCATIONS. CONFIRM ALL ELECTRICAL RATINGS AND SIZES PRIOR TO SUPPLYING AND INSTALLING OF WIRING AND CIRCUIT BREAKERS AS PER MECHANICAL SHOP DRAWINGS. REPORT ANY

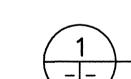
3. PROVIDE DISCONNECT SWITCHES FOR ALL EQUIPMENT AS REQUIRED BY CODE. PROVIDE WEATHERPROOF DISCONNECTS AS REQUIRED ON ROOF AND WET

6. NOT ALL MECHANICAL EQUIPMENT MAY BE SHOWN ON THIS DRAWING. CONFIRM MECHANICAL EQUIPMENT LIST, AMPERAGE, LOCATIONS, ACCESSORIES AND

2. ALL CONTROL WIRING FOR MECHANICAL ITEMS SHALL BE PROVIDED BY MECHANICAL CONTROLS SUBCONTRACTOR, REFER TO MECHANICAL

| | | | NEW | PAN | EL PF | P-WW | 1 | | | : MAINT. GARAGE S: SURFACE |
|----------------|----------|---------|-----|-------|-------|------|-----|---------|----------|-------------------------------|
| 347/600V/3ø/3W | | | 2: | 25 AM | P MAI | NS | | | | POWER: NORMAL |
| DESCRIPTION | LOAD (W) | BREAKER | CCT | Α | В | C | CCT | BREAKER | LOAD (W) | DESCRIPTION |
| EXISTING | | | 1 | | | | 2 | | | |
| EXISTING | | | 3 | | | | 4 | | | EXISTING |
| EXISTING | | | 5 | | | | 6 | | | |
| | | | 7 | | | | 8 | | | |
| MAU-01 | | 30A-3P | 9 | | | | 10 | 60A-3P | 4500 | TR-1 |
| | | | 11 | | | | 12 | | | |
| | | | 13 | | | | 14 | | | EXISTING |
| F-01 | | 15A-3P | 15 | | | | 16 | | | EXISTING |
| | | | 17 | | | | 18 | | | EXISTING |
| SPARE | | | 19 | | | | 20 | | | EXISTING |
| SPARE | | 4. | 21 | | | | 22 | | | EXISTING |
| SPARE | | | 23 | | | | 24 | | | EXISTING |
| SPARE | | | 25 | | | | 26 | | | EXISTING |
| SPARE | | | 27 | | | | 28 | | | EXISTING |
| SPARE | | | 29 | | | | 30 | | | EXISTING |
| SPARE | | | 31 | | | | 32 | | | EXISTING |
| SPARE | | | 33 | | | | 34 | | | EXISTING |
| SPARE | | | 35 | | | | 36 | | | EXISTING |
| SPARE | | | 37 | | | | 38 | | | EXISTING |
| SPARE | | | 39 | | | | 40 | | | EXISTING |
| SPARE | | | 41 | | | | 42 | | | EXISTING |





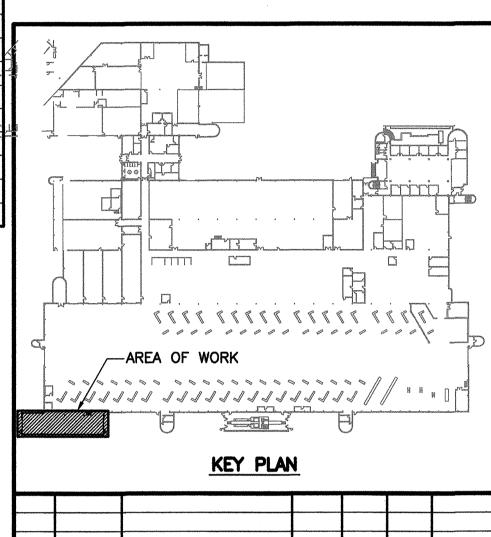
PARTIAL SINGLE LINE DISTRIBUTION

NOTES:

N.T.S.

 GIVE ADEQUATE NOTICE (MIN 72 HRS) TO THE CITY OF WINNIPEG OF ANY POWER OUTAGE REQUIRED FOR THIS WORK. SCHEDULE OUTAGES TO PROVIDE LEAST INTERFERENCE WITH OTHER WORK.

| | | | | | | | | | | | | M | ОТО | OR SCHEDULE | | | | | | | | | |
|---------|------|---|---|-------|---------------------|------------|-----------|---------|------|-----------|------|-----|-----|-------------------|---------|---------|----------------|----------|------|--------|----------|----------|---------------------------------|
| | | MOTOR | | | DESCRIPTION | LOCATION | | PACKAGE | | TER & ACC | | | | FEEDE | | BREAKER | CIRCUIT | F/A SHUT | | | CONTROL | | REMARKS |
| | No | HP | KW | AMP | DESCRIPTION | LOCATION | VOLIS / W | UNIT | TYPE | FUNCTION | PL I | PBH | OA | WIRE | CONDUIT | DILANLI | CINCOIT | DN. | WITH | DEVICE | SUPP. BY | WIRED BY | |
| MAU-1 | | ******* | | 19.10 | ROOF TOP UNIT | ROOF | 600/3 | X | MAG | FVNR | _ | - > | × | 3#6 RW90 CU+G | 35mm | 30A-3P | WW1 7, 9, 11 | X | | | MECH | MECH | |
| F-01 | | 5.0 | | | BUS TAIL EXHAUST | ROOF | 600/3 | X | MAN | | _ | | | 3#10 RW90 CU+G | 27mm | 20A-3P | WW1 13, 15, 17 | × | | | MECH | MECH | |
| F-02 | | 2.0 | | | WELDING EXHAUST | MAIN FLOOR | 208/3 | X | MAN | | - | _ | | 3#10 RW90 CU+G | 27mm | 20A-3P | A 13, 15, 17 | | | | MECH | месн | PLUG |
| P-1A | | 1.0 | *************************************** | | SANITARY PUMP | SUMP PIT | 208/3 | | | _ | - | | - | 3#12 RW90 CU+G | 27mm | 15A-3P | A 19, 21, 23 | | | | MECH | MECH | |
| P-1B | | 1.0 | ****** | | SANITARY PUMP | SUMP PIT | 208/3 | | | _ | - | | | 3#12 RW90 CU+G | 27mm | 15A-3P | A 25, 27, 29 | | | | MECH | MECH | |
| UH-01 | | *************************************** | | 6.3 | UNIT HEATER | MAIN FLOOR | 120/1 | X | MAN | _ | _ | - | _ | 2#12 RW90 CU+G | 27mm | 15A-1P | A 5 | | | | MECH | MECH | |
| UH-02 | 2 | | | 6.3 | UNIT HEATER | MAIN FLOOR | 120/1 | X | MAN | _ | _ | _ | _ | 2#12 RW90 CU+G | 27mm | 15A-1P | A 7 | | | | MECH | MECH | |
| HEAT TE | RACE | | 0.1 | | ON MUA-1 | ROOF | 120/1 | _ | | _ | _ | | - | 2#12 RW90 CU+G | 27mm | 15A-1P | A 3 | | - | | MECH | MECH | |
| ALARMS | 5 | • | FRAC | | ON GAS DET. PNL | WALL | 120/1 | | | | - | | - | 2#12 RW90 CU+G | 27mm | 15A-1P | A 1 | | | | MECH | MECH | CONFIRM EXACT LOCATI ON SITE |



REVISIONS/ISSUE

SEAL

CEA CANAS

JAMernber

22882

DATE DESCRIPTION

Certificate of Authorization
TETRA TECH WEI Inc.
No. 5313 Date: April 30, 2014

DRAFTING ENGINEERING

DESIGNED BY:

HC

BM/HA

HC

AUTHORIZED BY:

DATE:

SCALE:

13.11.15

AS NOTED

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Winnipeg

CITY OF WINNIPEG
TRANSIT DEPARTMENT

00



TETRA TECH

CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE BUS MAINTENANCE ADDITION

ELECTRICAL SCHEDULES

RAWING NO: 1329720500-DWG-E0003

3D MODEL REF No:

A1 (841 x 594)

MOTOR SCHEDULE NOTES:

DISCREPANCIES OR SUBSTITUTIONS PRIOR TO INSTALLATION.

5. ELECTRICAL SUBCONTRACTOR TO PROVIDE ALL MECHANICAL INTERLOCK WIRING.

CONTROLS REQUIREMENTS WITH MECHANICAL SUBCONTRACTOR AND MECHANICAL DRAWINGS.

4. ALL DEVICES TO HAVE RIVETED LAMACOID NAMEPLATES.

CLEANING

- MAINTAIN THE WORK IN TIDY CONDITION FREE FROM THE ACCUMULATION OF WASTE PRODUCTS AND DEBRIS, OTHER THAN THAT CAUSED BY THE CITY OF WINNIPEG OR OTHER SUBCONTRACTORS NOT ASSOCIATED WITH THIS PROJECT.
- 2. REMOVE WASTE MATERIAL AND DEBRIS FROM SITE AND DEPOSIT IN WASTE CONTAINERS AT END OF EACH WORKING DAY.
- 3. CLEAN INTERIOR AREAS PRIOR TO START OF FINISH WORK. MAINTAIN AREAS FREE OF DUST AND OTHER CONTAMINANTS DURING FINISHING OPERATIONS

DEMOLITION

1. ELECTRICAL SUBCONTRACTOR TO VISIT SITE AND INCLUDE REMOVAL OF ALL ELECTRICAL EQUIPMENT BEING DELETED. DELETE ALL WIRING NOT BEING USED FROM DEVICES BACK TO PANEL OR BACKBOARD.

SCOPE OF WORK

- 1. THE ELECTRICAL SUBCONTRACTOR SHALL PROVIDE ALL MATERIALS, LABOR, TOOLS, SUPERVISION, ETC. REQUIRED TO INSTALL COMPLETE OPERATIONAL ELECTRICAL SYSTEMS AS DESCRIBED IN THESE PLANS AND SPECIFICATIONS. SUCH INSTALLATIONS SHALL INCLUDE, BUT ARE NOT SPECIFICALLY LIMITED TO THE FOLLOWING: 1.1. INSTALLATION OF RACEWAY AND CIRCUIT WIRING.
- 1.2. CUTTING, CHANNELING, CORING AND CHASING REQUIRED TO ACCOMMODATE THE INSTALLATION OF ELECTRICAL WORK AND ROUGH PATCHING.
- 1.3. INSTALLATION OF ANY REQUIRED ELECTRICAL DISTRIBUTION EQUIPMENT.
- 1.4. INSTALLATION OF HVAC POWER WIRING AND FINAL CONNECTIONS TO HVAC EQUIPMENT.
- 1.5. INSTALLATION OF CONDUIT, JUNCTION BOXES, PULL BOXES, ETC. REQUIRED FOR THE AFOREMENTIONED EQUIPMENT.
- 1.6. INSTALLATION OF TELECOM SYSTEMS
- 1.7. INSTALLATION OF FIRE ALARM SYSTEMS
- 1.8. INSTALLATION OF PUBLIC ADDRESS SYSTEM

PANEL BOARDS

- 1. A TYPEWRITTEN REVISED DIRECTORY OF CIRCUITS SHALL BE INSTALLED INSIDE OF EACH PANEL BOARD DOOR. THE LIST SHALL INCLUDE AS-BUILT CONDITIONS INCLUDING ALL TYPES OF DEVICES SERVED BY EACH CIRCUIT. EACH PANEL SHALL BE EXTERNALLY TAGGED WITH PERMANENT PHENOLIC PLATE INDICATING PANEL IDENTIFICATION AND VOLTAGE.
- 2. PHASE LEGS OF PANELS SHALL BE BALANCED. ANY PANEL FOUND WITH UNBALANCED LOADS SHALL HAVE ITS CIRCUITS REARRANGED AS REQUIRED TO BALANCE PHASE LEGS.
- THE SHORT CIRCUIT RATING OF A PANEL SHALL APPLY TO ALL BRANCH DEVICES. SERIES CONNECTED SHORT CIRCUIT RATING OF BRANCH DEVICES WILL NOT BE ACCEPTED.

CIRCUIT BREAKERS AND FUSES

- 1. CIRCUIT BREAKERS SHALL BE BOLT-IN TYPE. CIRCUIT BREAKERS SHALL BE OF THE SAME MANUFACTURER AND BE COMPATIBLE WITH THE PANEL BOARD.
- 2. CIRCUIT BREAKERS SHALL BE QUICK-MAKE, QUICK-BREAK COMPENSATED FOR AMBIENT TEMPERATURES AND SHALL HAVE A MINIMUM SHORT CIRCUIT RATING OF 10.000 AMPERES SYMMETRICAL OR HIGHER WHERE NOTED ON PANEL SCHEDULE.
- 3. CIRCUIT BREAKERS SHALL BE OF THE "THERMAL-MAGNETIC" TYPE HAVING BIMETALLIC ELEMENT FOR TIME DELAY OVER LOAD PROTECTION AND MAGNETIC ELEMENT FOR SHORT CIRCUIT
- 4. ALL CIRCUIT BREAKERS FEEDING HVAC EQUIPMENT SHALL BE HACR RATED.
- 5. FUSES SHALL BE CURRENT LIMITING DUAL ELEMENT TYPE WITH A MINIMUM INTERRUPTING CAPACITY OF 200,000 RMS AMPERES AND OF THE CONTINUOUS CURRENT RATINGS AS SHOWN ON THE DRAWINGS.
- 6. FUSES SHALL HAVE AN AVERAGE MELTING TIME-CURRENT CHARACTERISTICS TO MEET THE UNDERWRITERS' LABORATORIES' REQUIREMENTS FOR "CLASS K" 0-600 AMPERE FUSES.
- CIRCUIT BREAKERS AND FUSES SHALL BE SIZED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EQUIPMENT BEING SERVED. VERIFY AND CONFIRM WITH SUPPLIER EQUIPMENT REQUIREMENTS AS NECESSARY PRIOR TO INSTALLATION OF BRANCH CIRCUIT OVER-CURRENT PROTECTION.
- COORDINATE WITH ALL SUBCONTRACTORS FOR THE ELECTRICAL REQUIREMENTS OF ALL EQUIPMENT TO BE INSTALLED. DO NOT RUN CONDUIT AND CONDUCTORS PRIOR TO THE CONFIRMATION OF THE EQUIPMENT REQUIREMENTS.

DISCONNECT SWITCHES

- 1. THE ELECTRICAL SUBCONTRACTOR SHALL SUPPLY AND INSTALL DISCONNECT SWITCHES AS SHOWN ON THE PLANS. OR AS OTHERWISE REQUIRED BY CODE. WHETHER SHOWN ON PLANS OR
- 2. ALL SWITCHES SHALL BE HEAVY DUTY QUICK-MAKE QUICK- BREAK TYPE. RATED AS REQUIRED. EACH SWITCH SHALL HAVE A SUFFICIENT NUMBER OF POLES TO INTERRUPT ALL UNGROUNDED CONDUCTORS. DISCONNECT SWITCHES SERVING MOTOR LOADS SHALL BE HORSEPOWER RATED.
- 3. FUSES SHALL BE INSTALLED IN ALL FUSED SWITCHES, SIZED AS INDICATED ON PLANS.
- UNLESS OTHERWISE NOTED, INDOOR SWITCHES SHALL BE PROVIDED WITH NEMA 1 ENCLOSURES: OUTDOOR SWITCHES WITH NEMA 3R ENCLOSURES.

RACEWAYS

- WHERE CONDUIT IS USED, 3/4" MINIMUM CONDUIT SHALL BE PROVIDED.
- ALL CONDUITS TO BE SUPPORTED BY STANDOFFS. CONNECTION TO CEILING SUPPORTS SHALL NOT BE PERMITTED. ALL CONDUIT SHALL BE RUN CONCEALED WHEN REQUIRED.
- ALL CONDUITS INSTALLED SHALL BE RIGID GALVANIZED WITH THREADED CONNECTIONS. ALL CONDUITS INSTALLED UNDERGROUND OR IN CONCRETE SLABS SHALL BE RIGID PVC WITH A SEPARATE GROUNDING CONDUCTOR AND CONCRETE ENCASEMENT WHERE REQUIRED.
- WHEREVER CONDUITS PASS THROUGH FLOORS OR FIRE RATED PARTITIONS, SLEEVES SHALL BE INSTALLED, SLEEVES SHALL BE GROUTED IN PLACE IN THE SUPPORTING WALL OR FLOOR. THE SPACE BETWEEN THE SLEEVE AND CONDUIT SHALL BE PACKED WITH AN APPROVED, NONCOMBUSTIBLE, FIRE STOPPING MATERIAL. ALL NEW HOLES SHALL BE CORE DRILLED. NO CHOPPING SHALL BE PERMITTED. EXCEPT AS APPROVED BY THE PROJECT MANAGER.
- FLEXIBLE CONDUIT SHALL BE USED TO MAKE FINAL CONNECTIONS TO MOTORS, TRANSFORMERS, EXPANSION JOINTS OR WHERE THE INSTALLATION FOR RIGID CONDUIT IS IMPRACTICAL.
- WIRING SHALL BE RUN IN WALLS, ABOVE CEILING OR BELOW FLOOR WHERE POSSIBLE. INSTALL CONDUIT PARALLEL TO BUILDING LINES. CLEAR ALL OPENINGS, PIPES, DUCTS, STRUCTURAL COMPONENTS, ETC.
- INSTALL CONDUIT CONTINUOUS BETWEEN BOXES AND CABINETS WITH NO MORE THAN FOUR 90 DEGREE BENDS. SECURELY FASTEN IN PLACE WITH STRAPS, HANGERS, AND STEEL SUPPORTS AS REQUIRED.
- DO NOT SUPPORT CONDUIT FROM SUSPENSION WIRES. REAM AND THOROUGHLY CLEAN CONDUIT ENDS BEFORE INSTALLATION. OPENINGS SHALL BE PLUGGED OR COVERED TO KEEP CONDUIT CLEAN.

WIRE AND CABLE

- FOR CONCEALED BRANCH CIRCUIT WIRING, TYPE MC FLEXIBLE METAL CONDUIT SHALL BE USED WHERE PERMITTED BY CODE. TYPE AC FLEXIBLE METAL CONDUIT AND ROMEX MAY NOT BE USED.
- ALL CONDUCTORS SHALL BE SOFT ANNEALED 98% PURE INSULATED COPPER. ALL CONDUCTORS SHALL HAVE 600 VOLT RATED INSULATION AND RATED 90 DEGREE CELSIUS UNLESS OTHERWISE NOTED. SERVICE ENTRANCE CONDUCTORS SHALL BE TYPE USE-2, RHW-2 OR XHHW-2.
- CONDUCTORS #8 AWG AND LARGER SHALL BE STRANDED, #10 AND SMALLER SHALL BE SOLID.
- THE MINIMUM WIRE SIZE FOR BRANCH CIRCUITS SHALL BE #12 AWG. LAYOUT OF BRANCH CIRCUIT WIRING AND ARRANGEMENT OF HOME RUNS SHALL BE FOR MAXIMUM ECONOMY AND EFFICIENCY.
- FACTORY COLOR CODING SHALL CONFORM TO THE BUILDING STANDARD OR AS REQUIRED BY THE UTILITY COMPANY.
- TAG ALL FEEDERS IN ALL PULL BOXES AND IN ALL GUTTER SPACE AND WIREWAYS THROUGH WHICH THEY PASS.
- MAKE SPLICES IN FEEDER TAPS IN PANEL BOX GUTTERS WITH PRESSURE TYPE CONNECTORS.
- SPLICES IN CIRCUITS SHALL BE TWISTED AND MADE MECHANICALLY TIGHT. SECURE WITH SCOTCHLOCK OR PIGTAIL CONNECTORS. CRIMP TYPE CONNECTORS SHALL NOT BE USED.
- ELECTRICAL SUBCONTRACTOR TO BAND AND LABEL CONDUIT AS PER CITY OF WINNIPEG STANDARDS.

PULL BOXES, JUNCTION BOXES AND **OUTLET BOXES**

- PULL BOXES, JUNCTION BOXES AND OUTLET BOXES SHALL BE MANUFACTURED FROM GALVANIZED INDUSTRY STANDARD GAUGE SHEET STEEL.
- PROVIDE PULL BOXES AND JUNCTION BOXES IN RACEWAYS TO ASSURE THAT CABLES ARE NOT DAMAGED WHEN THEY ARE PULLED AND TO FULFILL MINIMUM CODE REQUIREMENTS.
- PULL BOXES AND JUNCTION BOXES SHALL BE SIZED SO THAT THE MINIMUM BENDING RADIUS CRITERIA SPECIFIED FOR THE WIRES AND CABLE ARE MAINTAINED.
- PROVIDE AND INSTALL ALL REQUIRED JUNCTION AND PULL BOXES REGARDLESS WHETHER INDICATED ON DRAWINGS OR NOT.

GROUNDING

- ALL ELECTRICAL SYSTEMS SHALL BE GROUNDED AS REQUIRED BY THE NATIONAL ELECTRICAL CODE. THE LOCAL UTILITY COMPANY AND ALL OTHER LOCAL AUTHORITIES HAVING JURISDICTION. PERMANENTLY AND EFFECTIVELY GROUND ALL METALLIC CONDUITS, SUPPORTS, CABINETS, PANEL BOARDS AND SYSTEM GROUNDING NEUTRAL.
- A SEPARATE GROUNDING CONDUCTOR SHALL BE INSTALLED IN ALL FLEXIBLE AND NONMETALLIC CONDUITS SIZED IN ACCORDANCE WITH THE EQUIPMENT GROUNDING CONDUCTOR TABLE OF THE NATIONAL ELECTRICAL CODE.
- GROUND CLAMPS SHALL BE LISTED SPECIFICALLY FOR GROUNDING. WHERE GROUNDING CONDUCTOR IS ENCLOSED IN CONDUIT, GROUND CLAMP SHALL GROUND BOTH CONDUCTOR AND CONDUIT.
- GROUND ALL CABLE TRAY SECTIONS.

MECHANICAL EQUIPMENT

- ALL CONTROL WIRING ASSOCIATED WITH MECHANICAL EQUIPMENT IS THE RESPONSIBILITY OF THE MECHANICAL SUBCONTRACTOR UNLESS NOTED OTHERWISE. THE ELECTRICAL SUBCONTRACTOR IS RESPONSIBLE FOR PROVIDING AND INSTALLING ALL LINE VOLTAGE POWER. CONDUIT AND OUTLET BOXES RELATED TO HVAC CONTROLS, COORDINATE ALL WORK WITH THE MECHANICAL CONTRACTOR.
- COORDINATE WITH MECHANICAL AND PLUMBING SUBCONTRACTORS FOR THE ELECTRICAL REQUIREMENTS OF ALL MECHANICAL EQUIPMENT TO BE INSTALLED. DO NOT RUN CONDUIT AND CONDUCTORS PRIOR TO THE CONFIRMATION OF THE EQUIPMENT REQUIREMENTS.

SHOP DRAWINGS

1. SUBMIT TO THE ENGINEER FIVE (5) SETS OF SHOP DRAWINGS.

SYSTEM SHUT DOWNS

 SHOULD IT BE NECESSARY TO SHUT DOWN ANY EXISTING ELECTRICAL SYSTEM, THE CONTRACTOR SHALL NOTIFY THE CONTRACT ADMINISTRATOR AND BUILDING MANAGEMENT, IN WRITING, AT LEAST 3 DAYS PRIOR TO THE REQUESTED DATE. ALL SHUT DOWN WORK SHALL BE DONE AFTER NORMAL BUILDING OPERATING HOURS, IF SO DIRECTED BY THE AFOREMENTIONED PARTIES, AT NO ADDITIONAL COST.

JOB COMPLETION

- AT THE COMPLETION OF THE JOB THE ELECTRICAL SUBCONTRACTOR SHALL THOROUGHLY CLEAN ALL WORK AREA, RESTORING ANY DAMAGED OR DEFACED SURFACES OF FIXTURES OR EQUIPMENT TO THEIR ORIGINAL CONDITION. THE SUBCONTRACTOR SHALL REMOVE ALL TEMPORARY SYSTEMS UNLESS THE OWNER SPECIFICALLY REQUESTS THAT THEY BE LEFT IN PLACE.
- THE ELECTRICAL SUBCONTRACTOR SHALL THOROUGHLY TEST ALL NEW ELECTRICAL SYSTEMS. INCLUDING THOSE INSTALLED BY OTHERS AND WIRED BY ELECTRICAL CONTRACTOR. CORRECT ALL FAULTY CONDITIONS AT NO EXTRA COST. ALL PANELS SHALL BE BALANCED SO THAT THERE IS NO MORE THAN 10% DIFFERENCE IN PHASE CURRENTS UNDER NORMAL OPERATING CONDITIONS. MODIFY PANEL SCHEDULES AS REQUIRED.
- THE ELECTRICAL SUBCONTRACTOR SHALL DEMONSTRATE TO THE 3. CITY OF WINNIPEG THAT ALL ELECTRICAL DEVICES AND SYSTEMS ARE FULLY FUNCTIONAL, AND SHALL GIVE INSTRUCTIONS IN THEIR OPERATION AS REQUESTED.
- THE ELECTRICAL SUBCONTRACTOR SHALL OBTAIN, AND GIVE TO THE CITY OF WINNIPEG, AN UNDERWRITER'S CERTIFICATE COVERING ALL NEW ELECTRICAL EQUIPMENT. THE ELECTRICAL SUBCONTRACTOR SHALL CORRECT ANY DEFICIENCIES NOTED BY THE INSPECTOR, AT NO EXTRA COST, UNTIL SUCH CERTIFICATE IS RECEIVED.
- ALL WORK SHALL BE GUARANTEED TO BE FULLY OPERATIONAL AND FREE OF DEFECTS FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE.

SUBSTITUTIONS

- THE CONTRACTOR IS REQUIRED TO BID ON THIS PROJECT WITH THE UNDERSTANDING THAT ALL EQUIPMENT WILL BE PROVIDED AS SPECIFIED.
- 2. ANY SUBSTITUTIONS FROM THE SPECIFIED ITEMS MUST BE INCLUDED WITH A NUMBER INDICATING THE SAVINGS OVER THE SPECIFIED ITEMS THAT THE OWNER WILL REALIZE.
- THIS PROVISION IS REQUIRED FOR ALL SPECIFIED ITEMS INCLUDING BUT NOT LIMITED TO SUBSTITUTED "EQUALS", LIGHTING FIXTURES, PANELS AND FIRE ALARM EQUIPMENT.

FS AND FD CAST DEVICE BOXES

- PROVIDE CORROSION RESISTANT C/W MOUNTING FEET FOR SURFACE WIRING OF SWITCHES AND RECEPTACLES.
- WEATHERPROOF, RAINTIGHT AND DUST TIGHT.
- ACCURATELY TAPED, TAPERED CONDUIT THREADS TO PROVIDE TIGHT AND RIGID JOINTS AND GROUND CONTINUITY.

WORK IN EXISTING BUILDING

THE BUILDING SHALL REMAIN OPEN AND IN NORMAL OPERATION DURING THE CONSTRUCTION PERIOD.

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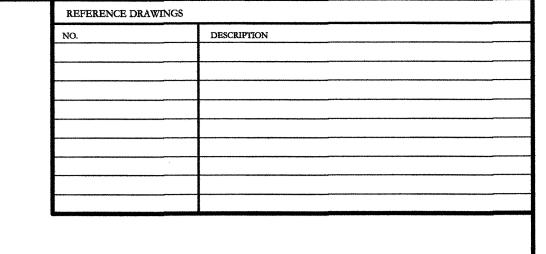
- WHERE EXISTING SERVICES SUCH AS ELECTRICAL POWER, FIRE ALARM SYSTEM, SOUND SYSTEM, ETC. ARE REQUIRED TO BE DISRUPTED AND/OR SHUT DOWN, COORDINATE THE SHUTDOWNS WITH THE CITY OF WINNIPEG AND CARRY OUT THE WORK AT A TIME AND IN A MANNER ACCEPTABLE TO THEM. CAREFULLY SCHEDULE ALL DISRUPTION AND/OR SHUTDOWNS AND ENSURE THAT THE DURATION OF SAME IS KEPT TO THE ABSOLUTE MINIMUM. ELECTRICAL SUBCONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH ANY FIRE ALARM SHUTDOWNS AND SHALL PROVIDE A VERIFICATION CERTIFICATE.
- SHOULD ANY TEMPORARY CONNECTIONS BE REQUIRED TO MAINTAIN SERVICES DURING WORK IN THE EXISTING BUILDING, SUPPLY AND INSTALL ALL NECESSARY MATERIAL AND EQUIPMENT AND PROVIDE ALL LABOUR AT NO EXTRA COST. SHOULD ANY EXISTING SYSTEM BE DAMAGED, MAKE FULL REPAIRS WITHOUT EXTRA COST, AND TO THE SATISFACTION OF THE OWNER AND CONSULTANT.
- WHERE EXISTING CONDUITS PASS VERTICALLY THROUGH A FLOOR AREA, RELOCATE THOSE CONDUITS TO BE INSTALLED CONCEALED IN A NEW WALL OR SURFACE MOUNTED IN A SERVICE AREA. EXTEND CONDUIT, WIRING, ETC. AS REQUIRED.
- EXISTING JUNCTION BOXES IN WALLS AND CEILING SPACES REQUIRED TO MAINTAIN EXISTING CIRCUITS SHALL REMAIN ACCESSIBLE.
- WHERE SERVICES ARE CONCEALED WITHIN WALLS, FLOORS OR CEILINGS AND CANNOT BE VISUALLY IDENTIFIED. ELECTRICAL SUBCONTRACTOR SHALL PROVIDE ELECTRONIC SCANNING DEVICES OR OTHER APPROVED MEANS TO LOCATE AND IDENTIFY CONCEALED SERVICES PRIOR TO DRILLING.
- INSTALL BOXES, CONDUIT AND WIRING THROUGH EXISTING AREAS AS REQUIRED FOR THE NEW INSTALLATION.
- ADD MODULES, SWITCHES, ETC. IN EXISTING CONTROL PANELS, AS REQUIRED, TO EXTEND EXISTING SYSTEMS TO NEW OR RENOVATED
- PATCH AND REPAIR WALLS AND CEILINGS IN EXISTING AREAS THAT HAVE BEEN DAMAGED OR CUT OPEN DUE TO THE NEW ELECTRICAL INSTALLATION.
- WHERE NEW CABLES OR CONDUITS HAVE BEEN INSTALLED THROUGH EXISTING FIRE RATED WALLS, SEAL OPENING AROUND CABLES AND CONDUIT TO MAINTAIN FIRE RATING.

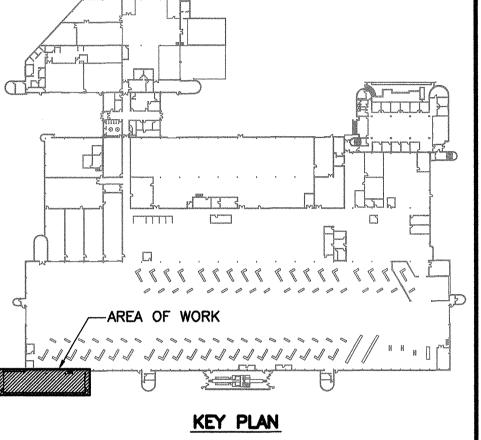
FIRESTOPPING

- FIRE STOP/SMOKE SEAL TO THE FOLLOWING STANDARDS; CAN4-S115M, CAN4-S101M, ASTM E84, ASTM E119, ASTM E814, ULC FIRESTOP SYSTEMS AND COMPONENTS AND THE FACTORY MUTUAL RESEARCH APPROVAL GUIDE. FIRESTOPPING SHALL BE PERFORMED BY THE FOLLOWING CONTRACTORS: -NATIONAL FIRESTOP LTD., 405 GUNN ROAD, WPG., MB
 - -TOTAL FIRE STOP SYSTEMS LIMITED, STONY MOUNTAIN, MB -WESTERN INDUSTRIAL SERVICES LTD., 1475 DUGALD ROAD, WPG., MB
- THE FOLLOWING MANUFACTURERS PRODUCTS/SYSTEMS SHALL BE
 - 3M FIRE PROTECTION PRODUCTS
 - AD FIRE PROTECTION SYSTEMS INC. - HILTI FIRE STOP SYSTEMS
- JOHNS MANVILLE FIRE PROTECTION SYSTEMS
- PROVIDE DETAILED SHOP DRAWINGS FOR REVIEW OF METHODS AND MATERIALS INTENDED FOR USE PRIOR TO PERFORMING THE WORK, AS REQUIRED.
- ASSEMBLY INFORMATION WALL PLATES SHALL BE PROVIDED AT EACH FIRESTOP INSTALLATION SITE.
- INSTALL FIRE STOPPING AT ALL FIRE SEPARATION PENETRATIONS IN STRICT ACCORDANCE WITH THE MANUFACTURERS INSTRUCTION AND IN COMPLIANCE WITH ALL APPLICABLE CODES AND STANDARDS.

WIRING DEVICES

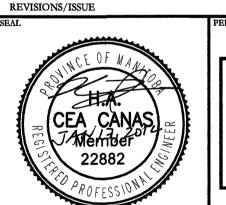
- INSTALL APPROVED VAPOUR BOXES FOR EACH JUNCTION BOX MOUNTED ON A VAPOUR BARRIER SURFACE. ASSURE THAT ALL THE WIRE PENETRATIONS ARE CAULKED.
- PROVIDE SERVICE TO CITY OF WINNIPEG EQUIPMENT. WHERE EQUIPMENT IS PLUG-IN TYPE, ENSURE THAT THE RECEPTACLE FITTING SUITABLE FOR CITY OF WINNIPEG EQUIPMENT BEFORE PURCHASE OF RECEPTACLE IS MADE. WHERE CONNECTION TO CITY OF WINNIPEG EQUIPMENT IS DIRECT, REVIEW NAMEPLATE OF THIS EQUIPMENT AND INSTALL CONDUIT. WIRING AND BREAKER IN ACCORDANCE WITH REQUIREMENTS OF NAMEPLATE.
- ELECTRICAL SUBCONTRACTOR TO INCLUDE ALL REQUIRED CONNECTIONS, REQUIRED TERMINAL BOXES AND BOX TERMINATIONS.





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APEGIN Certificate of Authorization TETRA TECH WEI Inc. No. 5313 Date: April 30, 2014

DRAFTING ENGINEERING

| ESIGNED BY: | PREPARED BY: | REVIEWED BY: | |
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| HC | BM/HA | HC | |
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CITY OF WINNIPEG TRANSIT DEPARTMENT



TETRA TECH

CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE ARTICULATING BUS MAINTENANCE ADDITION

ELECTRICAL **SPECIFICATIONS** SHEET 1 OF 2

3D MODEL REF No:

1329720500-DWG-E0004

ELECTRICAL SPECIFICATION CONT.

GENERAL CONDITIONS

- 1. DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF SYSTEMS AND WORK. ELECTRICAL SUBCONTRACTOR SHALL PROVIDE AND INSTALL AND NECESSARY ELECTRICAL EQUIPMENT NECESSARY TO FULFILL APPLICABLE CODES, REGULATIONS. BUILDING STANDARDS AND THE BEST PRACTICES OF THE TRADE FOR INSTALLATION OF ELECTRICAL WORK.
- 2. ALL ELECTRICAL WORK, MATERIALS AND EQUIPMENT SHALL CONFORM WITH THE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE, UNDERWRITERS LABORATORIES, BOARD OF UNDERWRITERS, OSHA, NEMA, NFPA, MALL STANDARDS AND ALL AUTHORITIES HAVING JURISDICTION. THE ELECTRICAL SUBCONTRACTOR SHALL PAY FOR AND OBTAIN ALL REQUIRED PERMITS AND CERTIFICATES OF REQUIRED ORDINANCES, AND DELIVER THEM TO THE CITY OF WINNIPEG REPRESENTATIVE.
- 3. THE ELECTRICAL SUBCONTRACTOR SHALL VISIT AND EXAMINE CAREFULLY THE AREAS AFFECTED BY THIS WORK TO BECOME FAMILIAR WITH EXISTING CONDITIONS AND WITH DIFFICULTIES THAT WILL ATTEND THE EXECUTION OF THIS WORK. THE ELECTRICAL SUBCONTRACTOR SHALL PERFORM THIS PRIOR TO SUBMITTING HIS PROPOSAL, SUBMITTING A PROPOSAL WILL BE CONSTRUED AS EVIDENCE THAT SUCH AN EXAMINATION HAS BEEN MADE AND LATER CLAIMS WILL NOT BE RECOGNIZED FOR EXTRA LABOUR, EQUIPMENT, OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN HAD SUCH AN EXAMINATION BEEN MADE.
- 4. UPON REVIEW OF THE DRAWINGS PRIOR TO SUBMITTING HIS PROPOSAL, THE ELECTRICAL SUBCONTRACTOR SHALL INFORM THE CONTRACT ADMINISTRATOR OF ANY DISCREPANCIES WITHIN THE DRAWINGS AND REQUEST CLARIFICATION CONCERNING THE DISCREPANCIES. LATER CLAIMS WILL NOT BE RECOGNIZED FOR EXTRA LABOR, EQUIPMENT OR MATERIALS SHOULD SUCH PROCEDURE NOT BE FOLLOWED.
- 5. THE ELECTRICAL SUBCONTRACTOR SHALL COORDINATE THIS WORK WITH OTHER SUBCONTRACTORS WHOSE WORK MIGHT AFFECT THIS INSTALLATION. THE ELECTRICAL SUBCONTRACTOR SHALL ARRANGE ALL PARTS OF THIS WORK AND EQUIPMENT IN PROPER RELATION TO THE WORK AND EQUIPMENT OF OTHERS.
- 6. THE ELECTRICAL SUBCONTRACTOR SHALL BE RESPONSIBLE FOR ALL CONDUIT, OUTLET BOXES, POKE-THRU SERVICE FITTINGS REQUIRED TO FACILITATE THE INSTALLATION OF COMMUNICATION WIRING AND DEVICES.
- 7. THE DRAWINGS INDICATE THE SIZE AND GENERAL LOCATION OF WORK. SCALED DIMENSIONS SHALL NOT BE USED. VERIFY SCALE WITH ARCHITECTURAL DRAWINGS. THE EXACT LOCATION AND ELEVATION OF ALL LIGHTING FIXTURES, SWITCHES, RECEPTACLES, ETC. SHALL BE DETERMINED FROM THE ARCHITECTS DRAWINGS.
- 8. THE "GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION" AS APPLICABLE, ARE PART OF THE CONTRACT.

FIRE ALARM SYSTEM

- 1. THE WORK COVERED BY THIS SECTION OF THE SPECIFICATIONS INCLUDES THE FURNISHING OF ALL PERMITS, FEES, LABOR, EQUIPMENT, MATERIALS, AND PERFORMANCE OF ALL OPERATIONS IN CONNECTION WITH THE INSTALLATION OF THE FIRE ALARM SYSTEM AS SHOWN ON THE DRAWINGS AND AS HEREIN SPECIFIED.
- 2. THE COMPLETE INSTALLATION SHALL CONFORM TO THE APPLICABLE SECTIONS OF NFPA-72, LOCAL CODE REQUIREMENTS AND THE NATIONAL ELECTRICAL CODE.
- 3. EACH AND ALL ITEMS OF THE FIRE ALARM SYSTEM SHALL BE LISTED AS A PRODUCT OF A SINGLE FIRE ALARM SYSTEM MANUFACTURER.
- 4. THE SYSTEM ALARM OPERATION SUBSEQUENT TO THE ALARM ACTIVATION OF ANY INITIATING DEVICE SHALL BE AS FOLLOWS: a. THE APPROPRIATE INITIATING DEVICE CIRCUIT RED LED SHALL FLASH ON THE CONTROL PANEL.
- b. A PULSING ALARM TONE SHALL OCCUR WITHIN THE CONTROL PANEL UNTIL SILENCED.
- c. ALL ALARM INDICATING APPLIANCES SHALL SOUND AND OR DISPLAY IN A SYNCHRONIZED CONTINUOUS PATTERN UNTIL SILENCED BY THE ALARM SILENCE SWITCH.
- d.A SUPERVISED SIGNAL TO NOTIFY THE LOCAL FIRE DEPARTMENT OR AN APPROVED CENTRAL STATION SHALL BE ACTIVATED.
- e. THE MECHANICAL CONTROLS SHALL ACTIVATE THE AIR HANDLING SYSTEMS AS REQUIRED TO SHUTDOWN ALL FANS AND GAS SUPPLY VALVES.
- 5. THE CONTROL PANEL SHALL RECEIVE 120 VAC POWER. VIA A DEDICATED CIRCUIT.
- 6. THE SYSTEM SHALL BE PROVIDED WITH 24 HOUR BATTERY BACK-UP.
- 7. THE CONTRACTOR SHALL WARRANT THE COMPLETED FIRE ALARM SYSTEM WIRING AND EQUIPMENT TO BE FREE FROM INHERENT MECHANICAL AND ELECTRICAL DEFECTS FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF THE COMPLETED AND CERTIFIED TEST OR FROM THE DATE OF FIRST BENEFICIAL USE.

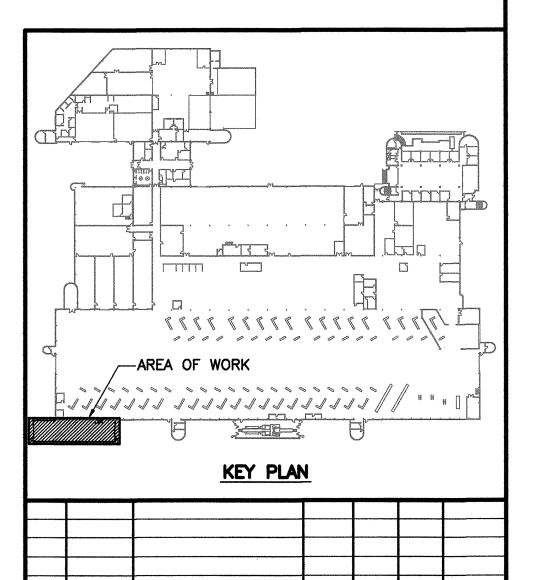
TEMPORARY POWER

- 1. FURNISH AND INSTALL WIRING FOR ADEQUATE TEMPORARY LIGHT
- AND POWER FOR THE PROJECT. 2. MAINTAIN THE SYSTEM IN GOOD AND ADEQUATE WORKING
- CONDITIONS AT ALL TIMES. 3. FURNISH AND INSTALL ALL LAMPS, BREAKERS, AND FUSING. AS IS
- 4. REPLACE BURNED OUT LAMPS, DEFECTIVE BREAKERS OR BLOWN
- 5. MAINTENANCE FOR THE ABOVE SHALL BE BASED ON OPERATION 1/2 HOUR BEFORE THE START OF THE FIRST TRADE THROUGH 1/2 HOUR AFTER THE END OF THE LAST TRADE.
- 6. WIRE ADEQUATE FOR ALL CONSTRUCTION NEEDS.

LIGHTING FIXTURES

- 1. ALL FIXTURES, LAMPS AND BALLASTS ARE FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR.
- 2. ALL LIGHT FIXTURE MOUNTING HARDWARE SHALL MATCH AND ALL LIGHT FIXTURE MOUNTING HARDWARE SHALL MATCH AND TYPE.
- 3. FLUORESCENT BALLASTS SHALL BE ELECTRONIC, U.L. CLASS "P" AND SHALL CONFORM TO ANSI AND UL SPECIFICATIONS. BALLASTS FOR FLUORESCENT LAMPS SHALL BE OF THE ENERGY SAVING SUPER LOW HEAT DESIGN WITH HIGH POWER FACTOR ELECTRONIC TYPE AS MANUFACTURED BY ADVANCE, UNIVERSAL, MOTOROLA OR GE. BALLASTS SHALL BE APPROVED FOR THE UTILITY COMPANY ENERGY REBATE PROGRAM.
- 4. PROVIDE LAMPS SUITABLE FOR LIGHTING FIXTURES IN WHICH THEY ARE USED AND AS INDICATED ON THE DRAWINGS. FLUORESCENT LAMPS SHALL BE "RAPID START" AND SHALL DELIVER NOT LESS THAN 3150 LUMENS. MINIMUM CHROMATICITY OF LAMPS SHALL BE 4100 KELVIN UNLESS OTHERWISE NOTED. MINIMUM COLOR RENDERING INDEX (CRI) OF LAMPS SHALL BE 86.

| | REFERENCE DRAWINGS | | | |
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REVISIONS/ISSUE

PEGM f Authorization CH WEI Inc. e: April 30, 2014

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PREPARED REVIEW DESIGN AUTHORIZE

DRAFTING ENGINEERING

| DESIGNED BY: | PREPARED BY: | | REVIEWED BY: | |
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| AUTHORIZED BY: | DATE: | 131115 | SCALE: AS NOTED | |

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CITY OF WINNIPEG TRANSIT DEPARTMENT



TETRA TECH

CITY OF WINNIPEG TRANSIT - FORT ROUGE GARAGE ARTICULATING BUS MAINTENANCE ADDITION

ELECTRICAL **SPECIFICATIONS** SHEET 2 OF 2

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