



Project: Whitby Hospice
Prince of Wales / Crawford Street
Whitby, Ontario

Project ID: ROA23-001

Addendum: 4

Attention: Project Bidders

Date: June 26, 2024

This Addendum is hereby made a part of the Contract Documents and modifies the original Bidding Documents as noted below. The following additions, deletions and amendments shall be incorporated into the bid submission.

- 4.1 Refer to Drawing 04|A303 – Exterior Elevations
 - .1 Revise M4 Tag on elevation to M5 as per the attached sketch ADD4.1
- 4.2 Refer to drawing 01|A605 – Millwork Details: Care Centre
 - .1 Refer to elevation detail 01A|A605 and revised as per attached sketch ADD4.2
 - .2 Refer to elevation detail 01C|A605 and revised as per with attached sketch ADD4.3
 - .3 Refer to elevation detail 01D|A605 and revised as per with attached sketch ADD4.4
- 4.3 Refer to drawing AS101-AS103 – Architectural Site Plan’s, Enlarged Site Plans and Site Detail Drawings
 - .1 Clarification: All landscaping is to be removed from contract and will be provided by owner. All notes pertaining to landscaping beds and design will be coordinated onsite with owner’s vendor.
- 4.4 Refer to drawing 05|A504 – Interior Elevations – Care Centre 145 Elevation ‘D’
 - .1 Refer to material wall tag ‘WF3’ and replace with ‘MF2’
- 4.5 Refer to Specification Section 08 11 16 Aluminum Window Framing
 - .1 Refer to line 2.7.1.1 and revise finish from Clear anodized to Black Anodized – based on Kawneer #29
- 4.6 Refer to Specification Section 08 11 17 Aluminum Doors
 - .1 Refer to line 2.5.1 and revise finish from Clear anodized to Black Anodized – based on Kawneer #29
- 4.7 Refer to Specification Section 08 50 75 Aluminum Skylights
 - .1 Refer to line 2.3.1.1 and revise finish from Clear anodized to Black Anodized – based on Kawneer #29
- 4.8 Refer to attached Mechanical Addendum No. 3m & 4m attached herewith.
- 4.9 Refer to attached Electrical Addendum No. 01eR attached herewith.

END OF ADDENDUM

PREPARED BY THE CONSULTANT

Ryan Villalta

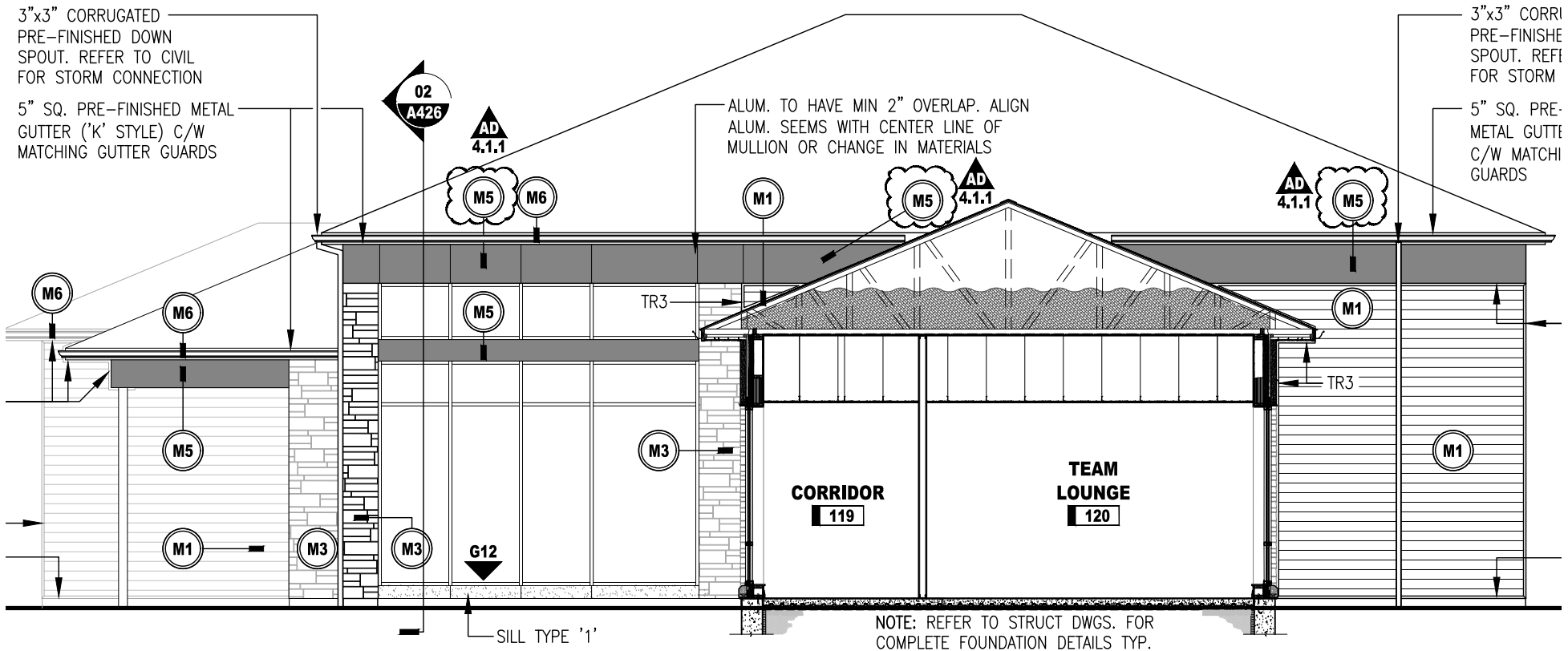
Project Manager

Signature

06-26-2024

Date: MM.DD.YEAR





ROA23-001 WHITBY HOSPICE

04 REVISED EXTERIOR ELEVATION

A303 SCALE: 1/8" = 1'-0"

THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY ERRORS OR OMISSIONS TO THE ARCHITECT PRIOR TO COMMENCING OR PROCEEDING WITH ANY WORK ON THIS PROJECT. ALL DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF THE ARCHITECT. COPYRIGHT 2020. THESE DRAWINGS AND SPECIFICATIONS ARE DESIGNED FOR THE CLIENT AND THE PROPERTY INDICATED ON THESE DRAWINGS ONLY AND SHALL NOT BE CONSTRUCTED FOR ANY OTHER CLIENT OR ANY OTHER PROPERTY. DO NOT SCALE DRAWINGS.

WHITBY HOSPICE
WHITBY, ONTARIO
L1N 8Y8

ROA
STUDIO
67 KING STREET WEST, CHATHAM ON N7M 1C7
TEL . 519.397.0943 EMAIL . info@roastudio.com

EXTERIOR ELEVATION -
MATERIAL REVISION

ARCHITECTURE

PROJECT ID
DRAWN BY
REVIEWED BY
DATE
SCALE

ROA23-001
C.REINSTAG
R.VILLALTA
06.26.2024
AS NOTED

ADD4.1

NOTE:
STAIN ALL CUT EDGES THROUGH WOOD
ACCENT WALL (RECEPTACLES, DATA, ETC.)

NOTE:
PROVIDE CONTINUOUS 3/4" PLYWOOD BLOCKING
BETWEEN STUD CAVITY AT ALL WALL MOUNTED
MILLWORK AND ACCESSORIES IN WALL

NOTE:
CAULK PERIMETER OF MILLWORK TYP.

AD
4.2.1

WALL PANEL: WF2

3/4" PARTICLE BOARD W/ MATCHING P.LAM TO
ALL EXPOSED SIDES/EDGES

COUNTERTOP: MF3

3/4" SOLID SURFACE C/W 3/4" CONT.
PLYWOOD UNDER SUPPORT.

DOORS, DRAWER FRONTS & GABLES: MF1

3/4" PARTICLE BOARD WITH 1/8" MATCHING
MELAMINE EDGING ON ALL EXPOSED
EDGES/FACES

DOOR PULL & LOCK TYP.
PULL TYPE: 'A'

BACK PANEL: MF1

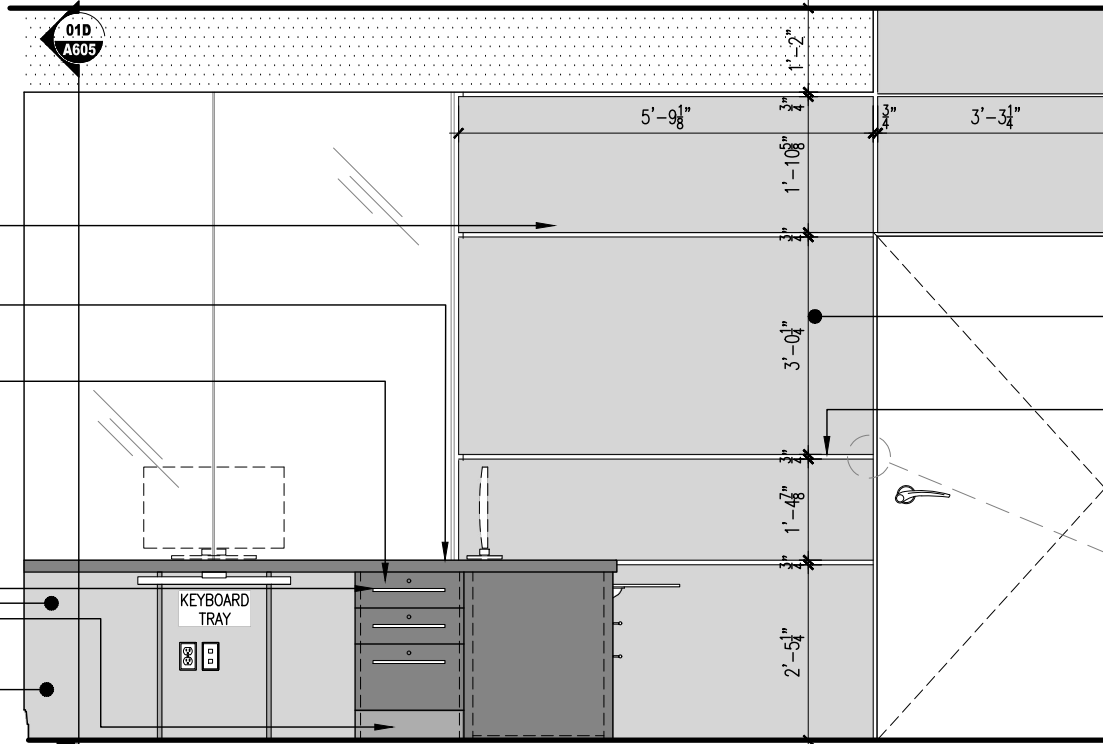
MELAMINE ON 3/4" PARTICLE BOARD

BASE KICK: MF1

3/4" PLY BASE KICK WITH MELAMINE
FINISH TO FRONT SIDE.

KNEE WALL:

2X4 WOOD STUD WALL SPACED @ 16" O/C MAX.
SECURE BOTTOM PLATE TO FLOOR. PROVIDE 1/2"
PLYWOOD ON CORRIDOR SIDE FOR REVEALS. SEE DETAIL

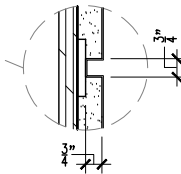


AD
4.2.1

WALL PANEL: WF2
3/4" PARTICLE BOARD W/ MATCHING P.LAM
TO ALL EXPOSED SIDES/EDGES

REVEALS: MF1
MATCHING MELAMINE TO ALL
EXPOSED SIDES/EDGES.

REVEAL DETAIL



01A REVISED MILLWORK DETAILS: CARE CENTRE - ELEVATION

A605 SCALE: 3/16" = 1'-0"

GENERAL NOTES	PROJECT IDENTIFICATION	CONSULTANT	DRAWING IDENTIFICATION	DISCIPLINE SEAL	ROA INTERNAL INFO	COPYRIGHT 2022
<p>THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY ERRORS OR OMISSIONS TO THE ARCHITECT PRIOR TO COMMENCING OR PROCEEDING WITH ANY WORK ON THIS PROJECT. ALL DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF THE ARCHITECT. COPYRIGHT 2022. THESE DRAWINGS AND SPECIFICATIONS ARE DESIGNED FOR THE CLIENT AND THE PROPERTY INDICATED ON THESE DRAWINGS ONLY AND SHALL NOT BE CONSTRUCTED FOR ANY OTHER CLIENT OR ANY OTHER PROPERTY. DO NOT SCALE DRAWINGS.</p>	<p>WHITBY HOSPICE - WHITBY, ONTARIO L1N 8Y8</p>	<p>ROA STUDIO 67 KING STREET WEST, CHATHAM ON N7M 1C7 TEL . 519.397.0943 EMAIL . info@roastudio.com</p>	<p>MILLWORK DETAIL - MILLWORK REVISION</p>		<p>ARCHITECTURE PROJECT ID ROA23-001 DRAWN BY C.REINSTAG REVIEWED BY R.VILLALTA DATE 06.26.2024 SCALE AS NOTED</p>	<p>ADD4.2</p>

ROA23-001 WHITBY HOSPICE

NOTE:
 PROVIDE CONTINUOUS 3/4" PLYWOOD BLOCKING
 BETWEEN STUD CAVITY AT ALL WALL MOUNTED
 MILLWORK AND ACCESSORIES IN WALL

NOTE:
 CAULK PERIMETER OF MILLWORK TYP.

GLASS:
 3/8" CTG PANELS. PROVIDE FULL 3M
 FROSTED FILM. IMAGE TO BE PROVIDED
 BY CONSULTANT AT A LATER DATE.

AD
 4.2.2

WALL PANEL: WF2
 3/4" PARTICLE BOARD W/ MATCHING P.LAM TO
 ALL EXPOSED SIDES/EDGES

COUNTERTOP: MF3
 3/4" SOLID SURFACE C/W 3/4" CONT.
 PLYWOOD UNDER SUPPORT.

DOORS, DRAWER FRONTS & GABLES: MF1
 3/4" PARTICLE BOARD WITH 1/8" MATCHING MELAMINE
 EDGING ON ALL EXPOSED EDGES/FACES

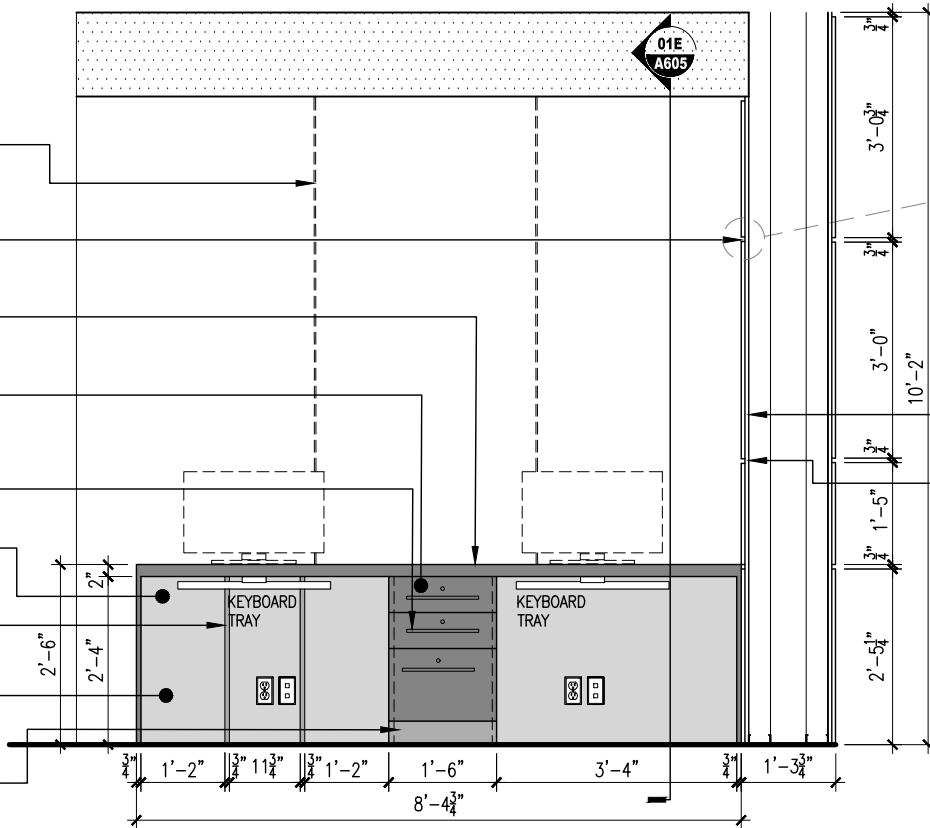
DOOR PULL & LOCK TYP.
 PULL TYPE: 'A'

BACK PANEL: MF1
 MELAMINE ON 3/4" PARTICLE BOARD

ROUNDED GABLE SUPPORT: MF1
 3/4" PARTICLE BOARD W/ MATCHING 1/8" MELAMINE TO
 ALL EXPOSED SIDES/EDGES C/W 2" DIA. GROMMET

KNEE WALL:
 2X4 WOOD STUD WALL SPACED @ 16" O/C MAX.
 SECURE BOTTOM PLATE TO FLOOR. PROVIDE 1/2"
 PLYWOOD ON CORRIDOR SIDE FOR REVEALS. SEE DETAIL

BASE KICK: MF1
 3/4" PLY BASE KICK WITH MELAMINE FINISH
 TO FRONT SIDE.




REVEAL DETAIL

WALL PANEL: MF2
 3/4" PARTICLE BOARD W/ MATCHING P.LAM
 TO ALL EXPOSED SIDES/EDGES

REVEALS: MF2
 MATCHING P.LAM TO ALL
 EXPOSED SIDES/EDGES.

01C REVISED MILLWORK DETAILS: CARE CENTRE - ELEVATION

A605 SCALE: 3/8" = 1'-0"

GENERAL NOTES	PROJECT IDENTIFICATION	CONSULTANT	DRAWING IDENTIFICATION	DISCIPLINE SEAL	ROA INTERNAL INFO	COPYRIGHT 2022
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ROA23-001 WHITBY HOSPICE

NOTE:
STAIN ALL CUT EDGES THROUGH WOOD
ACCENT WALL (RECEPTACLES, DATA, ETC.)

NOTE:
PROVIDE CONTINUOUS 3/4" PLYWOOD BLOCKING
BETWEEN STUD CAVITY AT ALL WALL MOUNTED
MILLWORK AND ACCESSORIES IN WALL

NOTE:
CAULK PERIMETER OF MILLWORK TYP.

GLASS:
3/8" CTG PANELS. PROVIDE FULL 3M
FROSTED FILM. IMAGE TO BE PROVIDED BY
CONSULTANT AT A LATER DATE.

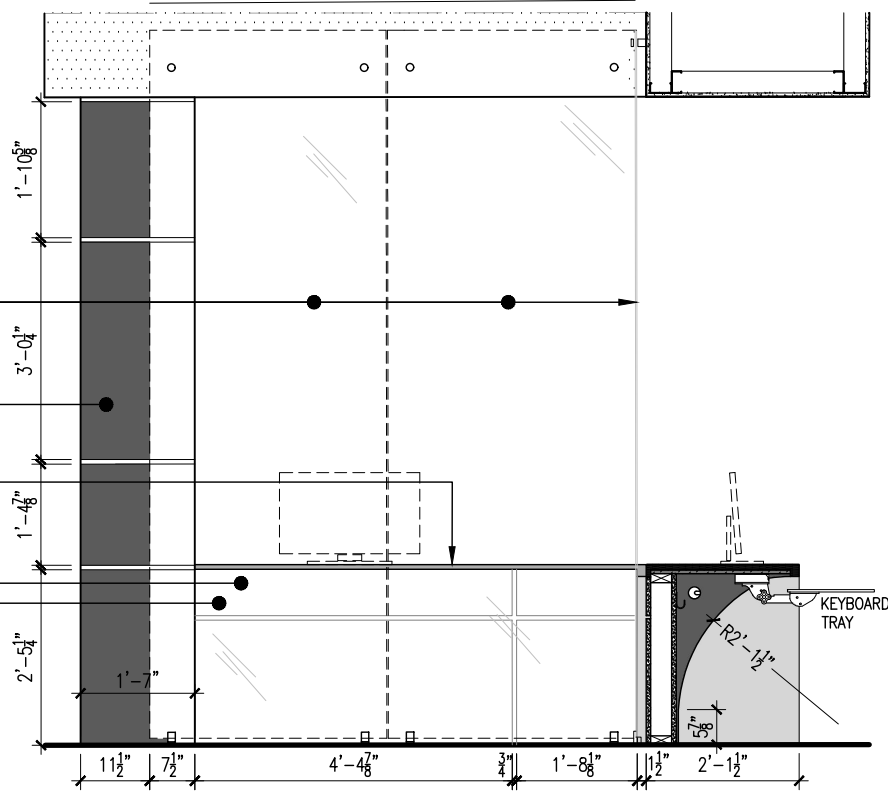
AD
4,2,3

WALL PANEL: WF2
3/4" PARTICLE BOARD W/ MATCHING P.LAM TO
ALL EXPOSED SIDES/EDGES

COUNTERTOP: MF3
3/4" SOLID SURFACE C/W 3/4" CONT.
PLYWOOD UNDER SUPPORT.

BACK PANEL: MF1
MELAMINE ON 3/4" PARTICLE BOARD

KNEE WALL:
2X4 WOOD STUD WALL SPACED @ 16"
O/C MAX. SECURE BOTTOM PLATE TO
FLOOR. PROVIDE 1/2" PLYWOOD ON
CORRIDOR SIDE FOR REVEALS. SEE DETAIL



01D REVISED MILLWORK DETAILS: CARE CENTRE - ELEVATION

A605 SCALE: 3/8" = 1'-0"

GENERAL NOTES	PROJECT IDENTIFICATION	CONSULTANT	DRAWING IDENTIFICATION	DISCIPLINE SEAL	ROA INTERNAL INFO	COPYRIGHT 2022
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ROA23-001 WHITBY HOSPICE

ADD4.4

ADDENDUM

Project: **Whitby Hospice**
Crawforth Street
Whitby, Ontario

Date: June 25, 2024
File No: 7301.pt

The following additions, deletions and amendments are hereby made a part of the Tender Documents for the above noted project and shall be incorporated into the Bid Submission.

1.0 Title

1.1 Mechanical

2.0 References

- 2.1 Mechanical Book Specifications, Duct System Dampers & Accessories 23 33 00, dated February 2024,
- 2.2 Mechanical Book Specifications, Centrifugal Inline Fans 23 33 20, dated February 2024,
- 2.3 Mechanical Book Specifications, Roof Mounted Exhaust Fans 23 33 30, dated February 2024,
- 2.4 Mechanical Book Specifications, Ceiling Mounted Fans 23 36 00, dated February 2024,
- 2.5 Mechanical Book Specifications, Air Terminal Units 23 36 00, dated February 2024,
- 2.6 Mechanical Book Specifications, Grilles & Diffusers 23 37 13, dated February 2024,
- 2.7 Mechanical Book Specifications, Custom Made Air Handling Units 23 75 00, dated February 2024,
- 2.8 Revised Mechanical Drawing 301: Partial First Floor Plan – Domestic Water and Gas Piping, attached.

3.0 Description of Work

- 3.1 Add PennBarry, Metalaire, Nailor, Thermolec and Pottorff as acceptable manufacturers for this project.
- 3.2 Add Envent as acceptable custom made air handling unit manufacturer for this project.
- 3.3 Revised gas piping layout. Gas-fired emergency generator has been changed to diesel emergency generator.
- 3.4 Changes are clouded.

4.0 Reason for Change

- 4.1 Additional Information/Clarification/Design Refinement

End of Add No. 3m

ADDENDUM

Project: **Whitby Hospice**
Crawforth Street
Whitby, Ontario

Date: June 25, 2024
File No: 7301.pt

The following additions, deletions and amendments are hereby made a part of the Tender Documents for the above noted project and shall be incorporated into the Bid Submission.

1.0 Title

1.1 Mechanical

2.0 References

2.1 Mechanical Book Specifications, Automatic Control Systems 23 05 05, dated February 2024.

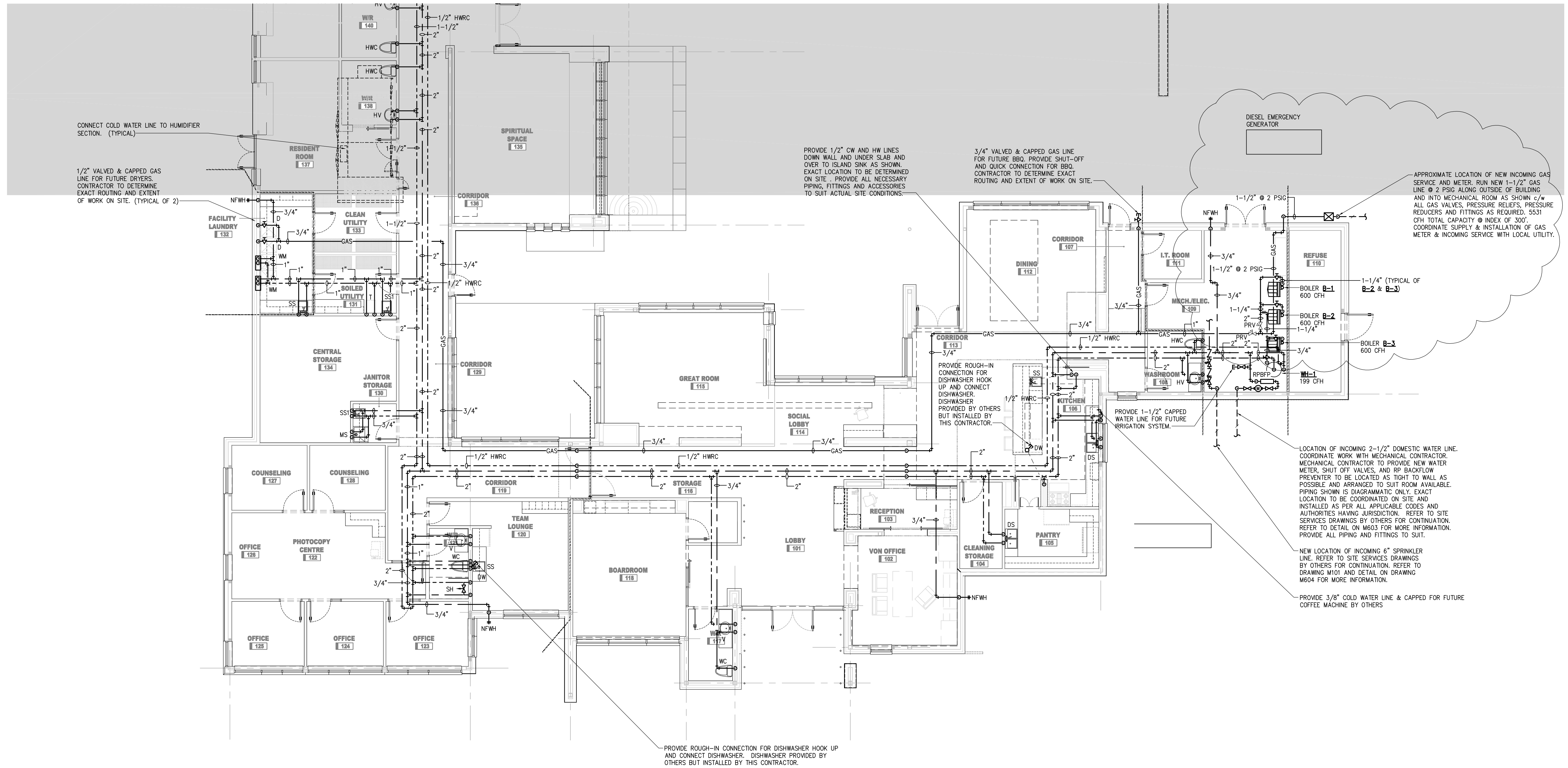
3.0 Description of Work

3.1 Add Automatic Controls and Energy Solutions Group Inc. as acceptable control contractor for this project.

4.0 Reason for Change

4.1 Additional Information/Clarification

End of Add No. 4m

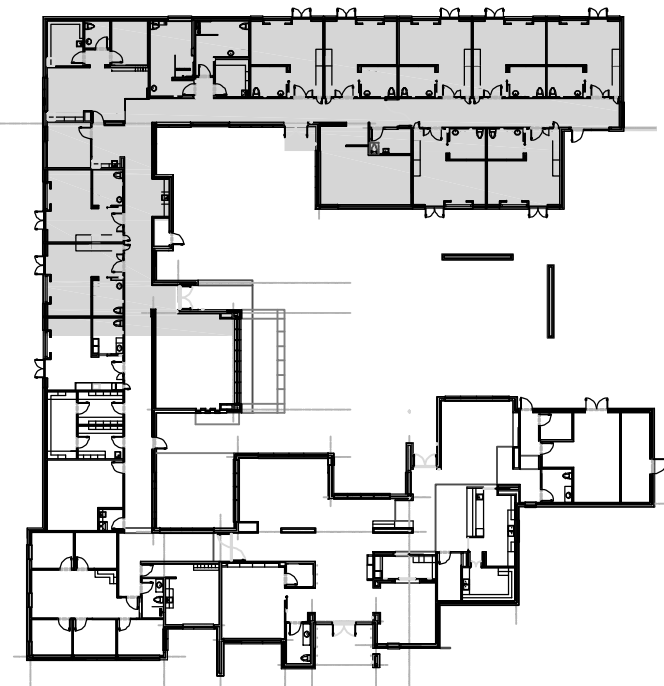


01 FLOOR PLAN - DOMESTIC WATER AND GAS PIPING

M301 SCALE: 1/8" = 1'-0"

REFER TO DRAWING M302

REFER TO DRAWING M301



NOTES	PROJECT IDENTIFICATION	DRAWING IDENTIFICATION	ORIENTATION	SUB-CONSULTANT	PRIME CONSULTANT	DISCIPLINE SEAL	DRAWING SUBMISSION(S)	INTERNAL INFO	COPYRIGHT 2018									
<p>THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY ERRORS OR OMISSIONS TO THE ENGINEER PRIOR TO COMMENCING OR PROCEEDING WITH ANY WORK ON THIS PROJECT. ALL DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF THE ENGINEER. THESE DRAWINGS AND SPECIFICATIONS ARE DESIGNED FOR THE CLIENT AND THE PROPERTY INDICATED ON THESE DRAWINGS ONLY AND SHALL NOT BE CONSTRUCTED FOR ANY OTHER CLIENT OR ANY OTHER PROPERTY. DO NOT SCALE DRAWINGS.</p>	<p>WHITBY HOSPICE WHITBY, ONTARIO LTN 8Y8</p>	<p>PARTIAL FIRST FLOOR PLAN DOMESTIC WATER AND GAS PIPING</p>		<p>INTEGRATED engineering 1930 Blue Heron Drive London, ON N6H 5L9 Tel: 519-472-3688 Fax: 519-472-4322 www.integratedengineering.ca</p>	<p>ROA STUDIO 67 KING STREET WEST, CHATHAM ON N7M 1C7 TEL . 519.397.0943 EMAIL . info@roastudio.com</p>		<table border="1"> <thead> <tr> <th>NO.</th> <th>ISSUED FOR</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>ISSUED FOR ADDENDUM 2M</td> <td>24.06.25</td> </tr> <tr> <td>1</td> <td>ISSUED FOR TENDER</td> <td>24.02.02</td> </tr> </tbody> </table>	NO.	ISSUED FOR	DATE	2	ISSUED FOR ADDENDUM 2M	24.06.25	1	ISSUED FOR TENDER	24.02.02	<p>MECHANICAL</p> <p>PROJECT ID: ROA23-001 DRAWN BY: KJM REVIEWED BY: GLH DATE: 23.01.2024 SCALE: AS NOTED</p>	<p>M301</p>
NO.	ISSUED FOR	DATE																
2	ISSUED FOR ADDENDUM 2M	24.06.25																
1	ISSUED FOR TENDER	24.02.02																

ADDENDUM

Project: **Whitby Hospice**
Crawforth Street
Whitby, Ontario

Date: June 25, 2024
File No: 7301.pt

The following additions, deletions and amendments are hereby made a part of the Tender Documents for the above noted project and shall be incorporated into the Bid Submission.

1.0 Title

1.1 Electrical

2.0 References

- 2.1 Electrical Book Specifications, Service Entrance Equipment 26 15 05, attached,
- 2.2 Electrical Book Specifications, Engine-Generator Set 26 30 05, attached,
- 2.3 Electrical Book Specifications, Engine-Generator Set Enclosure 26 30 20, attached,
- 2.4 Electrical Drawing E502: Electrical Single Line Diagram, attached,

3.0 Description of Work

- 3.1 Replace specification section Service Entrance Equipment 26 15 05 with attached.
- 3.2 Replace specification section Engine-Generator Set 26 30 05 with attached.
- 3.3 Replace specification section Engine-Generator Set Enclosure 26 30 20 with attached.
- 3.4 All revisions are indicated in red.
- 3.5 **Refer to Drawing E502:** Revise generator type to be *Diesel (Prime Power)* and revise generator and load test breakers to be 800Amp in lieu of 600Amp.
- 3.6 Identify the automatic transfer switches as follows: Both 100Amp ATS (for Panels E1 & E2) to be categorized as Vital and 600Amp ATS (for Distribution Panel DP-1) to be categorized as Conditional as per CSA Z32-15 Table 6.
- 3.7 *Revise feeder to Panel E2 to be 4#3R90 in 2" conduit.*

4.0 Reason for Change

4.1 Design refinement

End of Add No. 1eR

1 GENERAL

1.01 SUBMITTALS

- .1 **Shop Drawings/Product Data:** Submit shop drawings/product data sheets for all equipment specified in this Section. Shop drawings/product data is to include:
 - .1 equipment dimensions and details
 - .2 a single line diagram and a schematic diagram, if applicable
 - .3 component nameplate and warning sign data
 - .4 short circuit ratings, voltage ratings, continuous current ratings, and interrupt ratings
 - .5 any additional information requested by the Consultant
- .2 **Test Reports:** Submit signed copies of all test reports, and include a copy of each report with O & M Manual project close-out data.
- .3 **Spare Fuses:** Submit as specified in Part 3 of this Section.
- .4 **Manufacturer's Installation Certification Letter:** Submit a service entrance board manufacturer's installation certification letter as specified in Part 3 of this Section.

1.02 QUALITY ASSURANCE

- .1 **Codes and Standards:** Service entrance equipment is to be, as applicable, in accordance with requirements of:
 - .1 CSA-C22.2 No. 4/NMX-J-162-ANCE-2016/UL 98, Enclosed and Dead-Front Switches
 - .2 CSA-C22.2 No 14, Industrial Control Equipment
 - .3 CSA-C22.2 No. 5/NMX-J-266-ANCE/UL 489, Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures
 - .4 CSA-C22.2 No. 39, Fuseholder Assemblies
 - .5 CAN/CSA-C22.2 No. 29, Panelboards and Enclosed Panelboards
 - .6 CAN/CSA-C22.2 No. 31, Switchgear Assemblies
 - .7 CAN/CSA-C22.2 No 144, Ground Fault Circuit Interrupters

2 PRODUCTS

2.01 FUSED DISCONNECT SWITCH

- .1 In accordance with Section 26 28 23, Disconnect Switches, with rating as indicated on the drawings.

2.02 ENCLOSED CIRCUIT BREAKER

- .1 Breakers are to be moulded case breakers in accordance with CSA/C22.2 No. 5, calibrated for operation in a 40° C (105° F) ambient temperature, sized in accordance with the drawing, and as follows:
 - .1 for ground fault breakers, CSA Class A, Group 1 combination thermal magnetic trip breakers with solid-state ground default interrupters
 - .2 for breakers 225 amperes and larger, a solid-state adjustable trip unit with long time, short-time, and instantaneous time functions and time delays

2.03 PANELBOARD

- .1 In accordance with Section 26 24 16, Branch Circuit Panelboards, with capacity and branch circuit details as per the drawings.

2.04 METERING CABINET

- .1 CSA certified minimum 915 mm x 915 mm x 300 mm deep (3' x 3' x 12") minimum #14 gauge enamelled steel cabinet, EEMAC 2 in a sprinkler protected area, approved by the Utility and complete with:
 - .1 a removable minimum #12 gauge sheet steel interior mounting panel which is 80 mm (3¼") more narrow and shorter than the cabinet width and height, and mounted with a 15 mm (½") clearance behind the panel
 - .2 hinged double doors opening at the middle and equipped with a minimum of 3 latching points, and a non-locking latch and handle or latch-handle combination

2.05 GROUND FAULT EQUIPMENT

- .1 Panel mounting (unless otherwise indicated) ground fault protection unit designed to operate instantaneously at the ground current setting, and with characteristics as indicated on the drawings. The unit is to be complete with:
 - .1 a ground fault sensing relay for operation at the setting indicated on the drawings, and with 120 volt control voltage
 - .2 an ammeter with a 0 to 5 ampere scale to indicate the ground fault current
 - .3 a 3-position sensitivity control switch to select the value of leakage current at which the relay will operate
 - .4 an identified indicating LED which is illuminated when no ground fault exists and is extinguished when a ground fault occurs or the unit is tested
 - .5 a manual reset switch with manual target indication and SPDT contacts for alarm and trip, and a rest button for the contacts and target
 - .6 a zero sequence transformer of a type to suit the conductors involved, with 300 to 3000 mA range

- .7 **an artificial neutral and grounding resistor or a neutral ground resistor unit to suit the system**

2.06 METERING CURRENT AND POTENTIAL TRANSFORMERS

- .1 Supplied with metering equipment **by** the Utility

2.07 SERVICE ENTRANCE BOARD

- .1 Metal enclosed, factory assembled, dead front service entrance board assembly in accordance with the drawing plan, elevations, schedule, and any details, and in accordance with CAN/CSA-C22.2 No. 31 and all other applicable Codes and Standards.
- .2 **Enclosure:** Tamper-resistant enclosure consisting of individual sections cubicles constructed of cold rolled steel and bolted together and reinforced as necessary to form a self-contained structure with the necessary louvres for proper ventilation. The enclosure is to be NEMA/EEMAC Type 1 if the room is not sprinkler protected, NEMA/EEMAC Type 2 if the room is sprinkler protected, and finished with ANSI #61 grey enamel. The enclosure is to be complete with:
 - .1 **hinged access panels** where required, of formed sheet steel and equipped with gasketing, concealed steel hinges with stainless steel hinge pins, and a captive knurled thumb screws
 - .2 **metering cubicle**, for Utility metering equipment, full height and barriered to isolate the cubicle from adjoining cubicles
 - .3 **Utility metering CT's and PT's** as specified above in this Section
 - .4 **fused disconnect switch** as specified above in this Section
 - .5 **enclosed circuit breaker** as specified above in this Section
 - .6 **panelboard** as specified above in this Section
 - .7 **ground fault equipment** as specified above in this Section
 - .8 **power bus** from the load terminal of the main breaker or disconnect switch via the metering cubicle to main lugs of the distribution panelboard, consisting of rectangular, square edge, hard temper, high electrical conductivity copper with colour coded phasing
 - .9 **cable** with colour coded phasing from the load terminal of the main breaker or disconnect switch via the metering cubicle to lugs of the distribution panelboard
 - .10 **ground bus**, electrical grade copper extending the full width of the assembly at the bottom, with lugs at each end for attachment of ground conductors
- .3 **Acceptable Manufacturers:** Acceptable manufacturers are:
 - .1 Schneider Electric Canada
 - .2 Eaton Electric Canada

.3 Siemens Canada

3 EXECUTION

3.01 INSTALLATION OF SERVICE ENTRANCE EQUIPMENT

- .1 Provide electric service entrance equipment where shown.
- .2 Wall mount the equipment where indicated but confirm exact location prior to installation.
- .3 Secure the service entrance board in place, level, and plumb, on a concrete housekeeping pad.
- .4 Make "line" and "load" side connections as indicated.
- .5 Check protective devices against the coordination study results to ensure proper operation of the devices.
- .6 Ground and bond as indicated and as per the electrical work Section entitled Grounding-Secondary.
- .7 If service entrance equipment identification is not factory installed, install at the site using stainless steel screws.
- .8 Supply a complete set of identified fuses for the disconnect switch and store in an identified wall mounted steel cabinet adjacent to the service entrance equipment.
- .9 **Equipment and System Manufacturer's Certification:** Refer to the article entitled Equipment and System Manufacturer's Certification in the Electrical Work General Instructions Section.
- .10 **Start-Up:** Refer to the article entitled Equipment and System Start-up in the Electrical Work General Instructions Section.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 **Shop Drawings/Product Data:** Submit shop drawings/product data sheets for the engine-generator set and all accessories. Ensure that the shop drawings and product data sheets indicate all features of the equipment to confirm that the equipment is in accordance with requirements of this Section. Shop drawings and product data sheets are to be submitted for:
 - .1 the engine with make and model, weight, dimensions, and performance curves
 - .2 the generator (alternator) with make and model, weight, dimensions, electrical characteristics and all performance data
 - .3 the control panel, including a control wiring schematic, and a description of control panel sequences and integration with other building systems
 - .4 battery make and model, type and capacity
 - .5 battery charger make and model, and type
 - .6 voltage regulator and governor make, model and type
 - .7 cooling air and combustion air requirements lps and CDFM
 - .8 installation instructions and diagrams for wiring and piping
 - .9 engine-generator set sound pressure levels under full load
- .2 **Engine Exhaust System Review and Confirmation:** Submit a letter from the engine-generator set manufacturer which confirms that the engine exhaust system design and layout, including backpressure, is suitable for proper operation of the set.
- .3 **Engine-Generator Set Vibration Analysis:** Submit an engine-generator set torsional vibration analysis and a critical vibration analysis prepared by the set manufacturer.
- .4 **Factory Test Report:** Submit a dated and signed copy of the certified factory test report.
- .5 **Spare Parts and Maintenance Supplies:** Supply the following spare parts and maintenance supplies:
 - .1 (supplied loose) a surface wall mounting identified enameled steel cabinet with shelves, hinged door(s), and keyed lock with a minimum of three identified keys

- .2 four fuel oil filter elements with gaskets
 - .3 four lubricating oil filter elements with gaskets
 - .4 four air filters
 - .5 two complete sets of spare fuses
 - .6 two complete and identified sets of spare lamps for all indicating and warning lights
 - .7 one complete set of spare belts
 - .8 a litre of touch up paint for each colour/type of finish used on the set
 - .9 any special service and/or maintenance tools
- .6 **Manufacturer's Inspection, Certification, & Start-Up & Test Reports:** Submit a report from the generator set manufacturer to confirm that the manufacturer has inspected the completed generator set installation and found it acceptable, and a report documenting that he has supervised successful start-up and adjustment of the equipment, all as specified in Part 3 of this Section.
- .7 **Operation and Maintenance Training DVD:** When on-site maintenance and training is complete, supply and hand to the Owner a DVD outlining complete operation and maintenance procedures.
- .8 **Control Panel Keys:** Submit a minimum of 3 identified keys for the engine-generator set control panel door.

1.02 QUALITY ASSURANCE

- .1 The engine-generator set(s) is to be in accordance with requirements of the following:
- .1 CSA 282, Emergency Electrical Power Supply for Buildings
 - .2 CSA C22.2 No. 1-07.2, Battery Chargers
 - .3 NEMA MG-1, Motors and Generators
 - .4 CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities

1.03 ACCEPTABLE MANUFACTURERS/SUPPLIERS

- .1 Acceptable generator set suppliers are:
- .1 Generac
 - .2 Cummins

- .3 Caterpillar
- .4 Kohler
- .5 T&T Power Group
- .2 Acceptable generator set instrument manufacturers are:
 - .1 Tyco Electronics/Crompton Technology
 - .2 Basler Electric Co.
 - .3 Yokogawa Canada Inc.
- .3 **The manufacturer of the control panel main breaker manufacturer must be the same as the switchboard main breaker manufacturer unless approved by consultant.**

1.04 ON-SITE ONE YEAR SERVICE AND MAINTENANCE

- .1 Include for supplying a generator set supplier's qualified service representative for the following on-site engine-generator set service and maintenance for one year following Substantial Performance of the work
 - .1 twenty-four hour, seven day a week emergency repair service with a maximum two hour response time
 - .2 all required service and maintenance in accordance with requirements of the O & M Manual, including at least one oil and filter change, and supply of all consumables
 - .3 at the end of the one year period, an inspection and test in accordance with CAN/CSA-C282 and CAN/CSA-Z32 Annual Inspection Test and Maintenance /Requirements, Tables 2 through 5.
- .2 Notify the Owner 48 hours in advance of each site visit for service and maintenance procedures. One or more Owner's personal will accompany the service representative during each visit to gain further knowledge re: service and maintenance procedures.

1.05 WARRANTY PERIOD TEMPORARY ENGINE-GENERATOR SET

- .1 As part of warranty obligations, include all costs for providing at the site, within four hours of notification by the Owner and failure of a service technician to rectify and operating problem, a fully connected and operating temporary engine-generator set of equal capacity and performance of the specified engine-generator set, should any engine-generator set component failure occur that would prevent the set from operating properly at full capacity.

2 PRODUCTS

2.01 ENGINE-GENERATOR SET

- .1 Factory assembled and tested, radiator cooled, **diesel** engine driven electric generator set equipped with all required controls and accessories to comprise an automatic, continuous **prime power** electric generating plant to perform under conditions specified below. The engine-generator set must be suitable in all respects for installation in the space provided.
- .2 **Performance Requirements:** The engine-generator set is to meet frequency and voltage requirements specified in the referenced CSA Standard. The engine-generator set is to automatically start in the event of commercial power failure, automatically stop when commercial power is restored, and be capable of operating with light loads for an extended period of time, and performance criteria is to include the following:
 - .1 radiator cooling system maximum airflow at rated speed for radiator arrangement: m³/min.
 - .2 propane engine combustion air inlet flow rate at full speed: m³/min.
 - .3 engine exhaust gas flow rate at full speed: m³/min.
 - .4 heat rejection to atmosphere from generator at full load: kW
 - .5 maximum fuel oil return pipe restriction: KPa
 - .6 fuel flow rate at rated load: L/hr.
 - .7 coolant capacity with radiator: L
 - .8 **the engine-generator set is to be capable of operating at 100% of the nameplate rating** at the rated RPM in an ambient temperature of 40° C (105° F) without overheating or any other harmful effects
 - .9 the engine-generator set is to be capable of operating with a single full load step for the nameplate kilowatt rating within the CSA Standard voltage and frequency regulation requirements without stalling and without a voltage drop below 60% of normal voltage
 - .10 engine-generator emissions: in accordance with MOE requirements and C of A
 - .11 **Deleted**
- .3 **Fabricated Requirements:** Engine-generator set fabrication requirements include the following:
 - .1 if required by conditions, the set must be delivered to the site in sub-assemblies suitable for moving the set to the final location

- .2 all moving parts such as flywheels, belts, etc., are to be protected by removable OSHA guards
 - .3 all "hot" parts of the set such as exhaust manifolds and the flexible exhaust connection which are located where they might be touched by personnel during normal service or maintenance procedures are to be protected by guards, or be factory insulated with minimum 50 mm (32") thick removable/replaceable insulating material
 - .4 the engine flywheel housing is to be connected to the generator housing with a SAE adaptor and the engine-generator set is to be aligned and secured to a common, rigid, welded, stress relieved, structural steel enamelled base capable of maintaining alignment of the engine-generator shafts and frames under all conditions including shipping, and the manufacturer/supplier is to obtain and **submit torsional approval of the assembly from the engine manufacturer**
 - .5 engine-generator mounting feet and steel base sole plates are to be machined parallel and true, and steel shims will be permitted only underneath the generator feet if required
 - .6 minimum 95% isolation efficiency cast iron housed steel spring vibration isolators with levelling bolts, oil-proof snubbers, minimum 6 mm (1/4") thick sound pads, and seismic restraints as required by Code are to be supplied with the engine-generator set
 - .7 engine mounted accessories are to be readily removable without dismantling any part of the assembly
- .4 **Engine:** **Multi-cylinder, 4-cycle, diesel engine** manufactured to requirements of ISO 3046, capable of operating at a nominal 180 RPM when directly connected to the generator, and free from critical vibrations throughout the entire operating range. The engine is to be complete with inter-changeable cylinder heads special alloy steel exhaust valves, Deloro Stellite hard alloy faced exhaust valve insets, and the following:
- .1 **fuel system:** a fuel system with individual easily replaceable cylinder type fuel injectors, replaceable element fuel filters, an integral auxiliary fuel oil tank if required, suitable diameter two hour fire rated flexible braided stainless steel jacketed high pressure fuel lines with male swivel fittings, two 900 mm (36") long braided stainless steel fuel oil flexible connectors, and a water separator assembly with water sensor, gauge fuel restrictor sensor, filter, and alarm contact with relay
 - .2 **oil lubrication system:** full pressure lubrication for main bearings, connecting rod bearings, and camshaft bearings, with internally mounted high capacity positive displacement gear type oil pumps with adjustable pressure regulators, lubricating oil cooler, full flow oil filters, an oil level gauge switch on the side of the oil pan in an accessible location, and:

- .1 an oil fill pipe extended out beyond protective guards to permit easier access
- .2 an engine oil drain piped out to the engine-generator base and equipped with a braided stainless steel drain hose clipped to the base and complete with a full flow brass or bronze ball type drain valve
- .3 **engine air intake:** replaceable element dry vortex type engine air intake filters, and air box drain canisters
- .4 **engine exhaust system:** engine exhaust system components designed to meet MOE C of A requirements will be installed by the custom enclosure manufacturer and are to include:
 - .1 a welded black steel pipe exhaust manifold “Y” fitting
 - .2 minimum 600 mm (24”) long flexible stainless steel exhaust pipe sections
 - .3 a hospital grade super critical exhaust silencer
- .5 **engine coolant system:** the engine cooling system is to maintain the required engine temperatures at rated speed and load, and, except as specified, to be factory installed and complete with:
 - .1 a coolant radiator with mounting frame, duct connection adapter as required, protective screen, integral fuel cooler with connections, and coolant expansion tank
 - .2 a high performance static pusher type fan with motored, fan guard and shroud, and a fan hub grease fitting extended out beyond the hub housing for easier access
 - .3 coolant consisting of 50% automotive type polypropylene glycol with corrosion inhibitors and 50% clean water
 - .4 thermostatic controls
 - .5 208 volt, single phase, 6 kW (approx.) engine jacket coolant heaters equal to KIM “Hotstart”, sufficiently sized to maintain the coolant in the engine at the engine manufacturer’s rated temperature, arranged to automatically disconnect when the engine starts and runs, and complete with silicone rubber reinforced hoses, immersion type thermostats, pressure switches, and ball type isolating valves
 - .6 valved coolant drain piping of sufficient length to extend into the drain pan under the set
 - .7 a disconnect switch with all electrical components factory pre-wired through the disconnect switch
- .6 **deleted**

- .1 sensors and safety devices with relays, contacts, etc., factory wired to the engine-generator control panel to shut-down the engine and initiate an alarm and monitor set operation in the event that conditions specific below in this Section occur
- .7 **engine starting system:** a 12/24 volt DSC electric starting motor with a pinion arranged to disengage automatically when the engine starts, with a cranking motor cut-out switch to limit engine cranking to 3 attempts with not less than 45 seconds and more than 75 seconds between each attempt, and the following:
 - .1 **batteries:** Exide, Delco, or Surette sealed, long life lead-acid batteries, sized to the engine and battery manufacturer's recommendations and published data, with sufficient capacity to, in an ambient temperature of 0° C (32° F), crank the engine at the engine manufacturer's recommended cranking speed for a period of 60 seconds, with voltage measured at the starting motor terminals at the end of the cranking period, with drinking current flowing, being not less than 1.75 volts per cell
 - .2 **battery stand and accessories:** free-standing or unit mounted on the genset frame, corrosion resistant enameled steel stand with insulation board and suitably sized PVC floor mounting tray, and the following accessories:
 - .1 a battery heater
 - .2 a painted G1S painted plywood wall mounting backboard with hardware for mounting a digital hydrometer and test log book and a syringe
 - .3 braided copper battery jumper cables
 - .3 **battery charger:** remote wall mounting, totally enclosed, EEMAC 2, overload protected fully automatic, 120 volt, single phase, 60 Hz battery charger as recommended by the engine-generator set supplier and supplied with the set, capable of recharging batteries discharged by 2 30 second engine cranking attempts to 80% capacity within 4 hours and to full capacity within 12 hours, and equipped with:
 - .1 an AC switch and overload protection isolating voltage ratio transformer, silicon controlled rectifier assembly and DC protection, all suitable for both trickle charge rate and high charge rate, as required, after engine start
 - .2 2% accuracy DC ammeter and DC voltmeter
 - .3 AC power on indicating LED
 - .4 AC power failure alarm

- .5 float voltage adjustment
 - .6 Equalize circuit
 - .7 DC output protection'
 - .8 Contacts and associated hardware to connect a common alarm signal to the engine-generator set control panel
- .4 **Engine Drain Pan:** Soldered, water-tight, heavy-gauge G90 galvanized steel drain pan sized smaller than the foot print of the propane engine so as to mount on the concrete housekeeping pad between vibration isolators.
- .5 **Alternator:** Drip-proof, $\frac{2}{3}$ pitch, single bearing alternator to meet or exceed requirements of CSA C22.2 No.100, Motors and Generators, and current IEEE Standards, sized as indicated and the drawings, and close coupled to the engine with a SAE housing. The alternator is to be designed to minimize radio frequency interference (RFI) under all operating conditions, and the balanced telephone influence factor (TIF) is not to exceed 50. Maximum total harmonic distortion of the voltage waveform is not to exceed 6% under any given load, The alternator is to be complete with:
- .1 excitation boost not less than 3 times rated current for 10 seconds
 - .2 direct connected brushless main exciter with permanent magnet pilot exciter to provide power via an automatic voltage regulator to the main exciter, and with a dynamically balanced rotor permanently aligned to the engine by a SAE flexible disc coupling
 - .3 full amortisseur Class H rated windings, and a temperature rise not to exceed 130° C (265° F), as measured by resistance in an ambient temperature of 40° C (105° F), and resistor temperature detector (RTD) type thermistors embedded in the windings and complete with associated relays and contacts to transmit a high winding temperature alarm signal to the engine-generator set control panel
 - .4 a Basler Type SR4 of Newage Stamford No. MX321 static voltage regulator with 3 phase sensing, radio suppression module, frequency choke to prevent damage to the voltage regulator engine in case of lower than nominal engine speed, an adjustable stability circuit, and manually adjustable voltage potentiometer
 - .5 an electrical connection extension box sufficiently sized for installation of a current sensor for ground fault protection as per control panel requirements specified below, and connection of "Corflex II" cable (with non-ferrous ground bushings) and isolation of the cable from the set as indicated on the drawings

.6 a ground connection to sit the ground system, extended out to the alternator base

.6 **Engine-Generator Set Control Panel:** Set mounted (at eye level), dead front, vibration isolated, enameled steel control panel with an EEMAC and/or CSA enclosure rating to suit the locating, and equipped with a piano hinged door with key lock and a minimum of 3 identified keys. The panel is to be pre-wired and factory tested with the engine and alternator, and is to be complete with a microprocessor controller with LDCD digital displays featuring multiple metering displays and graphics with specified features and options. Controls and monitoring features are to be compatible with the building automation system and include but not be limited to the following:

- .1 main circuit breaker, generally as specified with a setting such that the generator short circuit output will trip the breaker, and with exact breaker type and exact settings as recommended by the engine-generator set manufacturer to suit the application
- .2 load bank breaker, moulded case, non-automatic type of the same frame size as the main breaker, interconnected to the system to permit connection of a load bank during regular testing of the engine-generator set, with shunt trip and relays connected such that if the load bank breaker is closed when a power failure occurs the load bank breaker will open and the main breaker will close
- .3 fire pump breaker (**where applicable**), moulded case type with solid-state trip unit, with exact frame size and type as indicated on the drawings
- .4 auxiliary automatic breaker for connection of ventilation damper controls, fuel oil pumps, etc., generally 30A-3P but with exact type and size to suit the application
- .5 controls to monitor engine characteristics including oil and fuel temperature and pressure, engine elapsed time running, air temperature, battery voltage, and engine over-speed
- .6 under frequency/over frequency voltage control module with adjustable relay to trip the main breaker on settings of $\pm 12\%$ of normal
- .7 an ammeter and a voltmeter, both with $\pm 1\%$ accuracy
- .8 a power factor meter
- .9 a frequency meter, an elapsed time meter, and a kW meter, all with $\pm 1\%$ accuracy
- .10 gauges for engine oil temperature, oil pressure, and coolant temperature

- .11 a control system to initiate engine-generator set starting and stopping sequences and annunciate (local and remote) any fault condition
- .12 an electronic control module to monitor engine-generator set functions with an operator interface alpha-numeric display for viewing set data and setup, controls and adjustments
- .13 a selector switch for "ON-OFF-Manual" operation, with circuitry such that operation with the switch is in the manual position by-passes the automatic control system and initiates an alarm, with the switch in the off position initiates an alarm, and with the switch in either the manual or off position illuminates a "NOT IN AUTO" amber warning light
- .14 an alarm horn with silencing switch or push button, and an alarm light and circuitry to cause the alarm light to flash until the alarm initiating device is reset or returns to normal
- .15 LED type shut-down and warning indicating lights (brilliant cluster type for LED's that are continuously illuminated for the following:
 - .1 high oil temperature – red for shut-down, amber for warning
 - .2 high coolant temperature – red for shut-down, amber for warning
 - .3 low oil pressure – red for shut-down, amber for warning
 - .4 over crank shut-down – red
 - .5 over speed shut-down – red
 - .6 over voltage shut-down – red
 - .7 selector switch "NOT IN AUTO" warning – amber
 - .8 low DC voltage warning – amber (c/w DC voltage sensor)
 - .9 engine cool-down period indication - white
 - .10 reverse power shut-down – red
 - .11 under voltage shut-down – red
 - .12 low frequency shut-down – red
 - .13 high frequency shut-down – red
 - .14 low coolant level warning – amber
 - .15 low fuel level warning – amber

- .16 battery charger failure warning – amber
- .17 water in fuel warning – amber
- .18 emergency power bus alive indication – blue
- .19 generator bus alive warning – amber
- .20 ECS not in auto warning – amber
- .21 low engine temperature warning - amber
- .22 audible alarm silence warning – amber
- .23 alternator winding/bearing high temperature warning – amber
- .24 fuel leakage warning – amber
- .25 ground fault warning – amber
- .26 auxiliary building alarms as specified and/or shown
- .27 two spare lights for future use
- .16 generator set synchronizing and paralleling components as required, including:
 - .1 synchronizer and synchroscope
 - .2 solid-state sync check relay
 - .3 synchronizing switch and controls
 - .4 synchronizing indicating LED's
 - .5 reverse power relay and accessories
 - .6 PLC with software for a complete automatic synchronization system as specified below in this Section
- .17 an auxiliary remote control connection terminal block assembly, clearly identified and including:
 - .1 contacts for engine alarm signal for remote annunciation of engine faults, failure, and alarms
 - .2 four Form C contacts for signal engine run
 - .3 five Form C contact for shut-down to engage the room exhaust fan starter

- .4 one Form C contact for shut-down to engage the room exhaust fan starter
- .18 permanently affixed, suitably sized, engraved Lamacoid nameplates for all control panel devices, switches, meters, lights, and other items, with wording approved by the Consultant
- .19 all required relays, contacts, and similar hardware required for connections to the building automation system as per the automation system points list, all to suit BAS protocol
- .7 **Emergency Power Off Push Button:** Equal to Rockwell Automation/Allen-Bradley 800T Series 55 mm (2¼") diameter head push button with shroud, thrust washer, and aluminum faceplate with "EMERGENCY POWER OFF" identification wording, housed in a flip-open polycarbonate tamper-proof cover.
- .8 **Structural Steel Mounting Base:** Structural steel reinforced and welded base of sufficient rigidity and strength to protect the assembly from stress or strain during transportation to the site, installation, and during operation. The base is to be factory cleaned, primed, and painted.

3 EXECUTION

3.01 INSTALLATION OF ENGINE-GENERATOR SET

- .1 Ensure that the factory tests have been satisfactorily performed and documented prior to delivery of the set to the site.
- .2 Provide a new emergency power engine-generator set where shown. Secure the set in place, level and plumb, on a concrete housekeeping pad on vibration isolators supplied with the set and strategically placed such that each isolator will support an equal portion of the weight and the pressure exerted on the structure by each isolator does not exceed 345k kPa (50 psi).
- .3 Check engine-generator alignment after installation on the housekeeping pad and realign if necessary.
- .4 Provide a drain pan under the engine on the housekeeping pad and between the isolators.
- .5 Carefully coordinate installation of the engine-generator set with the trades installing the flexible fuel oil connection and piping, the flexible exhaust connection, silencer and exhaust piping, and site applied thermal insulation. Ensure that the exhaust piping diameter is in accordance with the engine supplied and that the location and height of the exhaust stack meets local air and noise limitations.

- .6 Provide starting batteries, battery rack, and jumper cable to connect the batteries together and to the engine starting system. Provide a wall mounted storage cabinet adjacent the battery rack and containing a hydrometer, syringe, and other accessories.
- .7 Wall mount the battery charger adjacent to the battery rack and connect to the batteries. Test charger operation and adjust as required.
- .8 Fill the engine cooling system within a 50% water-50% automotive type ethylene glycol solution. Check the specific gravity of the coolant to confirm proper percentages.
- .9 Check and test operation of the engine starting system and engine jacket coolant heaters.
- .10 Check the level of the engine lubricating oil and add oil if required.
- .11 Surface wall mount an "Emergency Power Off" push button station where shown and connect to the generator set control panel to shut-down the set when the push button is activated. Confirm exact location prior to roughing-in.
- .12 Do all required control wiring in conduit between the generator set control panel and associated equipment as per the control wiring schematic and the wiring requirements of the electrical work. Check and test all such control functions.
- .13 Carefully coordinate building automation system connections to the control panel with the trade performing the building automation system work.

3.02 SITE TESTING, START-UP AND COMMISSIONING

- .1 When installation of the engine-generator set is complete and initial inspections by the set supplier's representative have been completed, obtain from the supplier's representative and forward to the Consultant a letter to confirm site inspection and proper installation of the equipment.
- .2 Arrange and pay for the set supplier's representative to supervise start-up of the equipment, and prepare and submit signed start-up reports.
- .3 In addition to testing and verification requirements specified in the Sections entitled Electrical Work Commissioning and Electrical Work Testing, perform testing work as specified below. Notify the Owner and Consultant ten working days in advance of the site testing, and arrange and pay for the set supplier's representative and a journeyman electrician to be on-site to conduct the tests. Prepare and submit signed reports to confirm successful testing results. Site tests are to include:

- .1 **Operational Tests:** With the engine in a “Cold Start” condition and load bank(s) the size of the emergency load at its normal operating level, simulate a power failure but do not interrupt existing services. Continue the operational test for 1 hour after which time simulate restoration of normal power and demonstrate satisfactory transfer of the load and shut-down of the engine. During the operation test, observe and record the following:
 - .1 time delay on start
 - .2 cranking time until the engine starts and runs
 - .3 time required for the engine to come up to full speed
 - .4 time required to achieve a steady-state conditions with all switches transferred to the emergency position
 - .5 engine oil pressure, coolant temperature, and battery charge rate at 5 minute intervals for the first 15 minutes, and at 15 minute intervals thereafter
 - .6 time delay on re-transfer for each transfer switch
 - .7 time delay for engine cool-down and shut-down
- .2 **Full Load Test:** Following the successful operational test, **perform a 6 hour full load test (for HCF)**. Provide load banks as required. The full load test may be initiated by any method that will start the engine and immediately upon reaching full speed, pick-up the full load in one step. Record data for items as listed above for the operation test at full load acceptance and every 15 minutes thereafter until completion of the test period.
- .3 **Cycle Crank Test:** Prevent the engine from running by any means recommended by the set supplier. Put the control switch in the “RUN” position to engage the starting system and cause the engine to attempt to start for cranking cycle of 30 seconds of continuous cranking or 3 10 second crank attempts separated by 10 seconds. Repeat the crank cycle a second time to demonstrate that the batteries have sufficient capacity for total cranking time of 60 seconds, then demonstrate the time required to re-charge the batteries.
- .4 **Safety Shut-Down and Alarms:** Demonstrate that all safety shut-downs and alarms as well as all mounting points are fully operational.
- .5 **Ventilation:** During the full load tests, demonstrate that sufficient Generator Room ventilation is provided in accordance with requirements of CAN/CSA-C282.
- .6 **Voltage and Frequency:** Perform voltage and frequency tests in accordance with requirements of CAN/CSA-C282 or CAN/CSA-Z32, as applicable.

- .7 **Oil Analysis:** Perform oil analysis tests in accordance with requirements of CAN/CSA-C282 or CAN/CSA-Z32, as applicable.

EDIT NOTE: Ref. subparagraph .8. Use only for multiple parallel sets to be synchronized.

- .8 **Synchronization and Paralleling:** Modify testing specified above to properly demonstrate the operation of multiple engine-generator sets and their synchronization and paralleling.

EDIT NOTE: Ref. article 3.3. Use only if the Owner has retained a specialist Air Emission Consultant to certify that the equipment conforms to requirements of the MOE Certificate of Air.

3.03 MINISTRY OF ENVIRONMENT TESTING

- .1 Arrange for the Owner's specialist Air Emissions Consultant to perform testing to confirm that the installed and operational engine-generator equipment meets requirements of the MOE Certificate of Air. Obtain a copy of the successful test report and include with operating and maintenance manual data.

3.04 ON-SITE TRAINING

The engine-generator set manufacturer/supplier is to provide a minimum 8 hour on-site training session for 4 members of the Owner's designated personnel on generator set operation and maintenance procedures. The Operating and Maintenance Manuals are to be used during this training, and a DVD recording of the session is to be handed to the Owner upon completion.

END OF SECTION

1 GENERAL

1.01 SUBMITTALS

- .1 **Shop Drawings/Product Data:** Submit shop drawings and product data sheets for the engine-generator set enclosure. Shop drawings/product data sheet must include all accessories, and enclosure design, weight (with tank loaded with fuel), dimensions, and features including the fuel tank sub-base.
- .2 **Enclosure Design Engineer:** The enclosure must be designed by a registered structural engineer licenced in the Province of the work. Enclosure shop drawings and product data sheets with design data must be stamped and signed by the design engineer to indicate conformance with applicable Codes and Standards.
- .3 **Enclosure Acoustical Design and Certification:** Submit with the enclosure shop drawings a letter stamped and signed by a registered acoustical engineer licenced in the Province of the work to indicate and certify the engine-generator set sound pressure levels outside the enclosure with the engine under full load. Refer to site acoustic performance and testing requirements specified in Parts 2 and 3 of this Section.
- .4 **Enclosure Door Keys:** Submit a minimum of 3 identified keys for the enclosure doors.
- .5 **Enclosure Finish Colour Chart:** Submit a chart to indicate the available wall and roof colours available for final selection by the Consultant.
- .6 **Identification & Signage:** Submit proposed identification product details with wording for the Consultant's review.
- .7 **Environmental Compliance Approval:** **If required**, apply for, pay for, obtain and submit an Environmental Compliance Approval Certificate in accordance with requirements specified in the electrical work Section entitled Engine-Generator Set Environmental Approval.

1.02 REFERENCES

- .1 Refer to the following electrical work Sections:
 - .1 the Section entitled Engine-Generator Set
 - .2 the Section entitled Emergency Power Transfer Switch

1.03 QUALITY ASSURANCE

- .1 The engine-generator set enclosure is to be in accordance with requirements of the following:
 - .1 **CAN/ULC-S601**, Aboveground Steel Tanks for Fuel Oil and Lubricating Oil
 - .2 CAN/ULC-S604, Standard for Factory-Built Type A Chimneys
 - .3 CSA C22.2 No. 5, Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit Breaker Enclosures
 - .4 CSA C22.2 No. 46, Electric Air-Heaters

2 PRODUCTS

2.01 WALK-IN TYPE ENGINE-GENERATOR SET ENCLOSURE

- .1 Factory fabricated, assembled, outdoor, weatherproof, non-combustible, 2 hour fire rated, sound attenuated, corrosion resistant steel enclosure, generally as indicated on the drawings, supplied with the engine-generator set, designed for mounting on and securement to a concrete base and ready for external wiring connections and engine exhaust piping.
- .2 The maximum sound pressure level at a distance on grade 7 m (22') from any side of the enclosure with the engine-generator set operating under full load is to be 72 dB.
- .3 The enclosure is to be arranged with 1 m (3') clearance around the engine-generator, and is to be complete with:
 - .1 **floor:** security type 6.4 mm (1/4") thick galvanized checker plate steel with a minimum R32 insulation and a galvanized steel bottom liner, a minimum 150 mm (6") sealed curb around the entire enclosure perimeter, floor mounted distribution equipment, and all floor openings to contain any liquid spills, 2 coats of epoxy equipment enamel over proper primer, and rubber mats on all exposed flooring
 - .2 **floor leak detection:** dual float discriminating sensor leak detection and alarm system to monitor within the curbed floor for liquid leaks, equipped with an alarm panel with alarm horn, alarm silence, and reset pushbuttons, an exterior weatherproof audible/visual alarm panel with flashing red indicating light, alarm horn, alarm horn silence pushbutton, reset pushbutton, and auxiliary contacts pre-wired to a junction box on the exterior wall for site connection to facilities inside the building
 - .3 **walls:** minimum #26 gauge, factory pre-finished, vertical exterior steel siding applied over building wrap and thermal and acoustic insulation, with taped and finished fire rated gypsum board and a perforated minimum #22 gauge galvanized steel liner, with galvanized steel plate reinforcement behind all wall mounted devices
 - .4 **roof:** factory finished steel roofing panels secured to as galvanized steel roof framing structure, sloped for positive drainage, with building wrap, acoustic and thermal insulation, perforated liner, and steel plate reinforcement for roof mounted devices as specified for walls, and drip shields over each door
 - .5 **doors:** a minimum of two 1065 mm x 2133 mm (42" x 84") high exterior grade, insulated, 2 hour fire rated steel doors with frames, 1 on each side of the enclosure, each prime coat painted and finished with epoxy enamel to match the siding, and equipped with:
 - .1 a heavy-duty door closer with retaining chain
 - .2 a mortised, latched, keyed alike lockset with lever and trim, and a panic bar
 - .3 3 tamper-proof heavy-duty stainless steel hinges
 - .4 a magnetic door contact, with wiring in conduit extended to a junction box for site extension into the building
 - .6 **sub-base fuel tank:** double wall steel tank with a capacity sufficient to operate the engine-generator set under full load for a minimum of 24 hours, and complete with:

- .1 an exterior fill connection with cap
- .2 a level control switch with visual indication and a contact for connection to a low fuel oil level alarm
- .3 CSA certified and ULC listed and labelled 2 hour fire rated, flexible, wire braided, jacketed, high pressure fuel oil lines from the tank to the engine fuel pump
- .4 **leak detector installed in the containment section and wired to alarm on fuel leak**
- .7 **enclosure and engine ventilation:** factory installed and connected supply and exhaust air ventilation system for engine combustion air, engine cooling, and enclosure ventilation, sized to suit requirements and equipped with:
 - .1 for both the supply and exhaust air ventilation openings, an extruded aluminium alloy, 100 mm (4") deep, fixed blade, weatherproof acoustic storm louvre with stainless steel securing hardware, framed aluminium mesh bird screen, and a factory applied anodized finish to match the enclosure finish colour
 - .2 a factory installed galvanized steel silencer to ASHRAEW and SMACNA Standards, selected to meet enclosure noise criteria
 - .3 for both the supply and exhaust air openings, an extruded aluminium, insulated, opposed blade, low leakage damper with spring stainless steel side seals, self-lubricating bronze bearings, end stops, stainless steel linkage, and 120 volt or 24 volt spring return, normally open damper motor with weather-proof enclosure to suit the mounting location
 - .4 for both supply and exhaust air wall openings, a sound attenuated galvanized steel snow/rain hood, finished to match the enclosure finish and supplied loose for field installation over the ventilation openings
 - .5 a wall mounted, direct drive propeller exhaust fan with fan blade and motor guards, motor starting switch, and insulated sheet steel wall mounting enclosure
- .8 **ventilation controls and sequence:** factory installed and wired in conduit, and factory tested control system designed and connected such that:
 - .1 the air intake damper is to fully open when the engine starts
 - .2 the exhaust fan and motorized damper is to modulate according to the controller, engine temperature sensor, and enclosure ambient temperature
- .9 **enclosure unit heater:** ceiling mounted CSA certified and labelled electric unit heater sized to maintain an enclosure temperature of minimum 15° C (60° F) with an outside temperature of -40° C (-40° F), and factory connected to a wall mounted dual scale thermostat with thermometer and ann adjustable low temperature alarm contact
- .10 **engine exhaust stack:** CAN/ULC-S604 Type A chimney, complete with all required installation and termination accessories
- .11 **engine exhaust silencer insulation:** Semi-rigid, 50 mm (2") thick mineral fibre "rock wool" insulation with a lagged canvas jacket meeting flame spread and smoke developed ratings of CAN/ULC-S102

- .12 **transfer switch:** in accordance with the electrical work Section entitled Emergency Power Transfer Switch, factory installed or site installed and connected to the control panel
- .13 **electrical work:** factory installed and pre-wired in accordance with wiring standards specified in this Division of the Specification, and consisting of:
 - .1 a circuit breaker panelboard with bolt-on breakers sized to accommodate all enclosure loads plus a minimum of 3 spare 15A-1P breakers, and a typed circuit directory under plastic on the panelboard door
 - .2 high output, totally enclosed fluorescent fixtures with electronic ballasts for a minimum of 500 lux average maintained illumination, controlled by a 3-way illuminated handle switch at each door
 - .3 a wall mounted 24 volt DC battery emergency lighting unit with charger and remote heads to provide a minimum 359 lux generally distributed for 2 hours
 - .4 an exterior, weatherproof and vandal proof LED lighting fixture located over each entrance door, with photocell and motion sensor ONN/OFF control
 - .5 3 Specification Grade, Premium Quality, duplex, 20 ampere, 125 volt U-ground receptacles with stainless steel faceplates, 1 located adjacent to the emergency lighting battery unit, and 1 on each side wall in an accessible location with 1 being adjacent to the engine start system battery charger
 - .6 weatherproof and vandal-proof, exterior dome type "ENGINE RUNNING" strobe light fixtures, each with red lens and equal to Federal Signal Corp. Model FP24PST, one located adjacent to each enclosure door and connected to the engine-generator set control pane
 - .7 weatherproof, exterior, emergency power off pushbuttons equal to a Rockwell Automation "Allen-Bradley" 800T Series, each with a red, 55 mm (2¼") diameter mushroom head pushbutton with shroud, thrust washer, and aluminium faceplate with "EMERGENCY POWER OFF" red identification in a break glass cover with locking handle operator, 1 located adjacent to each enclosure door and connected to the engine-generator set control panel
 - .8 weatherproof and vandal-proof, exterior dome type "TROUBLE" strobe light fixtures, each with an orange lens and equal to Federal Signal Corp. Model FP24PST, one located adjacent to each enclosure door and connected to all alarms such as the enclosure temperature alarm, fuel leak alarm, etc.
 - .9 all required wiring work with EMT and galvanized steel boxes where inside the enclosure, rigid galvanized steel with FS/FD boxes where outside the enclosure, and a minimum of 450 mm (18") of liquid-tight flexible conduit for all connections to motorized or vibrating equipment
- .14 **communications conduit and boxes:** empty EMT with fish wire and galvanized steel boxes inside the enclosure for future installation of a fire alarm system detector, pull station, and audible/visual alarm signals, and an outlet box with EMT and fish wire for future installation of a telephone, all terminated in identified FS/FD boxes on the exterior of the enclosure

- .15 **grounding and bonding:** properly sized electrical grade copper ground bus with connection lugs and all required ground connections as per Code requirements inside the enclosure, terminated for site connection to a ground grid outside the enclosure
- .16 **fire extinguishers:** ULC listed and labelled 10 B:C 6.8 kg (15 lb.) carbon dioxide extinguishers, each with a wall mount bracket and 1 located inside the enclosure at the strike side of each door
- .17 **stairs and landing:** factory fabricated galvanized steel stair and railing assembly at each entrance door, with slip-resistant stair treads, and, for assemblies more than 2 steps high, a 1.2 m x 2.4 m (4' x 8') slip-resistant landing with railing, all in accordance with Code requirements
- .18 **hinged door for cable connection:** weatherproof hinged access door of enclosure wall construction located as required for site connection of exterior cable such as load bank cable
- .19 **identification and signage:** factory installed, as per the electrical work Section entitled Basic Electrical Work Materials and Methods, but UV resistant with red lettering on a white background and permanently secured in place with stainless steel screws, generally as follows but with exact wording approved by the Consultant:
 - .1 on the exterior of each enclosure door, "AUTHORIZED PERSONNEL ONLY"
 - .2 on an exterior wall in a visible location at the engine-generator set, "WARNING – KEEP OFF – GENSET MAY START AUTOMATICALLY AT ANY MOMENT"

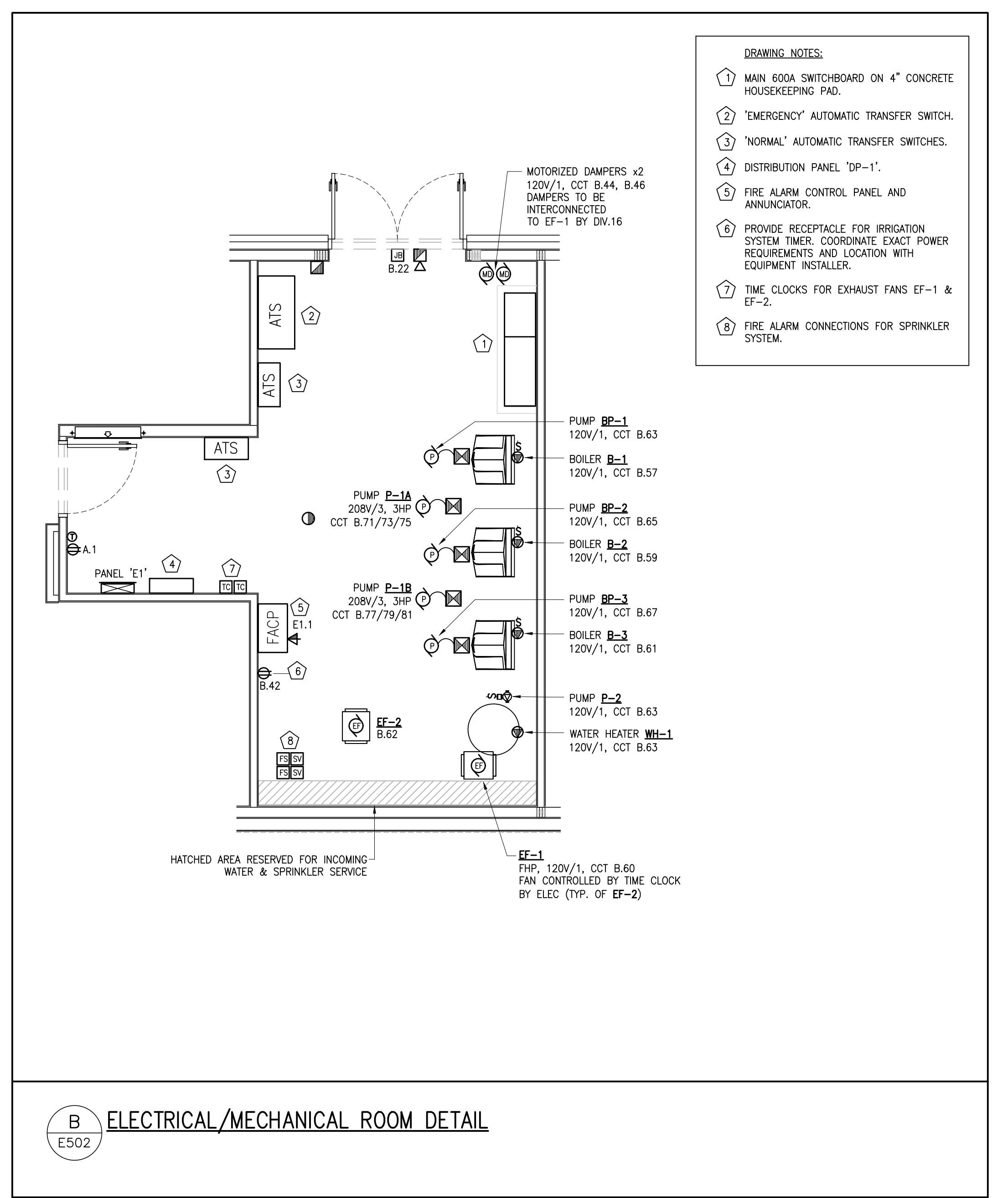
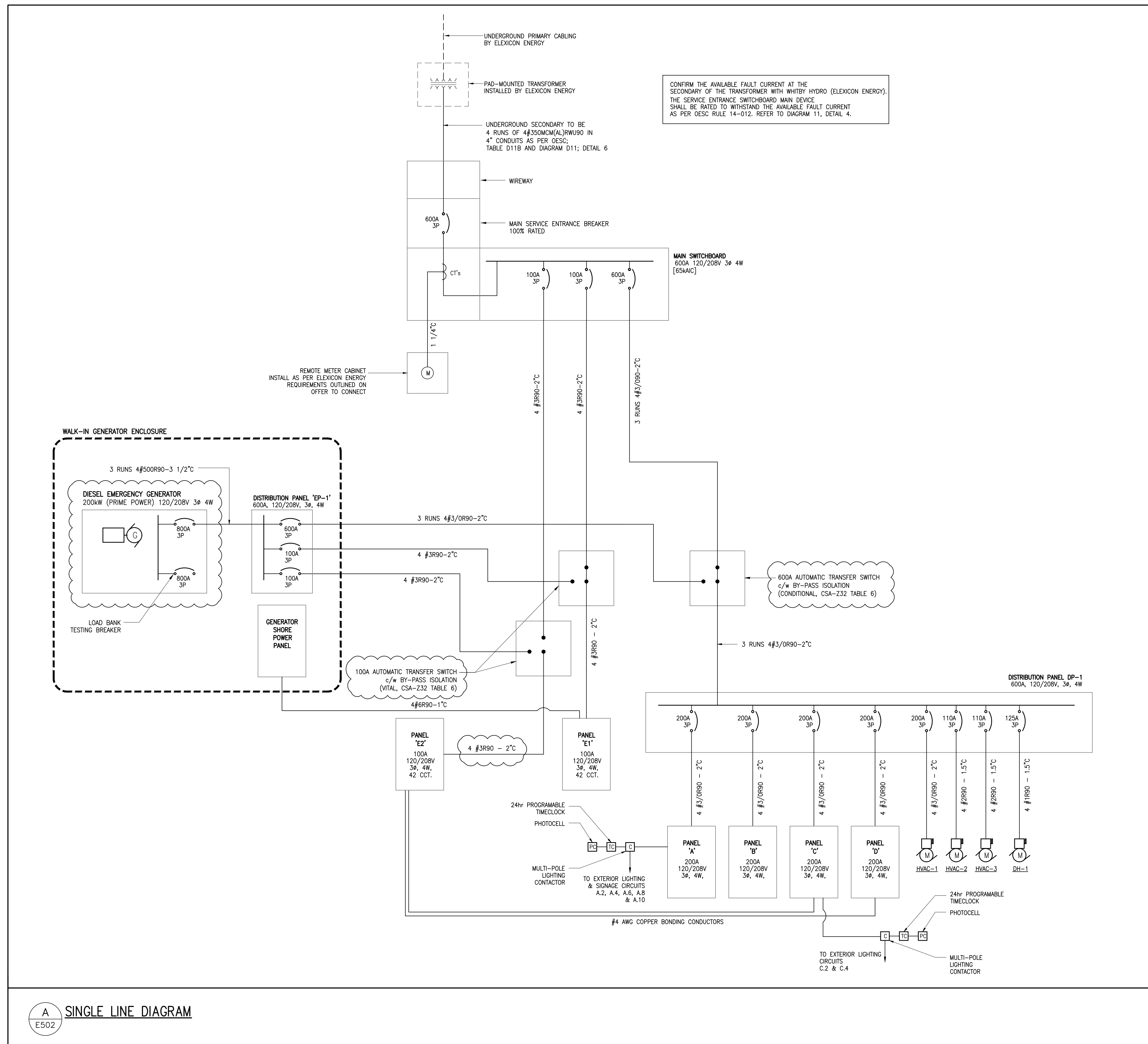
3 EXECUTION

3.01 INSTALLATION OF ENGINE-GENERATOR SET ENCLOSURE

- .1 Provide an enclosure for the engine-generator set where shown.
- .2 Secure the enclosure in place, level and plumb, on a concrete base.
- .3 Provide all required engine chimney with termination.
- .4 Do all required power, control, and communication wiring from the engine-generator set to the building as indicated and/or specified. Test all connections and functions.
- .5 Connect the enclosure/tank leak detection wiring to the engine-generator control panel as a control panel alarm.
- .6 Provide a ground grid outside of the enclosure and connect to the enclosure ground bus or ground connection, as applicable.
- .7 Fill the fuel tank with diesel fuel. After engine-generator set testing and commissioning is complete, re-fill the tank.

- .8 When the entire engine-generator set installation is complete, arrange and pay for an acoustical P. Eng. to perform, in the presence of the Consultant, an acoustical performance field test as specified with the engine operating at full speed under load. Take test readings at 10 different locations around the enclosure. Supply an appropriate load bank for performance and acoustic testing. Submit the acoustic performance test report as specified in Part 1 of this Section.

END OF SECTION



A SINGLE LINE DIAGRAM
E502

NOTES	PROJECT IDENTIFICATION	DRAWING IDENTIFICATION	ORIENTATION	SUB-CONSULTANT	PRIME CONSULTANT	DISCIPLINE SEAL	DRAWING SUBMISSION(S)	INTERNAL INFO	COPYRIGHT 2024
THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY ERRORS OR OMISSIONS TO THE ENGINEER PRIOR TO COMMENCING OR PROCEEDING WITH ANY WORK ON THIS PROJECT. ALL DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF THE ENGINEER. THESE DRAWINGS AND SPECIFICATIONS ARE DESIGNED FOR THE CLIENT AND THE PROPERTY INDICATED ON THESE DRAWINGS ONLY AND SHALL NOT BE CONSTRUCTED FOR ANY OTHER CLIENT OR ANY OTHER PROPERTY. DO NOT SCALE DRAWINGS.	WHITBY HOSPICE WHITBY, ONTARIO L1N 8Y8	ELECTRICAL SINGLE LINE DIAGRAM		 1930 Blue Heron Drive London, ON N6H 5L9 Tel: 519-472-3688 Fax: 519-472-4322 www.integratedengineering.ca PROJECT NUMBER: IE-7301	 67 KING STREET WEST, CHATHAM ON N7M 1C7 TEL . 519.397.0943 EMAIL . info@roastudio.com		MM-DD-YY 3 ADDENDUM 01eR 06-25-2024 2 ADDENDUM 01e 06-18-2024 1 ISSUED FOR TENDER 02-02-2024	ELECTRICAL PROJECT ID DRAWN BY REVIEWED BY DATE SCALE ROA23-001 JC GLH 01.02.2024 AS NOTED	E502