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LETTER OF INTEREST
LETTRE D'INTÉRÊT

Title - Sujet
Environmental Conditioning Chamber

Solicitation No. - N° de l'invitation W8486-163149/A	**Date** 2016-07-15
Client Reference No. - N° de référence du client W8486-163149	**GETS Ref. No. - N° de réf. de SEAG** PW-$$PV-925-71262
File No. - N° de dossier pv925.W8486-163149	**CCC No./N° CCC - FMS No./N° VME**

Solicitation Closes - L'invitation prend fin
at - à 02:00 PM
on - le 2016-08-02

Time Zone
Fuseau horaire
Eastern Daylight Saving Time EDT

F.O.B. - F.A.B.
Plant-Usine: ☐ **Destination:** ☐ **Other-Autre:** ☐

Address Enquiries to: - Adresser toutes questions à: Mirfatahi, Kaveh	**Buyer Id - Id de l'acheteur** pv925
Telephone No. - N° de téléphone (819) 956-3472 ( )	**FAX No. - N° de FAX** (819) 956-3814

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Canada

Request for Information regarding Environmental Conditioning Chamber

For

Public Works and Government Services Canada on behalf of the Department of National Defence

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Request for Information regarding Environmental Conditioning Chamber

For

Public Works and Government Services Canada on behalf of the Department of National Defence

1 Background of this Request for Information (RFI)

Public Works and Government Services Canada (PWGSC) on behalf of the Department of National Defence (DND) intends to establish an interest including price and availability from industry for the provision of an environmental conditioning chamber for the renewal of Canada's Quality Engineering Test Establishment (QETE). Interested suppliers are asked to comment upon both the proposed specification and the list of questions.

2 Purpose of this RFI

The purpose of this RFI is to provide industry with an early opportunity to comment on DND's requirement for an Environmental Conditioning Chamber.

This feedback will assist Canada in ensuring that its requirements are in line with industry standards.

3 Nature of RFI

This is not a bid solicitation. This RFI will not result in the award of any contract. As a result, potential suppliers of any goods or services described in this RFI should not reserve stock or facilities, nor allocate resources, as a result of any information contained in this RFI. Nor will this RFI result in the creation of any source list. Therefore, whether or not any potential supplier responds to this RFI will not preclude that supplier from participating in any future procurement. Also, the procurement of any of the goods and services described in this RFI will not necessarily follow this RFI. This RFI is simply intended to solicit feedback from industry with respect to the matters described in this RFI.

4 Contents of this RFI

This RFI contains Annex A – Requirements, Annex B – Questions to Industry for which PWGSC and DND are seeking feedback from industry, and Annex C - Acronyms and Definitions.

5 Nature and Format of Responses Requested

Respondents are requested to provide their responses to the questions and include any suggestions that could help to improve DND's requirement for an Environmental Conditioning Chamber. Respondents should explain any assumptions they make in their responses.

6 Response Costs

Canada will not reimburse any respondent for expenses incurred in responding to this RFI.

7 Treatment of Responses

(a) **Use of Responses**: Responses will not be formally evaluated. However, the responses received may be used by Canada to develop or modify procurement strategies. Canada will review all responses received by the RFI closing date. Canada may, in its discretion, review responses received after the RFI closing date.

(b) **Review Team**: A review team composed of representatives of the Client (where applicable) and other relevant stakeholders will review the responses. Canada reserves the right to hire any independent consultant, or use any Government resources that it considers necessary to review any response. Not all members of the review team will necessarily review all responses.

(c) **Confidentiality**: Respondents should mark any portions of their response that they consider proprietary or confidential. Canada will handle the responses in accordance with the *Access to Information Act*.

(d) **Follow-up Activity**: Canada may, at its discretion, meet with respondents who indicate in their responses that they wish to participate in a follow-up meeting. Such follow-up activity, if conducted, may include, but is not limited to, individual meetings. Canada may, in its discretion, contact any respondents to follow up with additional questions or for clarification of any aspect of a response.

8 Format of Responses

(a) **Cover Page**: If the response includes multiple volumes, respondents are requested to indicate on the front cover page of each volume the title of the response, the RFI number, the volume number and the full legal name of the respondent.

(b) **Title Page**: The first page of each volume of the response, after the cover page, should be the title page, which should contain:

(i) the title of the respondent’s response and the volume number;
(ii) the name and address of the respondent;
(iii) the name, address and telephone number of the respondent’s contact;
(iv) the date; and
(v) the RFI number.

(c) **Numbering System**: Respondents are requested to prepare their response using a numbering system corresponding to the one in this RFI. All references to descriptive material, technical manuals and brochures included as part of the response should be referenced accordingly.

(d) **Number of Copies**: Respondents are requested to submit one softcopy in either Microsoft Word or Adobe PDF.

(e) **Response Confidentiality**: Respondents are requested to clearly identify those portions of their response that are proprietary to the Responder. The confidentiality of each Responders response will be maintained. However, due to the nature of the RFI activity, Responders must be aware that aspects of their response may be used as a basis for developing documents.

9 Enquiries

Because this is not a bid solicitation, Canada will not necessarily respond to enquiries in writing or by circulating answers to all potential suppliers. However, respondents with questions regarding this RFI may direct their enquiries to:

Contracting Authority: Kaveh Mirfatahi
E-mail Address: kaveh.mirfatahi@tpsgc-pwgsc.gc.ca
Telephone: (613) 668-2618
Facsimile: (819) 956-3814

10 Submission of Responses

(a) **Time and Place for Submission of Responses**: Responses must be submitted only to the PWGSC Bid Receiving Unit by the date, time and place indicated on page 1 of this RFI.

(b) **Responsibility for Timely Delivery**: Each respondent is solely responsible for ensuring its response is delivered on time to the correct location.

(c) **Identification of Response**: Each respondent should ensure that its name and return address, the RFI number and the closing date appear legibly on the outside of the response.

ANNEX A

REQUIREMENTS

1.1 Objective

This Statement of Work (SOW) provides the minimum requirements and specifications for a thermal Environmental Conditioning Chamber (ECC) with Solar Radiation Simulation (SRS) capability to be used for the engineering test and evaluation of various types of military materiel by the Quality Engineering Test Establishment (QETE). The ECC must generate extremely high and low temperature environments, as well as provide full-spectrum radiant heating through a SRS lamp system. The ECC with SRS will be used to conduct testing in accordance with Military Standard 810 (MIL-STD-810) and North Atlantic Treaty Organization (NATO) Standardization Agreement 4370 (STANG 4370) Allied Environmental Conditions and Test Procedure (AECTP) 300 methods.

The ECC will be used to evaluate equipment as large as full-scale military armored vehicles under extreme high and low temperature conditions. The SRS functionality of the ECC will only be used to test items as large as civilian pattern vehicles. The ability for the ECC to generate very high and very low humidity environments will be requested as an option within this SOW.

QETE intends to have a Contractor design a vehicle sized, drive-in, ECC with SRS that must be installed in the Vehicle Test Laboratory (VTL) on the lower level of the National Printing Bureau (NPB) building in Gatineau, Québec (QC). The proposed location within the NPB has physical space restrictions based on existing building design and installed infrastructure/utilities. QETE has ordered an engineering assessment to determine whether electrical conduits and other overhead obstructions can be re-located and to what degree the proposed ECC site can be serviced with electrical power and chilled water. The final dimensions of the ECC chamber will ultimately depend on the results of this assessment; however, a nominal design envelope will be defined within this SOW.

The dimensions provided in this SOW can be considered the minimum space the Contractor has to work within to design the ECC with SRS in order to meet the requirements of the SOW. Results of the engineering assessment may allow some growth beyond this minimum envelope. This growth, if available, will likely not exceed an additional 610 mm (24 in) in any dimension beyond the nominal envelope. The objective is to have an ECC/SRS design which will provide the maximum available testing volume inside the chamber given the current physical restrictions on the exterior dimensions.

1.2 General Design Concept

1.2.1 Installation Location:

The ECC with SRS must be installed in the existing VTL located on the lower level of the NPB building in Gatineau, QC.

The ECC with SRS must be installed around existing structural support columns and below existing overhead utilities which cannot be moved. Appendix A, Figure A1 and A2, provide two views of the proposed ECC/SRS installation location. Appendix B, Figure B1, provides a top down view of the conceptual ECC/SRS in its proposed installation location.

The Contractor must perform an on-site survey to verify all relevant dimensions within the VTL to ensure that the ECC with SRS will not require modifications to the building structure or its existing overhead utilities. Any modifications to the conceptual ECC with SRS design required to accommodate the VTL space constraints must be conducted in discussion with the Technical Authority. **Note: The on-site survey will be mandatory during any eventual solicitation process; it is not mandatory in the response of the present RFI**.

The present flooring in the VTL is concrete and of variable slope for drainage. The area has been used to wash vehicles. The Contractor must evaluate the floor geometry and include any levelling actions required for the installation of the ECC/SRS as part of the bid. Any levelling must be conducted on top of the existing flooring. The Contractor must not excavate the existing flooring in the levelling process.

The VTL is a garage with a semi-controlled environment within the lower level of the NPB building. The ambient temperature within the VTL can be expected to range between 22±10°C with humidity ranging between 10 to 80% Relative Humidity (RH). The Contractor must design the ECC/SRS to meet all the performance requirements of this SOW without requiring modifications or additional controls of the ambient VTL environment.

1.2.2 Physical Geometry:

Appendix B, Figures B1 to B3, provide conceptual drawings of the intended design geometry with approximate dimensions. The Contractor must design the ECC and SRS to maximize the internal volume available for product testing while working within the physical constraints imposed by the proposed installation location in the VTL. The Contractor's proposals must be based on an ECC/SRS enclosure with the following nominal exterior dimensions (not including room for refrigeration machinery which is identified in Figures B1 and B2):

Approximate geometry of the main ECC section which must include the SRS functionality: Height 4.1 m (13.5 ft), Width 6.1 m (20 ft), and Length 7.0 m (23 ft).

Approximate geometry of the ECC section with a reduced-height, which does not need to include SRS functionality: Height 3.4 m (11 ft), Width 6.1 m (20 ft), Length 2.9 m (9.5 ft).

Approximate geometry of the ECC walk-in vestibule: Height 3.4 m (11 ft), Width 1.8 m (6 ft), Length 1.7 m (5.5 ft).

The Contractor must determine the exact final dimensions of the ECC with SRS to meet the stated design objectives while working within the physical constraints of the VTL. The design must be finalized in conversation with the Technical Authority post-contract.

1.2.3 Intended Usage:

The ECC with SRS will be used to perform engineering test and evaluation on various types of defence materiel to determine their response to simulated extreme environmental conditions. The material will range in size from small, man-portable electronics, up to full-size armoured fighting vehicles. Given the vertical height restrictions within the VTL, it is not expected to test the tallest items under SRS. Only thermal and humidity (if optioned) testing will be required for the largest test items. The following sections describe the Typical Test Items for each test environment, for the purpose of allowing the Contractor to design the ECC and SRS with sufficient capacity to meet the full range of testing requirements within this SOW:

Thermal Testing – Typical Test Item: The ECC must be designed to allow testing of all-up armoured fighting vehicles over the full range of extreme high and low temperature

conditions described in this SOW. The Typical Test Item for thermal testing is a Tactical Armoured Patrol Vehicle (TAPV) manufactured by TEXTRON Industries. The vehicle has the following nominal physical characteristics:

Height (top of remote weapon system): 3.2 m (10.5 ft)

Height (vehicle roof): 2.4 m (8 ft)

Length: 6.6 m (21.5 ft)

Width: 2.9 m (9.5 ft)

Weight: 18,370 kg (40,500 lbs)

Ground pressure: 352 kPa (51 psi)

The TAPV will be operated, stationary with the engine running, during the environmental testing. The ECC must be designed to allow operation of the TAPV over the full range of extreme high and low temperature conditions described in this SOW without affecting the ECC test conditions. The following performance characteristics of the TAPV should be used in the design of the ECC:

Engine: Cummins QSL 365 – 6 cylinder diesel

Engine power: 272 kW (365 HP)

High-idle speed: 1,200 to 1,500 rpm

Estimated air intake rate: 20 m^3/min (707 ft^3/min)

Average engine running time during test: 120 min

In the process of evaluating the Typical Test Item, it is expected that up to six (6) test personnel will be actively working within the ECC (in, on and around the Typical Test Item) for the entire duration of the testing.

<u>Solar Radiation Testing – Typical Test Item</u>: The SRS functionality of the ECC must be designed to allow solar radiation testing of materials that are as large as possible within the physical constraints of the VTL, over the full range of solar radiation tests environments described in this SOW. The SRS must be designed to allow, as a minimum, solar radiation testing of a civilian pattern vehicle with the following characteristics:

Height: 1.7 m (5.6 ft)

Length: 4.8 m (16 ft)

Width: 1.9 m (6.2 ft)

Weight: 2,495 kg (5,500 lbs)

The civilian pattern vehicle will be operated, stationary with engine running, during the SRS testing. The ECC with SRS must be designed to allow operation of the civilian pattern vehicle over the full range of solar radiation test environments described in this SOW without affecting the ECC test conditions. The following performance characteristics of the civilian pattern vehicle should be used in the design of the SRS:

Engine: 3.6L - 6 cylinder gas

Engine power: 164 kW (220 HP)

Idle speed: 600 rpm

Estimated air intake rate: 1 m^3/min (35 ft^3/min)

Average engine running time during test: 240 min

It is not expected to have test personnel within the ECC when the SRS is operating. Test personnel will be in the ECC immediately before and after the SRS is turned on/off.

High and Low Humidity Testing– Typical Test Item: The ability for the ECC to generate high and low humidity environments is requested as an option within this SOW. The Typical Test Item for both high and low humidity testing will be the same as that described for the Thermal Testing.

1.3 Performance Requirements

1.3.1 General

The ECC and SRS must be designed to conduct the environmental testing listed in this SOW in accordance with the procedures and test tolerances described in MIL-STD-810G, Change 1.

The ECC and SRS must be capable of meeting all the performance requirements of this SOW when evaluating the Typical Test Items described in 1.2.3.

The ECC must be capable of controlling any of the cyclic and steady-state thermal profiles described in this SOW within ± 2°C of the set-point at the ECC control sensor(s).

The ECC must be capable of maintaining a uniform temperature within the entire internal volume of the ECC (horizontal and vertical) with deviations of no more than ± 2°C when measured 305 mm (12 in) from any wall/floor/ceiling. It can be assumed that the ECC is empty when meeting this requirement. This temperature uniformity must be achieved under any steady-state condition over the full range of environments described in this SOW.

The ECC must be capable of maintaining a uniform temperature in the air surrounding the Typical Test Items of no more than ± 3°C when measured 305 mm (12 in) from any Typical Test Item surface. The ECC should be capable of maintaining a uniform temperature of no more than ± 2°C. It can be assumed that the test item is not generating internal heat in meeting this requirement. This temperature uniformity must be achieved under any steady-state condition over the full range of environments described in this SOW.

The ECC must be capable of cooling from a steady-state condition of +49°C to -55°C in no more than twelve (12) hours. This requirement must be achieved with the Typical Test Item in the ECC. This requirement pertains to the ECC air temperature, not the Typical Test Item temperature. It can be assumed that the typical test item is not operating when meeting this requirement.

The ECC must be capable of heating from a steady-state condition of -55°C to +49°C in no more than three (3) hours. This requirement must be achieved with the Typical Test Item in the ECC. This requirement pertains to the ECC air temperature, not the Typical Test Item temperature. It must be assumed that the typical test item is not operating when meeting this requirement.

The ECC must recover to set-point temperature within five (5) minutes after any door has been fully opened, exposing the ECC to VTL ambient air for a period of one (1) minute.

The ECC with SRS must be designed with sufficient heating and refrigeration capacity to meet all the performance requirements listed in this SOW while accounting for all heat exchange with the external VTL environment, infiltration from doors and ports, heat gain from operating the Typical Test Item(s), heat gain from interior lighting and heat gain from up to six (6) people working inside the ECC as detailed in this SOW.

The ECC must be capable of meeting the performance and maintaining the full range of test environments described within this SOW for continuous testing periods of up to twenty-eight (28) days without interruption or degradation in programmed environmental test conditions.

1.3.2 Thermal Testing

The ECC must be capable of conducting extreme high temperature testing in accordance with MIL-STD-810G, Change 1, Method 501.6, Procedures I, II and III. The ECC must be capable of generating and automatically controlling the Induced (storage and transit) and Ambient Air high temperature cycles associated with the A1, A2, and A3 climatic categories, as described in MIL-STD-810G, Change 1, Method 501.6, Tables 501.6-I, -II, and –III.

The ECC must be capable of conducting extreme low temperature testing in accordance with MIL-STD-810G, Change 1, Method 502.6, Procedures I, II and III. The ECC must be capable of generating and automatically controlling the Induced (storage and transit) and Ambient Air low temperature cycles associated with the C1, C2, and C3 climatic categories, as described in MIL-STD-810G, Change 1, Method 502.6, Tables 502.6-I.

The ECC must be capable of generating and maintaining any steady-state temperature condition between -55ºC and +85ºC.

The ECC must be capable of generating and controlling any temperature-time varying profile, cyclical or stepped, between -55ºC and +85ºC within the ramp rate limitations of 1.3.1.

1.3.3 Solar Testing

The ECC with SRS must be capable of conducting solar radiation testing with high temperature in accordance with MIL-STD-810G, Change 1, Methods 505.6, Procedures I and II. The ECC with SRS must be capable of generating and automatically controlling the solar radiation and Ambient Air high temperature cycles associated with the A1 and A2 climatic categories, as described in MIL-STD-810G, Change 1, Method 505.6, Figure 505.6-I.

The ECC with SRS must be capable of generating and automatically controlling the steady-state solar radiation and Ambient Air high temperatures associated with the A1 and A2 climatic categories, as described in MIL-STD-810G, Change 1, Method 505.6, Figure 505.6-II.

The ECC with SRS must be capable of generating and maintaining any steady-state combination of temperature and solar radiation between +5ºC and +49ºC with 0 to 1120 W/m^2.

The SRS must be a full-spectrum light source. The SRS must meet the spectral power distribution requirements of MIL-STD-810G, Change 1, Method 505.6, Figure 505.6-II over the solar diurnal cycle. The primary purpose of the SRS will be the evaluation of thermal, rather than actinic effects, thus in meeting this requirement, accuracy in the visible and infrared spectral region is more important than the ultra-violet (UV) ranges. If there is a deviation from Figure

505.6-II, at any power level or test height, correlation with natural sunlight is acceptable where levels in Figure 505.6-II are not technologically possible.

The SRS must be capable of varying the solar radiation intensity to follow the diurnal energy outputs specified in MIL-STD-810G, Method 505.6, Figure 505.6-I, while still maintaining the required spectral distribution from Figure 505.6-II.

The SRS must meet total irradiance and irradiance uniformity requirements of MIL-STD-810G, Change 1, Method 505.6, Table 505.6-II.

The SRS must provide the greatest possible horizontal solar test area within the ECC given the physical constraints of the VTL.

The SRS must provide the greatest possible vertical range of solar test heights within the ECC given the physical constraints of the VTL. To achieve a variable height requirement, the height of the SRS may be adjustable or the height of the test item can be adjusted if a fixed position SRS is proposed:

If the height of SRS is adjustable, it must be controllable external to the ECC while in operation, with an external means of determining the vertical position.

If the SRS is permanently installed inside the ECC, the SRS must survive without damage or degradation when exposed to the full range of environments described in this SOW, including extreme low temperatures and high humidity (if optioned), without modifications or preparations.

If the SRS is designed to be removable from the ECC, any rails, racks and equipment required to remove the system from the ECC must be provided. The power for all electrical equipment and accessories inside the ECC must be provided with quick connections and not require the services of an electrician to connect and disconnect during assembly/disassembly, installation, and removal. The SRS must be capable of being installed or removed by no more than two (2) individuals within sixty (60) minutes. The system must be capable of being stored with minimum space claim when not needed.

All SRS control interfaces must be external to the ECC, with readouts of each control function.

The position and installation of the SRS must not impede the ingress/egress of any of the Typical Test Items from the ECC.

1.3.4 Humidity Testing

The ability for the ECC to generate high and low humidity environments is requested as an option within this SOW. The requirements of the very high and very low humidity functions are described as follows:

The ECC must be capable of conducting low humidity testing in accordance with MIL-STD-810G, Change 1, Methods 501.6, Procedures I and II. The ECC must be capable of generating and automatically controlling the Induced (storage and transit) and Ambient Air high temperature and humidity cycles associated with the A1, A2, and A3 climatic categories, as described in MIL-STD-810G, Change 1, Methods 501.6, Tables 501.6-I, -II, and –III.

The ECC must be capable of conducting high humidity testing in accordance with MIL-STD-810G, Change 1, Methods 507.6, Procedures I. The ECC must be capable of

generating and automatically controlling the Induced (storage and transit) and Ambient Air humidity and temperature cycles associated with the B1, B2, and B3 climatic categories, as described in MIL-STD-810G, Change 1, Methods 507.6, Tables 507.6-I.

The ECC must be capable of conducting high humidity testing in accordance with MIL-STD-810G, Change 1, Methods 507.6, Procedures II.

The ECC must be capable of generating and maintaining any steady-state combination of temperature and humidity between +1ºC and +85ºC with 1 to 99% relative humidity (RH).

1.4 Physical Design Requirements

1.4.1 General

The ECC with SRS must be a self-contained unit with all essential systems, sub-systems, and equipment necessary for a complete and functional test chamber.

The ECC with SRS structure, panels, systems and accessories including, ports, fixtures, and fittings must be capable of being operated for extended periods of time without damage or degradation in performance under any combination of the temperature, humidity and simulated solar radiation conditions specified in this SOW.

The ECC must be capable of being hosed down for cleaning purposes without damage or leakage into the structure of the ECC. Integral floor and/or side drains must be provided allowing connection to the VTL floor drain(s). The ECC drainage capacity must be able to evacuate the flow rate typically encountered with washing using a standard garden hose.

The ECC must be fitted with a pressure/vacuum relief to prevent over/under pressurization during rapid temperature changes, turning on/off of circulation fans, and/or opening closing of doors and ports. This is to prevent the suction-in or blowing-out of any port covers and doors, as well as to ensure that all doors must be opened without resistance from pressure differentials.

The ECC with SRS construction must employ materials that will not allow the growth of mold when exposed to liquid moisture or humidity for prolonged periods of time.

The Contractor must ensure that there is a water tight seal between the ECC/SRS and the existing VTL floor to prevent water ingress under the ECC, as the VTL will continue to be used to wash vehicles in neighboring work-bays.

The ECC with SRS design and installation, including all electrical equipment, must conform to the latest Canadian Standards Association (CSA) standards, the latest National Building Code of Canada (NBCC), local Municipal Codes and By-Laws and applicable codes, ordinances and regulations present in the Province of Quebec, Canada at the time of delivery.

1.4.2 Wall/Floor/Ceiling Panels

All ECC panel sections must consist of the appropriate thickness insulation with interior and exterior metal surfaces.

All ECC interior surfaces and any other surfaces in contract with the generated climatic conditions must be fabricated from stainless steel, with a number four (4) finish.

All ECC interior surface sections must be sealed from the remaining structure in a manner that prevents water, moisture, water vapour, condensation, and air from escaping or entering the chamber other than through the designated drains and vents.

Any non-stainless steel component of the ECC must be painted, coated or anodized to prevent corrosion.

The ECC must be well sealed and insulated to ensure that the extreme climatic conditions quoted in this SOW can be maintained for an extended period of times while minimizing infiltration and external condensation.

1.4.3 Floor Panels

The ECC floor must be stainless steel and have, as a minimum, the same insulation value as the remainder of the ECC.

The ECC floor must minimize the size of gaps between panels for ease of transporting material with pallet jacks and carts. Any gaps greater than 3.1 mm (0.125 in) wide must be filled with semi-rigid material to smooth the surface.

The ECC floor, at all locations, must support without damage a minimum of ten (10) people up to 115 kg (254 lbs) standing, walking, or conducting work.

The ECC floor, at all locations, must support without damage the weight and movement of a standard pallet-jack carrying a palletized load of up to 2,268 kg (5,000 lbs).

The ECC must be designed with a heavy-duty floor section capable of supporting the Typical Test Items described in this SOW with a load of up to 18,370 kg (40,500 lbs) and ground pressure of up to 352 kPa (51 psi).

To reduce cost, it is permissible to limit the heavy-duty load bearing portion of the ECC floor to an area permitting the ingress, central positioning within the ECC/SRS test area, and egress of the Typical Test Items using the ECC main access door. It must be possible to also maneuver an industrial forklift (example Daewoo model G20E) carrying 2000 kg (4,409.25 lb) over the same area. The heavy-duty floor must accommodate any vehicle track width (tire outside-to-outside) up to a maximum width of 3.2 m (10.5 ft). The heavy-duty track should be continuous across the span in order to accommodate a range of smaller track widths including an industrial fork-lift.

1.4.4 Doors

Main Access Door

The ECC must have one main access door(s) with a minimum of 3.6 m (12 ft) width and full chamber height on the East side of the ECC. This door will permit the driving-in and out of the Typical Test Items. This door will also be used to transport test material in-out of the ECC using an industrial fork-lift. The design of the door style (single door, double door, etc..) will be determined in consultation with the Technical Authority post-contract.

Pallet Access Door

The ECC must have one pallet-size entry door with a minimum 1.52 m (5 ft) width and 2.1m (7 ft) height on the South side of the ECC. This door will allow for loading and unloading of materials that are on standard shipping pallets using an industrial pallet-jack. The

location of the door will be determined in consultation with the Technical Authority post-contract.

Vestibule Doors

The ECC must have two (2) vestibule doors on the West side of the ECC. The vestibule doors are standard environmental chamber doors sizes that allow for entry and egress of chamber personnel only.
The vestibule design must allow personnel to enter/exit the ECC without disturbing the environmental conditions inside the ECC.
The vestibule doors must be in-line.

All ECC doors must be well insulated, self-sealing, and provide a near perfect seal under all ECC operating conditions to mitigate leakage, condensation, frost, ice, etc…

All ECC doors must include high quality hardware that is corrosion resistant, cam action type, self-closing, self-lubricating and edge or strap mounted with stainless steel.

All ECC doors must be designed to remain closed and tightly sealed under all operating conditions including rapid change in temperature, while activating air circulation fans, when other doors are opened or closed and when there is an abrupt change in the internal pressure of the chamber.

With the possible exception of the main access door, all ECC doors must be capable of being opened one person, without aid, from both the inside and the outside of the ECC chamber under all ECC chamber operating conditions.

All external ECC doors must have three (3) stainless steel or corrosion resistant hasps, minimum 6 mm (0.25 in) thick, installed approximately at the top, middle and bottom section of each external ECC door for the purpose of securely locking the ECC.

1.4.5 Ramps

Main Access Door

A ramp between the interior ECC floor and the existing VTL floor must be provided across the width of the Main Access Door to permit smooth ingress and egress of the Typical Test Items as well as a standard industrial forklift.

The ramp must be designed to support without damage, the dynamic application of the loads and ground pressures associated with movement of the Typical Test Items as well as a standard industrial forklift as described in1.4.3.

Pallet Access Door

A ramp between the interior ECC floor and the existing VTL floor must be provided across the width of the Pallet Access Door to permit smooth ingress and egress of a standard industrial pallet jack with standard pallet.

The ramp must be designed to support without damage, the dynamic application of the loads and ground pressures associated with movement of an industrial pallet-jack as described in 1.4.3.

The Pallet Access Door ramp must be designed to be installed and removed as required using either a standard pallet-jack or industrial fork-lift.

All ramps must not inhibit the opening, closing, and locking of their respective doors.

All ramps must be sealed between the ECC and VTL flooring to mitigate moisture ingress between the ramp and the ECC as well as the existing VTL flooring.

1.4.6 Windows

All ECC windows must be designed to permit visibility into the ECC under all operating conditions (mitigating fog, frost, ice, condensation etc…).

Hinged blackout panels, shutters, or louvers must be fitted to each external window to enable complete black-out of light into or out of the ECC chamber when required for test specific applications.

Windows must be provided with ultraviolet (UV) radiation protection to allow unprotected visibility of a test item when operating the SRS at all intensities. It can be expected that an outside observer will wear standard sun-glasses; however, the UV protected windows must sufficiently block UV rays to not require any additional personal UV protection for eyes or skin.

Door Windows

The ECC must have a one (1) window on each door for a total of five (5) door-windows.

The door windows must be a minimum nominal size of 457 mm (18 in) wide and 610 mm (24 in) high.

The door windows must be placed at “person height” to allow an individual to easily view inside the ECC from the outside without the need for steps.

Chamber Windows

The ECC must have a minimum of two (2) chamber observation windows; one (1) observation window on both the West and South walls of the ECC Chamber.

The ECC West wall window must be a minimum of 1.5 m (5 ft) wide and 914 mm (36 in) high to permit laboratory personnel to observe the interior of the ECC from the existing VTL control room/office under all operating conditions.

The ECC South wall window must be a minimum nominal size of 610 mm (24 in) square and placed at “person height” to allow an individual to easily view inside the ECC from the outside without the need for steps.

1.4.7 Ports

Instrumentation Ports

The ECC must have a minimum of eighteen (18) small instrument ports of 102 mm (4 in) diameter nominal, to allow for pass-through of cables inside/outside the ECC. Ten (10) ports must be installed on the South wall and four (4) ports must be installed on each of the East and West walls.

The ECC must have a minimum of 8 large instrument ports of 305 mm (12 in) diameter nominal, to allow for pass-through of test instrumentation inside/outside the ECC. Six (6) ports must be installed on the South wall and two (2) ports must be installed on each of the East and West walls.

The instrumentation ports must be installed at two (2) different access heights on the ECC walls. The exact locations to be determined in discussion with Technical Authority post contract.

Flexible, insulated, removable inserts must be provided for all instrumentation ports to provide sealing around instrumentation cables when the ECC is in-use.

Vehicle Exhaust Ports

The ECC must have two (2) vehicle exhaust ports for the purpose of evacuating combustion exhaust fumes from the ECC. They must be installed in the vicinity of the South-East corner of the ECC. The exact locations to be specified by the Technical Authority post contract.

The vehicle exhaust ports must include a bulk-head fitting to permit attachment of the existing VTL exhaust extraction hose(s). The existing hose(s) are designed to mate with exhaust pipes no larger than 180 mm (7 in) diameter. The hoses utilize a vise-grip clamp attachment that requires a male-connection that extends a minimum of 76 mm (3 in) from the ECC wall. The bulk-head fittings must also permit connection of a similar diameter hose on the inside of the ECC.

All instrumentation and exhaust ports must be provided with insulated port covers that can be tightly sealed when not in use, minimizing infiltration and condensation. The port covers must be made from a material which will not be subject to mold growth when left damp or in high humidity environments.

All instrument and exhaust port covers must be designed to remain securely in place throughout all ECC operating conditions including starting and stopping circulation fans, opening and closing doors, and any other actions resulting in internal ECC pressure changes.

1.4.8 Interior Lighting

The ECC must have interior lighting to provide a minimum of 50 foot-candles (540 lx) of uniform illumination when measured at 760 mm (30 in) above the floor.

The interior ECC lighting should be mounted in recessed fixtures to protect from inadvertent impact by operators or large test articles.

The interior ECC lighting must utilize readily available, standard commercial-off-the-shelf lightbulbs.

It must be possible to change any interior lightbulb without the need for specialized tools in less than two (2) minutes.

The interior ECC lighting must be capable to withstand, without damage, being turned on, operated, and turned off at any time over the entire range of ECC operating conditions specified within this SOW.

The ECC must have light switches locate outside of the ECC next to each exterior door to turn on and off the interior ECC lighting.

1.5 Refrigeration System Requirements

1.5.1 General

The ECC cooling system must be an industrial type refrigeration system employing non-ozone depleting refrigerant. The system must be a closed-loop type system. Liquid nitrogen, ammonia, or other non-refrigerant systems must not be used.

The ECC cooling system capacity must be sufficient to simultaneously and continuously meet all thermal loads, including internal heat gain from operating the Typical Test Items, operating ECC interior lighting, test personnel working inside the ECC, intake air for the Typical Test Item combustion cycle, heat from the SRS (when employed), heat exchange between the ECC and the surrounding VTL environment and losses from infiltration or other ECC design inefficiencies. The ECC cooling system capacity must be sufficient to meet all of the above thermal loads over the full range of environmental test conditions specified in this SOW in order to achieve the test performance and test tolerances detailed in this SOW.

The NPB has a source of chilled water available for the ECC installation. Details regarding the supply will be provided during a mandatory site-visit. System chilled water requirements must be discussed with the Technical Authority.

The NPB has a range of potential power voltage options for the ECC installation. Details regarding the supply will be provided during a mandatory site-visit. System electrical power requirements must be discussed with the Technical Authority.

Ventilation around the ECC and its machinery will be continuously provided from the VTL supply air system. Details on the VTL ambient environment is found in 1.2.1.

The ECC refrigeration system must be capable of immediate operation without preparation following any period of dormancy.

1.5.2 Automatic De-frost System

The ECC refrigeration system must have an automatic defrost system to allow for periodic de-frosting of refrigerant coils.

The ECC must maintain test conditions during de-frosting cycles.

The ECC de-frost system must have a means to capture and evacuate condensate out of the ECC from the de-frost cycle.

1.5.3 Make-up Air

The ECC refrigeration and ventilation system must be capable of supplying continuous additional conditioned air to the ECC from the VTL ambient air in order to meet the combustion requirements of the Typical Test Items and also maintaining ECC test conditions.

1.5.4 System Monitoring

The ECC refrigeration system must employ sensors to monitor and report any exceedances of critical refrigerant system operating parameters including, but not limited to, high and low system pressures, high and low system temperatures.

1.6 Control System Requirements

1.6.1 General

The Contractor must provide an integrated control system for the ECC/SRS. The system must include all hardware and software needed for the programming, operation, and system monitoring of both the ECC and SRS. The control system must be automated and integrated with the ECC/SRS and feature:

Microprocessor based Proportional-Integral-Derivative (PID) controller(s) designed for environmental chamber testing applications. The PID controller(s) must continuously monitor ECC/SRS conditions versus set-point, providing an output which will modify the system capacity in response to any deviations.

The range of the controller(s) must be established to cover the full dynamic range of environmental test conditions described in this SOW.

The accuracy of the controller(s) must meet or exceed the accuracy and test tolerances described in MIL-STD-810G at all times during operation (including dynamic ramping and steady-state).

The controller software must be a graphical user interface, menu-driven, personal computer based application.

The controller software must be capable of being operated at a remote station via information technology (IT) network, using Ethernet cable. No special licensing must be required to access and control the ECC/SRS via a networked computer.

1.6.2 Thermal Testing

The control system must allow for programming, review, and automatic control and execution of any user defined fixed temperature test condition, temperature ramp rate, and any range of diurnal or temperature-time varying profile over the full range of tests specified in this SOW.

As a minimum, the control system must display the programmed set-point, ramp-rate, user-defined profile as well as current ECC conditions.

1.6.3 Solar Testing

The control system must allow for programming, review, and automatic control and execution of any user defined fixed intensity SRS test condition and temperature combination, and any range of diurnal or combined temperature and radiation-time varying profile over the full range of simulated solar tests specified in this SOW.

As a minimum, the control system must display the programmed set-point, lamp position (if lamps height is adjustable), and user defined profile as well as current SRS conditions.

1.6.4 Humidity Testing

The ability for the ECC to generate high and low humidity environments is requested as an option within this SOW. The control system must allow for programming, review, and automatic control and execution of any user defined fixed humidity and temperature test condition, temperature and humidity ramp rates, and any range of diurnal or combined temperature and humidity-time varying profile over the full range of test temperatures and humidity combinations specified in this SOW.

As a minimum, the control system must display the programmed set-point, ramp-rate, user-defined profile as well as current ECC conditions.

1.6.5 Data logging

The controller software must allow for the data collection and recording of user set-points, profiles, ECC/SRS conditions and any applicable warning and alarms. The controller software data-logging capability must include:

User configurable file name.

User defined sample rate, ranging between 1 sec and 5 minutes per sample (ex. 1 sec, 10 sec, 30 sec, 1 min, 2 min…).

Automatic generation of header file including date, time, channel title/number, and engineering units.

Ability to export the recorded data as ASCII text or to Microsoft Excel.

1.7 Warnings, Alarms, and Stops

1.7.1 General

The controller system software must display visually and also provide an audible alert, of any ECC/SRS system faults, trips, deviations, errors, abnormalities, or malfunctions related to test conditions, ECC/SRS system hardware or software status or operation.

The controller system software must log any alerts, alarms, or warnings for operator review.

1.7.2 Test Limit Alert

The controller system software must allow programming of user-defined high and low test tolerances for temperature and humidity (if optioned) around a set-point or profile for all test conditions.

The controller system software must provide visual and audible alert to any exceedances (high or low) of the user defined tolerances.

1.7.3 Safety Limit Alarm

The control system must include secondary independent hardware safety control circuits and devices allowing for user selectable high and low temperature safety limits.

The limits must be easily user programmable in order to select test specific high and low temperature safety limits.

In the event of safety limit alarm condition, the safety controller must completely de-energize the ECC including SRS and activate an audible and visual alarm.

A panel mounted momentary contact push button must be provided to deactivate only the audible portion of the alarm. The ECC and SRS must remain de-energized until the operator manually re-sets the system or an operator manually re-defines new safety alarm limits.

1.7.4 Emergency Stop Alarm

The ECC/SRS must have a re-set type, personnel emergency alarm system (e-stops) which will immediately and completely de-energize the ECC/SRS from all power upon contact.

The e-stop actuator must be a heavy duty, oil tight switch, equipped with a red button marked: “EMERGENCY ALARM – PULL TO RESET”.

There must be an e-stop actuator position adjacent to each external door such that an individual observing the interior of the chamber at the door window can easily reach the actuator.

One (1) additional e-stop must be provided at the chamber control panel.

The system control software must also be provided with a software equivalent e-stop.

When activated, the e-stop system must produce an audible alarm that provides a high decibel level of sound output at a frequency distinct from other ECC/SRS alerts and alarms.

When activated, the e-stop system must illuminate warning light(s) which must be mounted in an area providing no vision interference from all ECC sides.

1.7.5 Refrigerant Alarm

The ECC must be provided with sufficient refrigerant gas leak detectors to rapidly identify a leak from any areas of the ECC refrigeration system.

The ECC refrigerant leak detection system must be programmable with adjustable two-stage warning levels: a low and high-leak level with user adjustable parts-per-million threshold.

When activated, the low-leak must trigger a visible and audible warning.

When activated, the high-leak must trigger a visible and audible warning and must completely de-energize the ECC/SRS from all power. When activated, the system must illuminate warning light(s) which must be mounted in an area providing no vision interference from all ECC sides.

1.7.6 Noxious Gas Alarm

The ECC must be provided with sufficient detectors to monitor the level of noxious gases associated with diesel and gasoline combustion within the ECC. At a minimum the detectors must monitor carbon-monoxide (CO), carbon-dioxide (CO2), nitric oxide (NO), and nitric-dioxide (NO2).

The detectors must be programmable to provide alarm settings based on exposure threshold limit values based on occupational health and safety regulation within Canada and the Province of Quebec.

When activated, the detectors must trigger a visible and audible warning. When activated, the system must illuminate warning light(s) which must be mounted in an area providing no vision interference from all ECC sides.

APPENDIX A TO ANNEX A
PHOTOS

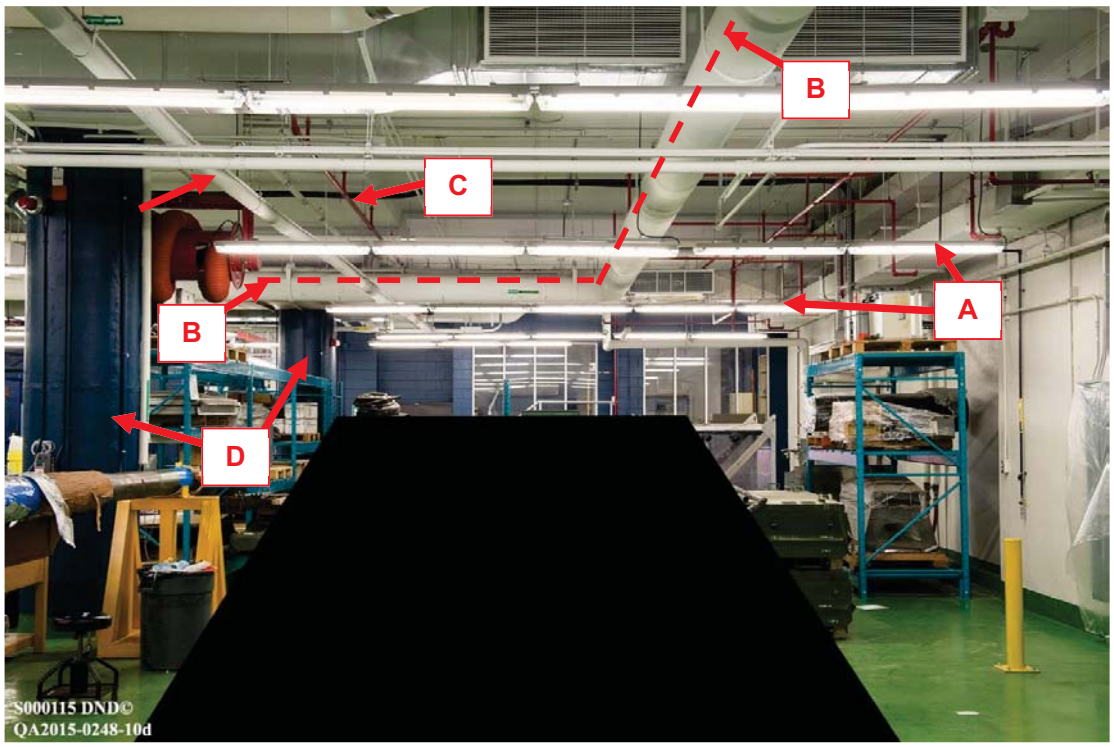

Figure A1: Proposed ECC/SRS installation area in the QETE VTL. View is from the east looking west.

A - Electrical conduit and lighting will be removed by the Technical Authority.

B – Large chilled-water return pipe cannot be moved. This pipe limits the north wall of the ECC (on the right-hand side in the photo) and the ECC must step-down in height under the pipe on the west side. The area bounded by the chilled-water pipe will define the useable area for the SRS capability of the ECC. It is not expected to have SRS lamps in the stepped-down area of the ECC to the west of the chilled water pipe.

C – Maximum height available for the ECC/SRS will be governed by the existing fire sprinkler system. Additional height for design and installation of the SRS is available around the fire sprinkler and other utilities so long as the design does not require removal, re-routing, or modification to any of these utilities.

D – ECC/SRS must be designed to be installed in between two existing structural support columns. One column is shown in the figure at the west end of the VTL. The second column is in-line to the east approximately 10 m (32.8 ft) away.

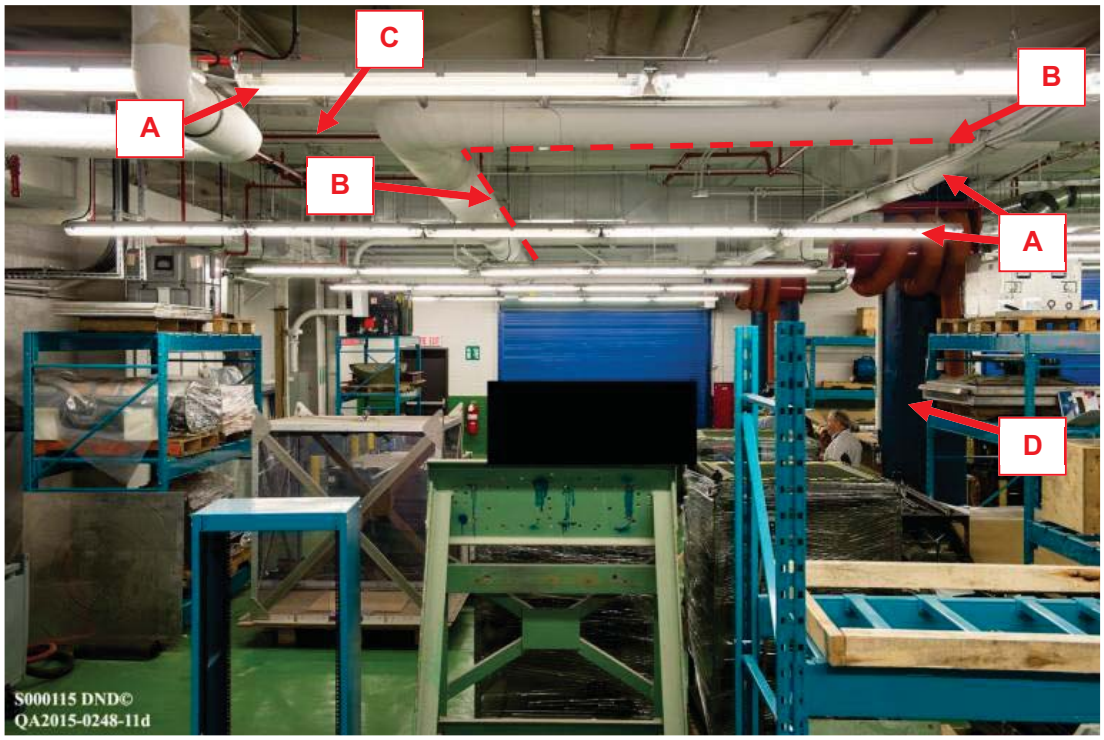

Figure A2: Proposed ECC/SRS installation area in the QETE VTL. View is from the west looking east.

A - Electrical conduit and lighting will be removed by the Technical Authority.

B – Large chilled-water return pipe cannot be moved. This pipe limits the north wall of the ECC (on the left-hand side in the photo) and the ECC must step-down in height under the pipe on the west side. The area bounded by the chilled-water pipe will define the useable area for the SRS capability of the ECC. It is not expected to have SRS lamps in the stepped-down area of the ECC to the west of the chilled water pipe.

C – Maximum height available for the ECC/SRS will be governed by the existing fire sprinkler system. Additional height for design and installation of the SRS is available around the fire sprinkler and other utilities so long as the design does not require removal, re-routing, or modification to any of these utilities.

D – ECC/SRS must be designed to be installed in between two existing structural support columns. One column is shown in the figure at the east end of the VTL. The second column (not shown in above photo) is in-line to the west approximately 10 m (32.8 ft) away.

APPENDIX B TO ANNEX A
DRAWINGS

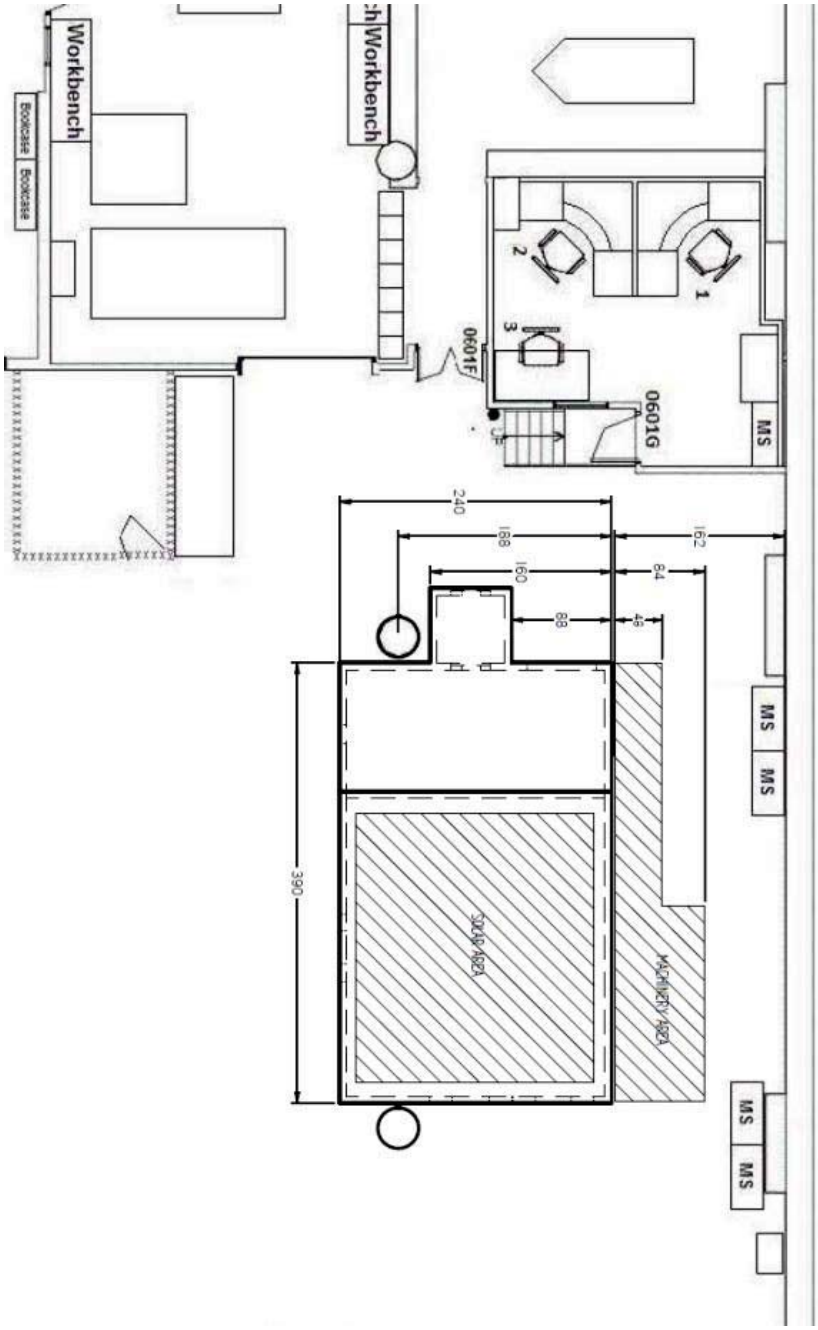

Figure B1 – Top-down drawing of the VTL showing the approximate intended location of the ECC/SRS. The drawing is conceptual in nature and is only intended to serve as a means of communicating a desired design. All dimensions are approximate and directions nominal. Units are in inches.

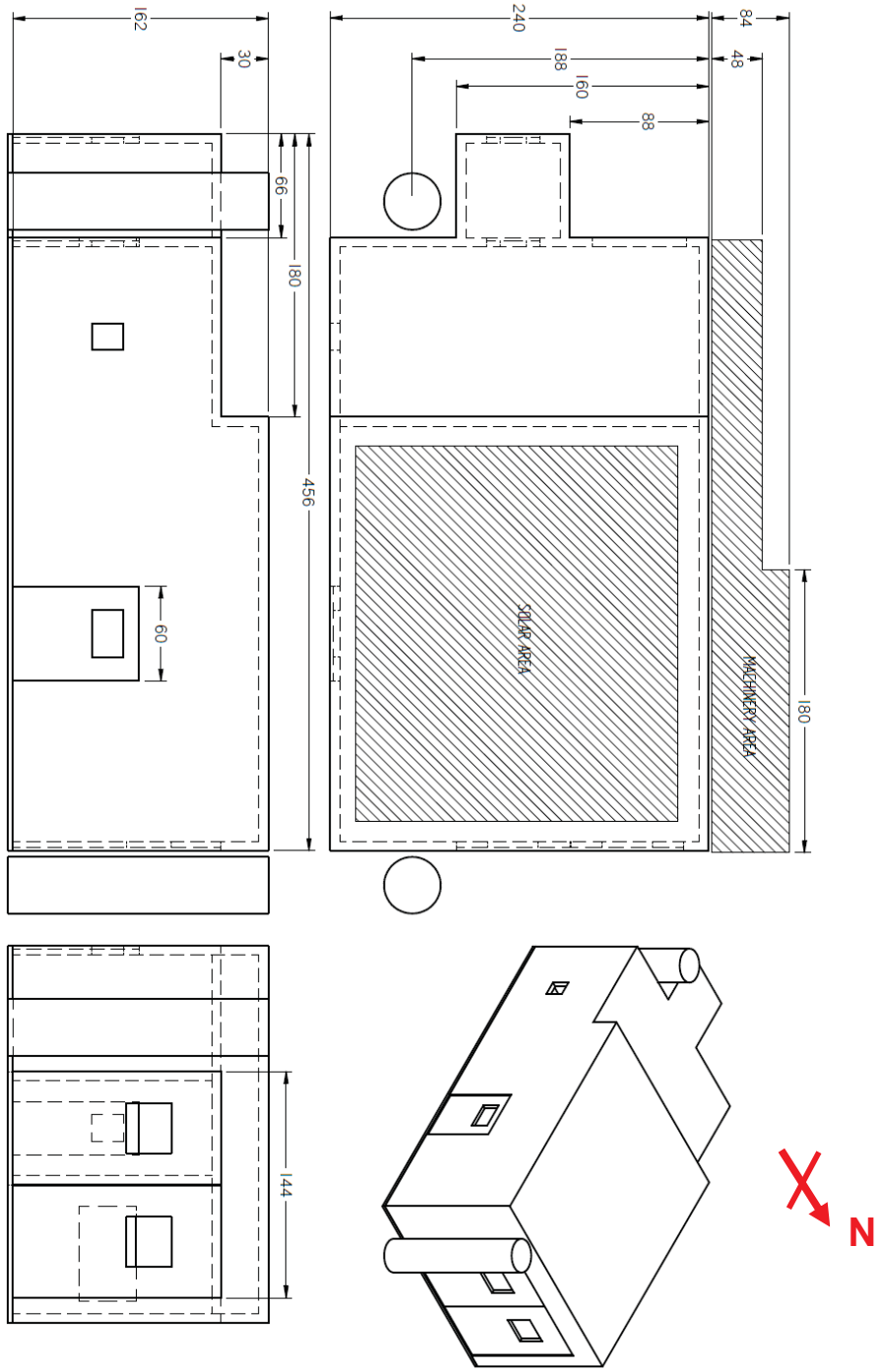

Figure B2 –Isometric drawing of the conceptual ECC/SRS. The drawing is conceptual in nature and is only intended to serve as a means of communicating a desired design. All dimensions are approximate and directions nominal. Units are in inches.

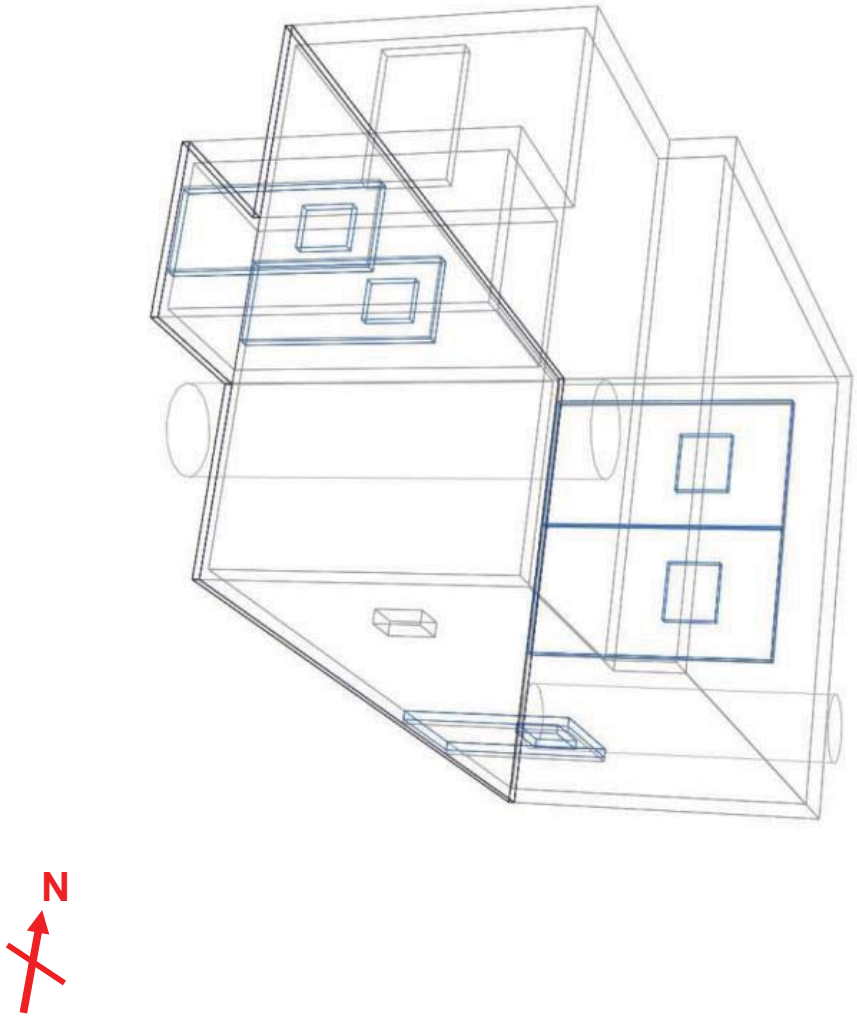

Figure B3 – Three-dimensional drawing of the conceptual ECC/SRS. The drawing is conceptual in nature and is only intended to serve as a means of communicating a desired design. All dimensions are approximate and directions nominal. Units are in inches.

ANNEX B
QUESTIONS TO INDUSTRY

Interested suppliers are asked to comment upon the following items:

1. Provide feedback on the feasibility of the proposed design;
2. Identify primary cost-drivers and recommend any technology/design alternatives;
3. Identify any critical omissions, or required clarifications, to the specification as currently written;
4. Provide a rough order of magnitude on costing (with and without the requested option for humidity control); and
5. Provide a rough order of magnitude on the time to design, time to deliver, and time to install after a contract award.

ANNEX C
ACRONYMS AND DEFINITIONS

AECTP	Allied Environmental Conditions and Test Publications
CAF	Canadian Armed Forces
CFM	Cubic Feet per Minute
DND	Department of National Defence
ECC	Environmental Conditioning Chamber
IT	Information Technology
MIL-STD	Military Standard
NATO	North Atlantic Treaty Organization
OEM	Original Equipment Manufacturer
NPB	National Printing Bureau
PID	Proportional-Integral-Derivative
RH	Relative Humidity
RPM	Revolutions per Minute
SOW	Statement of Work
SRS	Solar Radiation Simulation
STANAG	Standardization Agreement
TA	Technical Authority
TAPV	Tactical Armoured Patrol Vehicle
UV	Ultra-violet
QC	Province of Québec
QETE	Quality Engineering Test Establishment
VTL	Vehicle Test Laboratory