



A1. CONTRACT ADVISOR

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Construction

Request for Proposals (RFP)

for

Performance of the work as described in
Appendix “A” – Statement of Work.

A2. TITLE Mechanical & Electrical Upgrades, New Delhi, India		
A3.SOLICITATION NUMBER 21-175731	A4.PROJECT NUMBER B-DELHI-116	A5. DATE October 16, 2020
A6. RFP DOCUMENTS <ol style="list-style-type: none"> 1. Request for Proposals (RFP) title page 2. Submission Requirements (Section “I”) 3. Evaluation and Basis of Selection (Section “II”) 4. Tender Form (Section “III”) 5. General Instructions (Section “IV”) 6. Draft Construction Contract 7. Statement of Work (Appendix “A”) 8. Drawings and Specifications (Appendix “B”) 9. Photographs (Appendix “C”) 10. Security Requirements Check List (Appendix “D”) <p>In the event of discrepancies, inconsistencies or ambiguities of the wording of these documents, the document that appears first on the above list shall prevail.</p>		
A7. PROPOSAL DELIVERY <p>In order for the proposal to be valid, it must be received no later than 14h00 (Eastern Standard Time) on Monday, November 2, 2020 referred to herein as the “Closing Date”.</p> <p>Electronic proposals must be sent only to the following email address: realproperty-contracts@international.gc.ca</p>		
A8. TENDER FORM <p>All the information required in section 2.4 must appear in Section “III” – Tender Form ONLY and must be included in a separate attachment named “Tender Form”. Failure to comply may result in the proposal being declared non-compliant and rejected from further consideration.</p>		
A9. PROPONENTS’ CONFERENCE <p>A Proponents’ conference will be held virtually on Thursday, October 22, 2020. The conference will begin at 16h30 (local time in Delhi, India). The purpose of the proponents’ conference is to provide instructions and assistance to the Proponents in preparing the documentation required for the proposal. The scope of the requirement outlined in the bid solicitation will be reviewed during the conference and questions will be answered. It is recommended that Proponents who intend to submit a proposal attend or send a representative.</p> <p>Proponents are requested to communicate with the Contract Advisor no later than three (3) calendar days prior to confirm attendance and provide the name(s) of the person(s) who will attend. Proponents who do not attend or do not send a representative will not be given an alternative appointment but they will not be precluded from submitting a bid. Any clarifications or changes to the bid solicitation resulting from the proponents’ conference will be included as an amendment to the bid solicitation.</p> <p>No site visit will be held.</p>		
A10. ENQUIRIES <p>All enquiries or issues concerning this RFP must be submitted in writing to the Contract Advisor no later than three (3) calendar days prior to the Closing Date and Time in order to allow sufficient time to provide a response.</p>		
A11. LANGUAGE <p>Proposals shall be submitted in English or French.</p>		
A12. CONTRACT DOCUMENTS <p>The draft contract which the selected Proponent will be expected to execute is included with this RFP. Proponents are advised to review it in detail and identify any problematic clauses to the Contract Advisor in accordance with A10 - Enquiries. Her Majesty reserves the right not to make any amendment(s) to the Contract Documents.</p>		

SECTION "I" – SUBMISSION REQUIREMENTS**1.0 SUBMISSION OF PROPOSAL**

- 1.1 Proposals must be received by DFATD at the email address identified and by the date and time specified on page 1 of the solicitation.
- 1.2 Proponents should ensure that their name and the solicitation number is clearly referenced in the email subject line. It is the responsibility of the Proponent to confirm that their submission has been received on time and to the correct email address.
- 1.3 More than one (1) e-mail can be sent if necessary. If the same file is sent twice, the latest file received will be used for evaluation purposes and the previous one(s) will not be opened.
- 1.4 Her Majesty requests that Proponents provide their electronic proposals in Portable Document Format (.pdf) software application files or Microsoft office version 2003 or greater files.
- 1.5 Proponents should follow the specifications format instructions described below, during the preparation of their proposal:
 - Minimum type face of 10 points.
 - All material be formatted to print on 8.5" x 11" or A4 paper.
 - For clarity and comparative evaluation, the Proponent should respond using the same subject headings and numbering structure as in this RFP document.
- 1.6 Proposals may be modified or resubmitted only before the solicitation Closing Date and Time, and must be done in writing. The latest proposal received will supersede any previously received proposals.
- 1.7 Her Majesty will take no responsibility if a proposal is not received on time because the e-mail was refused by a server for the following reasons:
 - The size of attachments exceeds 10 MB.
 - The e-mail was rejected or put in quarantine because it contains executable code (including macros).
 - The e-mail was rejected or put in quarantine because it contains files that are not accepted by DFATD server, such as, but not limited to, .rar, encrypted .zip, encrypted .pdf, .exe., etc.
- 1.8 Links to an online storage service (such as Google Drive™, Dropbox™, etc.) or to another website, a File Transfer Protocol (FTP) service access, or any other means of transferring files, will not be accepted. All documents submitted must be attached to the e-mail.
- 1.9 It is strongly recommended that Proponents confirm with the Contract Advisor that their complete proposal was received. For this same reason, it is recommended that in cases where more than one e-mail containing documents comprising the quote is submitted, the emails be numbered and the total number of emails sent in response to the solicitation also be identified.
- 1.10 Her Majesty requires that each proposal, at Closing Date and Time or upon request from the Contract Advisor, be signed by the Proponent or by an authorized representative of the Proponent. If any required signature(s) are not submitted as requested, the Contract Advisor may inform the Proponent of a time frame within which to provide the signature(s). Failure to comply with the request of the Contract Advisor and to provide the signature(s) within the time frame provided may render the proposal non-responsive.

- 1.11** It is the Proponent's responsibility to:
- obtain clarification of the requirements contained in the RFP, if necessary, before submitting a proposal;
 - prepare its proposal in accordance with the instructions contained in the RFP;
 - submit by Closing Date and Time a complete proposal;
 - send its proposal only to the email address specified on page 1 of the bid solicitation;
 - ensure that the Proponent's name, and the solicitation number are in the subject line of the email containing the proposal; and,
 - provide a comprehensible and sufficiently detailed proposal, including all requested pricing details, that will permit a complete evaluation in accordance with the criteria set out in the RFP.
- 1.12** Unless specified otherwise in the RFP, Her Majesty will evaluate only the documentation provided with a Proponent's proposal. Her Majesty will not evaluate information such as references to Web site addresses where additional information can be found, or technical manuals or brochures not submitted with the proposal.
- 1.13** A proposal cannot be assigned or transferred in whole or in part.

1.14 Approval of alternative Material

The proposal must be based on using materials specified by trade or manufacturer's names where specified in the tender documentation.

Alternatives to materials and equipment specified by trade or manufacturer's names will be considered during the bid period if full descriptive data on proposed alternatives is submitted in writing to the Contract Advisor as specified in A10. Enquiries.

The Contract Advisor must approve any alternative material in writing. Approved alternatives will be incorporated in the specification by issuance of addenda to the tender documents.

SECTION "II" – EVALUATION AND BASIS OF SELECTION

2.0 TECHNICAL PROPOSAL

- 2.1 The evaluation will be based solely on the content of the responses and any correctly submitted amendment. No assumptions should be made that Her Majesty has any previous knowledge of the Proponents' qualifications other than that supplied pursuant to this RFP.
- 2.2 The Proponent's Technical response **must not** exceed thirty (30) single-sided pages of 8½ "x 11" paper, minimum type face 10 pts., including organization charts and schedule. Material exceeding the thirty (30) page maximum will **NOT** be considered.

2.3 TECHNICAL EVALUATION

2.3.1 MANDATORY REQUIREMENTS

Failure to comply with any of the mandatory requirements will render the Proposal non-compliant and the Proposal will receive no further consideration.

Amounts in the criteria below are excluding taxes.

SECTION 1 – CORPORATE EXPERIENCE

CORPORATE		
Item	DESCRIPTION	COMPLIANCE
M1	Proponent must have a minimum of five (5) years' experience in the installation of rooftop air handling equipment, in the past ten (10) years to bid closing date.	Proponent should provide the following: <ul style="list-style-type: none"> • a summary of their experience; • demonstration of 5+ years' experience; • demonstration that experience is within the last 10 years.
M2	Proponent must have completed one (1) rooftop equipment installation project, including all mechanical and electrical works, valued in excess of \$100,000 CAD in the past five (5) years to bid closing date.	Proponent should provide the following: <ul style="list-style-type: none"> • Title of project • Client name • Value of the project (over \$100,000 CAD) • Work period <ul style="list-style-type: none"> ○ Start date (month, year) ○ End date (month, year) • Description of services provided by the Proponent

SECTION 2 – PERSONNEL EXPERIENCE

PROJECT MANAGER		
Item	DESCRIPTION	COMPLIANCE
M3	The Project Manager must have a minimum of five (5) years of experience in the provision of project management services on mechanical and electrical construction projects within the past ten (10) years to bid closing date.	Proponent should provide the following: <ul style="list-style-type: none"> • summary of the Project Manager’s experience; • demonstration of 5+ years’ experience; and • demonstration that experience is within the last 10 years.

2.3.2 POINT-RATED CRITERIA (MAXIMUM TOTAL OF 62 POINTS)

2.3.2.1 Work Plan (20 points)

Intent: Evaluate the Proponent’s strategy for delivering the Project.

Information to be submitted:

- 1) the name and role of each individual Proponent team member for each project milestone;
- 2) a project organization chart showing names and titles of all Proponent team resources named for the Project; and
- 3) a short description of the roles of key stake-holders: Proponent Team, sub-consultants and other specialists and describe how this team will work together to execute the various phases of the Work.

Rating:

Score	Evaluation	Definition
20	Outstanding	Innovative, comprehensive and complete in all details; exceeds all requirements and objectives.
15	Excellent	Substantial response in clearly definable detail; meets all critical requirements; demonstrates full understanding.
10	Good	Meets all minimum requirements; demonstrates partial understanding.
5	Poor	Misses some requirements, demonstrates partial understanding; some detail missing.
0	Unsatisfactory	No data/incomplete bid; lacks understanding.

2.3.2.2 Corporate Experience (10 points per project. Total of 30 points)

Intent: Evaluate the Proponent’s recent corporate experience on projects of similar size and scope as described in the Statement of Work.

“Recent” is defined as work in the past five (5) years to bid closing date.

“Similar” is defined as mechanical and associated electrical HVAC (heating, ventilation, air conditioning) systems for commercial/institutional office areas of greater than 100 square metres and less than 5,000 square metres with a construction value over \$250,000 CAD.

Information to be submitted:

Proponent should submit **three (3)** recent projects of similar size and scope. Each project must have included coordination with occupants to maintain the system operation with the occupants remaining in the building and continuing with their office functions.

- 1) The following should be provided for each project:
 - Title of project
 - Location of project (city, country)
 - Client name
 - Brief description of project scope
 - Value of construction work (CAD \$)
 - Work period
 - Start date of work (month, year)
 - End date of work (month, year)
 - Corporate role in the project
 - Description of coordination with occupants

Rating:

Score	Evaluation	Definition
8	Outstanding	Innovative, comprehensive and complete in all details; exceeds all requirements and objectives.
6	Excellent	Substantial response in clearly definable detail; meets all critical requirements; demonstrates full understanding.
4	Good	Meets all minimum requirements; demonstrates partial understanding.
2	Poor	Misses some requirements, demonstrates partial understanding; some detail missing.
0	Unsatisfactory	No data/incomplete bid; lacks understanding.

- 2) For each project, Proponent should identify the location (city, country) where the work took place.

Work located in India – **2 points per project**

2.3.2.3 Experience of Project Manager (4 points per project. Total of 12 points)

Intent: Evaluate the recent experience of the proposed Project Manager on projects of similar size and scope as described in the Statement of Work.

“Recent” is defined as work in the past five (5) years to bid closing date.

“Similar” is defined as mechanical and associated electrical HVAC (heating, ventilation, air conditioning) systems for commercial/institutional office areas of greater than 100 square metres and less than 5,000 square metres with a construction value over \$250,000 CAD.

Information to be submitted:

- 1) The Project Manager should submit **three (3)** recent projects of similar size and scope. The following should be provided for each project:
 - Title of project
 - Location of project (city, country)
 - Client name
 - Brief description of project scope
 - Value of construction work (CAD \$)
 - Work period
 - Start date of work (month, year)
 - End date of work (month, year)
 - Description of services provided by Project Manager

Rating:

Score	Evaluation	Definition
4	Outstanding	Innovative, comprehensive and complete in all details; exceeds all requirements and objectives.
3	Excellent	Substantial response in clearly definable detail; meets all critical requirements; demonstrates full understanding.
2	Good	Meets all minimum requirements; demonstrates partial understanding.
1	Poor	Misses some requirements, demonstrates partial understanding; some detail missing.
0	Unsatisfactory	No data/incomplete bid; lacks understanding.

2.4 TENDER FORM

2.4.1 All the information required in section 2.4 must appear on Section “IV” – Tender Form and ONLY and must be included in a separate attachment named “Tender Form”. Failure to comply may result in the proposal being declared non-compliant and rejected from further consideration.

2.4.2 Fixed Price

2.4.2.1 Proponents shall quote an all inclusive Fixed Price (excluding the cost of The Minister’s services and equipment\ furniture) on the form attached as Section “IV” – Tender Form. The Fixed Price must include, but not necessarily be limited to, all costs resulting from the performance of the Work as described in this RFP, all costs resulting from the performance of any additional Work described in the Proponent’s Proposal (unless clearly described as an option), all travel, living costs and all overhead costs including disbursements;

2.4.2.2 Proponents shall estimate the value of the taxes (including VAT as per 2.4.3) expected to be payable by Her Majesty as a result of entering into a contract with the Proponent on the Tender Form;

2.4.2.3 All payments shall be made according to the terms of payment set out in the attached draft contract;

2.4.2.4 Exchange rate fluctuation protection is not offered; and

2.4.2.5 Tender Forms not meeting the above requirements may not be given any further consideration.

2.4.3 Taxes & Duties

2.4.3.1 Proponents are to provide full details concerning the applicability, amount and administration of the payment of all taxes (including VAT as described below) and duties (including import duties) payable in respect of the Work, as well as any possible exemption from all or part of same.

2.4.3.2 Her Majesty will pay the VAT specified in the Tender Form provided:

2.5.3.2.1 that amount is applicable to the Work provided by the Contractor to Her Majesty under the Contract. Her Majesty will not be responsible for the payment of any VAT payable by the Contractor to any third party (including Subcontractors);

2.5.3.2.2 Her Majesty is unable to procure an exemption from VAT in respect of the Work;

2.5.3.2.3 the Contractor agrees to render every reasonable assistance to Her Majesty in obtaining reimbursement of all VAT paid in respect of the Work from the appropriate Government Agency;

2.5.3.2.4 the VAT is shown separately on all of the Contractor's invoices and progress claims; and

2.5.3.2.5 the Contractor agrees to remit to the appropriate Government Agency any amounts of VAT legally required to be remitted by the Contractor pursuant to applicable tax laws.

2.4.4 Price Breakdown

Her Majesty reserves the right to request a breakdown of the components of the Tender Form should it believe that the price is unreasonable. Failure to provide an adequate breakdown, describing the rationale and assumptions used to determine the cost of each component of the Work, may lead to disqualification.

2.5 BASIS OF SELECTION

2.5.1 To be declared responsive, a bid must:

- a. comply with all the requirements of the bid solicitation; and
- b. meet all mandatory criteria.

2.5.2 Bids not meeting (a) or (b) will be declared non-responsive.

2.5.3 The selection will be based on the highest responsive combined rating of technical merit and price. The ratio will be 60 % for the technical merit and 40 % for the price.

2.5.4 To establish the technical merit score, the overall technical score for each responsive bid will be determined as follows: total number of points obtained / maximum number of points available multiplied by the ratio of 60 %.

2.5.5 To establish the pricing score, each responsive bid will be prorated against the lowest evaluated price and the ratio of 40 %.

2.5.6 For each responsive bid, the technical merit score and the pricing score will be added to determine its combined rating.

2.5.7 In the case of a tie for the highest total score, the Proponent submitting the lowest price will be selected. In the case of a tie for the total score and a tie for the price proposal score, the Proponent

with the highest score for the "Technical Proposal" will be selected.

- 2.5.8** Neither the responsive bid obtaining the highest technical score nor the one with the lowest evaluated price will necessarily be accepted. The responsive bid with the highest combined rating of technical merit and price will be recommended for award of a contract.

The table below illustrates an example where all three bids are responsive and the selection of the Contractor is determined by a 60/40 ratio of technical merit and price, respectively. The total available points equals 135 and the lowest evaluated price is \$45,000 (45).

Basis of Selection - Highest Combined Rating Technical Merit (60%) and Price (40%)

		Proponent 1	Proponent 2	Proponent 3
Overall Technical Score		115/135	89/135	92/135
Bid Evaluated Price		\$55,000.00	\$50,000.00	\$45,000.00
Calculations	Technical Merit Score	$115/135 \times 60 = 51.11$	$89/135 \times 60 = 39.56$	$92/135 \times 60 = 40.89$
	Pricing Score	$45/55 \times 40 = 32.73$	$45/50 \times 40 = 36.00$	$45/45 \times 40 = 40.00$
Combined Rating		83.84	75.56	80.89
Overall Rating		1st	3rd	2nd

2.6 PHASED BID COMPLIANCE PROCESS (PBCP)

2.6.1 General

- (a) Her Majesty is conducting the PBCP described below for this requirement.
- (b) Notwithstanding any review by Her Majesty at Phase I or II of the PBCP, Proponents are and will remain solely responsible for the accuracy, consistency and completeness of their Bids and Her Majesty does not undertake, by reason of this review, any obligations or responsibility for identifying any or all errors or omissions in Bids or in responses by a Proponent to any communication from Her Majesty.

The Proponent acknowledges that the reviews in Phase I and II of this PBCP are preliminary and do not preclude a finding in Phase III that the bid is non-responsive, even for mandatory requirements which were subject to review in Phase I or II and notwithstanding that the bid had been found responsive in such earlier phase. Her Majesty may deem a bid to be non-responsive to a mandatory requirement at any phase.

The Proponent also acknowledges that its response to a notice or a Compliance Assessment Report (CAR) (each defined below) in Phase I or II may not be successful in rendering its bid responsive to the mandatory requirements that are the subject of the notice or CAR, and may render its bid non-responsive to other mandatory requirements.

- (c) Her Majesty may, in its discretion, request and accept at any time from a Proponent and consider as part of the Bid, any information to correct errors or deficiencies in the Bid that are clerical or administrative, such as, without limitation, failure to sign the Bid or any part or to checkmark a box in a form, or other failure of format or form or failure to acknowledge; failure to provide a procurement business number or contact information such as names, addresses and telephone numbers; inadvertent errors in numbers or calculations that do not change the amount the Proponent has specified as the price or of any component thereof that is subject to evaluation. This shall not

limit Her Majesty’s right to request or accept any information after the bid solicitation closing in circumstances where the bid solicitation expressly provides for this right. The Proponent will have the time period specified in writing by Her Majesty to provide the necessary documentation. Failure to meet this deadline will result in the Bid being declared non-responsive.

- (d) The PBCP does not limit Her Majesty’s rights to request or accept any information during the solicitation period or after bid solicitation closing in circumstances where the bid solicitation expressly provides for this right, or in the circumstances described in subsection (c).
- (e) Her Majesty will send any Notice or CAR by any method Her Majesty chooses, in its absolute discretion. The Proponent must submit its response by the method stipulated in the Notice or CAR. Responses are deemed to be received by Her Majesty at the date and time they are delivered to Her Majesty by the method and at the address specified in the Notice or CAR. An email response permitted by the Notice or CAR is deemed received by Her Majesty on the date and time it is received in Her Majesty’s email inbox at Her Majesty’s email address specified in the Notice or CAR. A Notice or CAR sent by Her Majesty to the Proponent at any address provided by the Proponent in or pursuant to the Bid is deemed received by the Proponent on the date it is sent by Her Majesty. Her Majesty is not responsible for late receipt by Her Majesty of a response, however caused.

2.6.2 Phase I: Financial Bid

- (a) After the closing date and time of this bid solicitation, Her Majesty will examine the Bid to determine whether it includes a Financial Bid and whether any Financial Bid includes all information required by the solicitation. Her Majesty’s review in Phase I will be limited to identifying whether any information that is required under the bid solicitation to be included in the Financial Bid is missing from the Financial Bid. This review will not assess whether the Financial Bid meets any standard or is responsive to all solicitation requirements.
- (b) Her Majesty’s review in Phase I will be performed by officials of the Department of Foreign Affairs, Trade and Development Canada.
- (c) If Her Majesty determines, in its absolute discretion that there is no Financial Bid or that the Financial Bid is missing all of the information required by the bid solicitation to be included in the Financial Bid, then the Bid will be considered non-responsive and will be given no further consideration.
- (d) For Bids other than those described in c), Her Majesty will send a written notice to the Proponent (“Notice”) identifying where the Financial Bid is missing information. A Proponent, whose Financial Bid has been found responsive to the requirements that are reviewed at Phase I, will not receive a Notice. Such Proponents shall not be entitled to submit any additional information in respect of their Financial Bid.
- (e) The Proponents who have been sent a Notice shall have the time period specified in the Notice (the “Remedy Period”) to remedy the matters identified in the Notice by providing to Her Majesty, in writing, additional information or clarification in response to the Notice. Responses received after the end of the Remedy Period will not be considered by Her Majesty, except in circumstances and on terms expressly provided for in the Notice.
- (f) In its response to the Notice, the Proponent will be entitled to remedy only that part of its Financial Bid which is identified in the Notice. For instance, where the Notice states that a required line item has been left blank, only the missing information may be added to the Financial

Bid, except that, in those instances where the addition of such information will necessarily result in a change to other calculations previously submitted in its Financial Bid, (for example, the calculation to determine a total price), such necessary adjustments shall be identified by the Proponent and only these adjustments shall be made. All submitted information must comply with the requirements of this solicitation.

- (g) Any other changes to the Financial Bid submitted by the Proponent will be considered to be new information and will be disregarded. There will be no change permitted to any other Section of the Proponent’s Bid. Information submitted in accordance with the requirements of this solicitation in response to the Notice will replace, in full, only that part of the original Financial Bid as is permitted above, and will be used for the remainder of the bid evaluation process.
- (h) Her Majesty will determine whether the Financial Bid is responsive to the requirements reviewed at Phase I, considering such additional information or clarification as may have been provided by the Proponent in accordance with this Section. If the Financial Bid is not found responsive for the requirements reviewed at Phase I to the satisfaction of Her Majesty, then the Bid shall be considered non-responsive and will receive no further consideration.
- (i) Only Bids found responsive to the requirements reviewed in Phase I to the satisfaction of Her Majesty, will receive a Phase II review.

2.6.3 Phase II: Technical Bid

- (a) Her Majesty’s review at Phase II will be limited to a review of the Technical Bid to identify any instances where the Proponent has failed to meet any Eligible Mandatory Criterion. This review will not assess whether the Technical Bid meets any standard or is responsive to all solicitation requirements. Eligible Mandatory Criteria are all mandatory technical criteria that are identified in this solicitation as being subject to the PBCP. Mandatory technical criteria that are not identified in the solicitation as being subject to the PBCP, will not be evaluated until Phase III.
- (b) Her Majesty will send a written notice to the Proponent (Compliance Assessment Report or “CAR”) identifying any Eligible Mandatory Criteria that the Bid has failed to meet. A Proponent whose Bid has been found responsive to the requirements that are reviewed at Phase II will receive a CAR that states that its Bid has been found responsive to the requirements reviewed at Phase II. Such Proponent shall not be entitled to submit any response to the CAR.
- (c) A Proponent shall have the period specified in the CAR (the “Remedy Period”) to remedy the failure to meet any Eligible Mandatory Criterion identified in the CAR by providing to Her Majesty in writing additional or different information or clarification in response to the CAR. Responses received after the end of the Remedy Period will not be considered by Her Majesty, except in circumstances and on terms expressly provided for in the CAR.
- (d) The Proponent’s response must address only the Eligible Mandatory Criteria listed in the CAR as not having been achieved, and must include only such information as is necessary to achieve such compliance. Any additional information provided by the Proponent which is not necessary to achieve such compliance will not be considered by Her Majesty, except that, in those instances where such a response to the Eligible Mandatory Criteria specified in the CAR will necessarily result in a consequential change to other parts of the Bid, the Proponent shall identify such additional changes, provided that its response must not include any change to the Financial Bid.
- (e) The Proponent’s response to the CAR should identify in each case the Eligible Mandatory Criterion in the CAR to which it is responding, including identifying in the corresponding section

of the original Bid, the wording of the proposed change to that section, and the wording and location in the Bid of any other consequential changes that necessarily result from such change. In respect of any such consequential change, the Proponent must include a rationale explaining why such consequential change is a necessary result of the change proposed to meet the Eligible Mandatory Criterion. It is not up to Her Majesty to revise the Proponent's Bid, and failure of the Proponent to do so in accordance with this subparagraph is at the Proponent's own risk. All submitted information must comply with the requirements of this solicitation.

- (f) Any changes to the Bid submitted by the Proponent other than as permitted in this solicitation, will be considered to be new information and will be disregarded. Information submitted in accordance with the requirements of this solicitation in response to the CAR will replace, in full, only that part of the original Bid as is permitted in this Section.
- (g) Additional or different information submitted during Phase II permitted by this section will be considered as included in the Bid, but will be considered by Her Majesty in the evaluation of the Bid at Phase II only for the purpose of determining whether the Bid meets the Eligible Mandatory Criteria. It will not be used at any Phase of the evaluation to increase or decrease any score that the original Bid would achieve without the benefit of such additional or different information. For instance, an Eligible Mandatory Criterion that requires a mandatory minimum number of points to achieve compliance will be assessed at Phase II to determine whether such mandatory minimum score would be achieved with such additional or different information submitted by the Proponent in response to the CAR. If so, the Bid will be considered responsive in respect of such Eligible Mandatory Criterion, and the additional or different information submitted by the Proponent shall bind the Proponent as part of its Bid, but the Proponent's original score, which was less than the mandatory minimum for such Eligible Mandatory Criterion, will not change, and it will be that original score that is used to calculate any score for the Bid
- (h) Her Majesty will determine whether the Bid is responsive for the requirements reviewed at Phase II, considering such additional or different information or clarification as may have been provided by the Proponent in accordance with this Section. If the Bid is not found responsive for the requirements reviewed at Phase II to the satisfaction of Her Majesty, then the Bid shall be considered non-responsive and will receive no further consideration.
- (i) Only Bids found responsive to the requirements reviewed in Phase II to the satisfaction of Her Majesty, will receive a Phase III evaluation.

2.6.4 Phase III: Final Evaluation of the Bid

- (a) In Phase III, Her Majesty will complete the evaluation of all Bids found responsive to the requirements reviewed at Phase II. Bids will be assessed in accordance with the entire requirement of the bid solicitation including the technical and financial evaluation criteria.
- (b) A Bid is non-responsive and will receive no further consideration if it does not meet all mandatory evaluation criteria of the solicitation.

2.6.5 Technical Evaluation

2.6.5.1 The Phased Bid Compliance Process will apply to all mandatory technical criteria.

SECTION "III" – TENDER FORM

CONTACT INFORMATION

Name of Firm: _____

Address: _____

Contact Person: _____

Phone number: (____) ____-____ Fax number: (____) ____-____

Email: _____

The **TOTAL PRICE (exclusive of VAT)** will be used for evaluation purposes.

Initial Work + Optional Work #1 + Optional Work #2 = Total Price

TF1 **FIXED PRICE**

Fixed Price (*exclusive of VAT*): _____
(Initial Work)

Fixed Price (*exclusive of VAT*): _____
(Optional Work #1)

Fixed Price (*exclusive of VAT*): _____
(Optional Work #2)

TOTAL PRICE (*exclusive of VAT*): _____
(Initial Work + Optional Works)

Applicable taxes: _____
(Initial Work + Optional Works)

All amounts are in Indian Rupees currency (INR).

TF3 ACCEPTANCE AND ENTRY INTO CONTRACT

I/We undertake, within fourteen (14) calendar days of receipt of notification of acceptance of my/our bid, to sign a contract contained in the RFP incorporating all the relative elements of this project, for the performance of the Work provided I/We are notified, by Her Majesty, of the acceptance of my/our bid within one hundred and twenty (120) days of the tender closing date.

TF4 CONSTRUCTION TIME

I/We agree to complete the Work within the time stipulated in the specification from the date of notification of acceptance of my/our bid.

TF5 INSURANCE

Within fourteen (14) calendar days after receipt of written notification of acceptance of my/our bid, I/We will furnish an insurance certificate in accordance with article C9 respectively of the draft Construction Contract.

SIGNED, ATTESTED TO AND DELIVERED on the _____ day of _____ on behalf of:

Print the legal name of the Proponent

Signature of authorized signatory

Signature of authorized signatory

Print name(s) & titles of authorized signatory

Print name(s) & titles of authorized signatory

Signature of Witness

SECTION "IV" - GENERAL INSTRUCTIONS

G11 RESPONSIVENESS

- 1.1 For a proposal to be considered valid, it must comply with all the requirements of this RFP identified as mandatory. Mandatory criteria are also expressed by using imperative verbs such as "shall", "must" and "will".

G12 ENQUIRIES - SOLICITATION STAGE

- 2.1 All enquiries or issues concerning this RFP must be submitted in writing to the Contract Advisor as early as possible within the solicitation period. Enquiries and issues must be received within the timeframe described in article A10 to allow sufficient time to provide a response. Enquiries received after that time will not be answered prior to the Closing Date.
- 2.2 To ensure consistency and quality of information provided to Proponents, the Contract Advisor will give notice, in the same manner as this RFP, of any additional information in response to significant enquiries received without revealing the sources of the enquiries.
- 2.3 All enquiries and other communications with government officials throughout the solicitation period shall be directed ONLY to the Contract Advisor named herein. Non-compliance with this condition during the solicitation period may (for that reason alone) result in the disqualification of your proposal.

G13 PROPONENT'S SUGGESTED IMPROVEMENTS DURING SOLICITATION PERIOD

- 3.1 Should any Proponent consider that the specifications or Statement of Work contained in this RFP can be improved technically or technologically, the Proponent is invited to make suggestions, in writing, to the Contract Advisor named herein. The Proponent must clearly outline the suggested improvements as well as the reason for the suggestion. Suggestions which do not restrict the level of competition nor favour a particular Proponent will be given consideration provided they are received by the Contract Advisor within the timeframe described in A10 to allow sufficient time to provide a response. Her Majesty reserves the right to accept or reject any or all suggestions.

G14 PROPOSAL PREPARATION COST

- 4.1 The costs, including travel incurred by the Proponent in the preparation of its proposal and/or the negotiation (if applicable) of any resulting contract will be the sole responsibility of the Proponent and will not be reimbursed by Her Majesty.

G15 PROPOSAL DELIVERY

- 5.1 Proposals and/or amendments thereto, will only be accepted by the Minister if they are received at the address indicated in A7, on or before the Closing Date and Time specified in A7.
- 5.2 Responsibility for proposal delivery: The Proponent has sole responsibility for the timely receipt of a proposal by Her Majesty and cannot transfer this responsibility to the Government of Canada. Her Majesty will not assume responsibility for proposals that are directed to an email address other than the one stipulated in A7.

G16 VALIDITY OF PROPOSAL

- 6.1 Any proposal must remain open for acceptance for a period of not less than one hundred and twenty (120) calendar days after the Closing Date.

G17 RIGHTS OF CANADA

- 7.1 Her Majesty reserves the right:
- 7.1.1 during the evaluation, to submit questions to or conduct interviews with Proponents, at Proponents cost, upon forty eight (48) hours written notice, to seek clarification or to verify any or all information provided by the Proponent with respect to this RFP;
- 7.1.2 to reject all proposals received in response to this RFP if it/they fail to meet the objectives of the requirement within the boundaries imposed by Her Majesty's different stakeholders;
- 7.1.3 to accept any proposal in whole or in part without prior negotiation;
- 7.1.4 to cancel and/or re-issue this RFP at any time;
- 7.1.5 to award one or more contracts, if applicable;
- 7.1.6 to retain all proposals submitted in response to this RFP;
- 7.1.7 not to accept any deviations from the stated terms and conditions;
- 7.1.8 to incorporate all, or any portion of the Statement of Work, Request for Proposals and the successful proposal in any resulting contract; and
- 7.1.9 not to contract at all.

G18 INCAPACITY TO CONTRACT WITH GOVERNMENT

- 8.1 Canada may reject a proposal where the Proponent, including the Proponent's officers, agents and employees, has been convicted of an offence under the following provisions of the Criminal Code:
- 8.1.1 Section 121, Frauds upon the Government;
- 8.1.2 Section 124, Selling or Purchasing Office; or
- 8.1.3 Section 418, Selling Defective Stores to Her Majesty.
- (Subsection 750 (3) of the Criminal Code prohibits anyone who has been so convicted from holding public office, contracting with the government or benefiting from a government contract.)
- 8.2 Where Canada intends to reject a proposal pursuant to a provision of paragraph 8.1, the Contract Advisor will so inform the Proponent and provide the Proponent ten (10) calendar days within which to make representations, prior to making a final decision on the proposal rejection.

G19 INCURRING OF COST

- 9.1 No costs incurred before receipt of a signed Contract or specified written authorization from the Contract Advisor can be charged to any resulting Contract. In addition, the Contractor is not to perform Work in excess of or outside the scope of any resulting Contract based on verbal or written requests or instructions from any government personnel other than the Contract Advisor. The Proponent's attention is drawn to the fact that the Contract Advisor is the only authority which can commit Her Majesty to the expenditure of the funds for this requirement.

G110 PROPERTY OF HER MAJESTY

- 10.1 All correspondence, documents and information provided to the Minister by any Proponent in connection with this RFP will become the property of Her Majesty and may be released pursuant to the Canadian Federal Access to Information Act and the Privacy Act.

GI11 RIGHTS OF UNSUCCESSFUL PROPONENTS

11.1 Proponents are reminded that all materials submitted by them in either paper or electronic form, including architectural and engineering design drawings, specifications, photographs, etc. shall, upon opening of the proposal by Canadian officials become the property of the Canadian government. In consequence, they will not be returned to the unsuccessful Proponents of this tender competition. The keeping of such information by Canada is necessary to ensure that, in the event of a future internal audit of the tender process, or in the event of a challenge by one of the unsuccessful Proponents to this tender process, all the documents submitted by competing Proponents are available and not tampered with. Nevertheless, complete copyright in those materials will of course remain with the copyright owners of the materials submitted; Canada assures Proponents that it will at no time use those materials for any commercial purposes without the written consent of the authors.

GI12 PRICE SUPPORT

12.1 In the event that the Proponent's bid is the sole responsive proposal received, the Proponent must provide, on the Minister's request, one or more of the following price support if applicable:

- 12.1.1** a current published price list indicating the percentage discount available to the Minister;
- 12.1.2** copies of paid invoices for like services performed for other customers or for like items (same quantity and quality) sold to other customers;
- 12.1.3** a price breakdown showing the cost of direct labour, direct materials, purchased items, engineering and plant overheads, general and administrative overhead, transportation, etc., profit;
- 12.1.4** price or rate certification; and
- 12.1.5** any other supporting documentation as requested by the Minister.

GI13 PROPONENTS NOT TO PROMOTE THEIR INTEREST IN THIS PROJECT

13.1 Proponents must not make any public comment, respond to questions in a public forum or carry out any activities to publicly promote or advertise their interest in this Project, except for their response to Her Majesty pursuant to this RFP.

GI14 ACCEPTANCE OF BIDS

14.1 Proponents must meet and adhere to the architectural and design standards contained in the bid documentation.

14.2 Proponents must submit a list of sub-contractors on TF2 they propose to use on the Works. The successful Proponent shall not be allowed any subsequent substitution of the submitted list of sub-contractors, unless authorized, in advance in writing by Her Majesty.

GI15 SIGNATURES

15.1 The following requirements are to be adhered to when signing the Tender Form:

15.1.1 Corporation

The signatures of the authorized signatories shall be affixed and their names and titles typed or printed.

15.1.2 Partnership

The signatures of the partners shall be affixed and their names typed or printed. If not all of the partners sign or if the signatory is not a partner then a certified true copy of the agreement signed by all partners authorizing such person or persons to execute the document on their behalf shall accompany the bid.

15.1.3 Sole Proprietorship

The signature of the sole proprietor shall be affixed and the name typed or printed. In the event that the signatory is not the sole proprietor then a certified true copy of the agreement signed by the sole proprietor authorizing such person or persons to execute the document shall accompany the bid.

15.1.4 Joint Venture

The signatures of the authorized signatories of each member of the joint venture shall be affixed and their names and titles typed or printed. Each of the participating signatories shall sign the document in the manner applicable to their particular business arrangement which is more particularly described in 15.1.1 to 15.1.3 above.

GI16 RETURN OF DOCUMENTS

16.1 Unsuccessful Proponents must, if requested by the Contract Advisor, return all bid documents (e.g. Working Drawings, Specifications and Bills of Quantities) intact and in good condition within fourteen (14) calendar days of notification. Any copies of the Working Drawings, Specifications and Bill of Quantities are to be returned along with the original bid documents.

GI17 PROPONENT'S CONFERENCE

17.1 Proponents, or their representative(s), are requested to attend a Proponent's conference as described in A9. during which the requirements outlined in this RFP document will be reviewed and any questions will be answered.

17.2 Proponents are advised that any clarifications or changes resulting from the Proponents' conference shall be included as an amendment to the bid solicitation document.

17.3 No expenses will be reimbursed by Her Majesty pursuant to the Proponent's Conference.

GI18 INTERPRETATION

In this RFP, “Her Majesty”, “the Minister” or “Canada” means Her Majesty the Queen in right of Canada, as represented by the Minister of Foreign Affairs.



C. ARTICLES OF AGREEMENT

C1. DEPARTMENTAL REPRESENTATIVE

[Information to be provided at contract award]

DRAFT

Construction Contract

Between

Her Majesty the Queen in right of Canada
(referred to herein as "Her Majesty")
represented by the Minister of Foreign Affairs
(referred to herein as the "Minister")

and

[Information to be provided at contract award]
(referred to herein as the "Contractor")

for

Performance of the Work described in
Appendix "A" – Statement of Work.

C2. TITLE Mechanical and Electrical Upgrades, New Delhi, India		
C3. CONTRACT PERIOD Start: contract award date Completion Date: July 31, 2021		
C4. CONTRACT NUMBER	C5. PROJECT NUMBER B-DELHI-116	C6. DATE
C7. CONTRACT DOCUMENTS <ol style="list-style-type: none"> 1. Articles of Agreement 2. Supplementary Conditions (Section "I") 3. Terms of Payment (Section "II") 4. General Conditions (Section "III") 5. Insurance Conditions (Section "IV") 6. Statement of Work 7. Drawings and Specifications 8. Photographs 9. Security Requirements Check List 10. Contractor's Proposal <p>In the event of discrepancies, inconsistencies or ambiguities of the wording of these documents, the document that appears first on the above list shall prevail.</p>		
C8. CONTRACT AMOUNT Her Majesty shall pay the Contractor a fixed amount of ₹ ____. The Fixed Price is: <ol style="list-style-type: none"> a. inclusive of all applicable duties, costs and taxes (other than contractor's Output VAT payable on the Contract price). b. Exclusive of VAT. c. In Indian Rupees currency. <p>Payments shall be made in accordance with Section "II" Terms of Payment.</p>		
C9. INSURANCE The Contractor shall provide a comprehensive general liability insurance of \$1,000,000 CAD in accordance with the Insurance Conditions (Section "IV").		
C10. CONTRACT SECURITY Not applicable.		
C11. MOBILIZATION ADVANCE Not applicable.		
C12. HOLDBACK Her Majesty shall withhold a holdback, as described in article TP4.4, of 10% of all progress payments.		
C13. INVOICES A copy is to be sent to Departmental Representative showing: <ol style="list-style-type: none"> a. the amount of the progress payment being claimed for Work satisfactorily performed; b. the amount for any tax (including VAT) calculated in accordance with the applicable legislation; c. the date; d. the name and address of the consignee; e. description of the Work performed; f. the project name; and g. the contract number. 		
C14. GOVERNING LAWS Laws in force in the Province of Ontario, Canada.		
FOR THE CONTRACTOR _____ SIGNATURE _____ PRINT NAME AND CAPACITY		DATE _____ DATE
FOR THE MINISTER _____ SIGNATURE _____ PRINT NAME AND CAPACITY		
		CORPORATE SEAL

SECTION "I" – SUPPLEMENTARY CONDITIONS**1. SECURITY REQUIREMENTS**

The Contractor and/or all other personnel involved in the Work must be properly supervised on the premises of the Mission, Official Residence or Staff quarter. No access to the restricted zones of the Mission will be permitted.

2. HEALTH AND SAFETY

The Contractor must comply with all requirements of applicable Canadian (federal, provincial, municipal), foreign and local environmental, health and safety laws and regulations. The Contractor must follow the prevention and infection control measures of the workplace or put in place by the Canadian mission (i.e. practise physical distancing, practise proper hand washing, avoid touching face with unwashed hands, etc.) and follow the proper protocols to complete the required work such as utilizing the appropriate equipment and personal protective equipment (PPE) as necessary. The Contractor is responsible for all costs associated with the compliance to protective measures and any other costs related to the general health and safety of its employees and agents.

3. OPTIONAL WORK

The Contractor grants to Canada the irrevocable option to acquire the services described in the Statement of Work of the Contract under the same conditions and at the prices stated in the Contract. The option may only be exercised by the Contract Authority and will be evidenced, for administrative purposes only, through a contract amendment.

The Contract Authority may exercise the option at any time before the expiry of the Contract by sending a written notice to the Contractor.

4. TRAVEL AND LIVING EXPENSES

The Contractor will be reimbursed its authorized travel and living expenses reasonably and properly incurred in the performance of the Work, at cost, without any allowance for profit and/or administrative overhead, in accordance with the meal, and private vehicle allowances specified in Appendices B, C and D of the National Joint Council Travel Directive, and with the other provisions of the directive referring to "travellers", rather than those referring to "employees". Canada will not pay the Contractor any incidental expense allowance for authorized travel.

All travel must have the prior authorization of the Project Authority.

All payments are subject to government audit.

SECTION "II" – TERMS OF PAYMENT**TP1 AMOUNT PAYABLE - GENERAL**

- 1.1** Subject to any other provisions of this Contract, Her Majesty shall pay the Contractor, at the times and in the manner hereinafter set out, the amount by which:
- 1.1.1** the aggregate of the amounts described in TP2 exceeds; and
 - 1.1.2** the aggregate of the amounts described in TP3;
- and the Contractor shall accept that amount as payment in full satisfaction for everything furnished and done by him in respect of the Work to which the payment relates.
- 1.2** Subject to any other provisions in this Contract, "Days" shall mean continuous calendar days including weekends and statutory public holidays.

TP2 AMOUNT PAYABLE TO THE CONTRACTOR

- 2.1** The amounts referred to in TP1.1.1 are the aggregate of:
- 2.1.1** The contract amount referred to in C8 of the Articles of Agreement; and
 - 2.1.2** The amounts, if any, that are payable to the Contractor pursuant to the General Conditions.

TP3 AMOUNT PAYABLE TO HER MAJESTY

- 3.1** The amounts referred to in TP1.1.2 are the aggregate of the amounts, if any, that the Contractor is liable to pay Her Majesty pursuant to the Contract.
- 3.2** When making any payment to the Contractor, the failure of Her Majesty to deduct an amount referred to in TP3.1 from an amount referred to in TP2 shall not constitute a waiver of the right to do so, or an admission of lack of entitlement to do so in any subsequent payment to the Contractor.

TP4 TIME OF PAYMENT

- 4.1** In these Terms of Payment:
- 4.1.1** The "payment period" means a period of thirty (30) consecutive days or such other longer period as is agreed between the Contractor and the Departmental Representative;
 - 4.1.2** An amount is "due and payable" when it is due and payable by Her Majesty to the Contractor according to TP4.4, TP4.7 or TP4.10;
 - 4.1.3** An amount is overdue when it is unpaid on the first day following the day upon which it is due and payable;
 - 4.1.4** The "date of payment" means the date of the negotiable instrument of an amount due and payable by the Receiver General for Canada and given for payment; and
 - 4.1.5** The "Bank Rate" means the discount rate of interest set by the Bank of Canada in effect at the opening of business on the date of payment.

Progress Payments

- 4.2** The Contractor shall, on the expiration of a payment period, deliver to the Departmental Representative in respect of that payment period a written progress claim in a form acceptable to the Departmental Representative that fully describes any part of the Work that has been completed (including its percentage of the total Work), and any material that was delivered to the work site but not incorporated into the Work, during that payment period.
- 4.3** The Departmental Representative shall, not later than ten days after receipt by him of a progress claim referred to in TP4.2:
- 4.3.1** Inspect, or cause to have inspected, the part of the Work and the material described in the progress claim; and
 - 4.3.2** Determine the value of the part of the Work and the material described in the progress claim that, in the opinion of the Departmental Representative:
 - 4.3.2.1** is in accordance with the Contract, and
 - 4.3.2.2** was not paid for in any other progress claim relating to the Contract.

- 4.4 Subject to TP1 and TP4.5 Her Majesty shall, no later than thirty (30) days after the receipt by the Departmental Representative of a progress claim referred to in TP4.2, pay the Contractor an amount that is equal to the value that is determined under TP4.3.2 less a holdback as stated in C12.
- 4.5 It is a condition precedent to Her Majesty's obligation under TP4.4 that the Contractor has made and delivered to the Departmental Representative a statutory declaration in respect of a progress claim referred to in TP4.2.
- 4.6 A statutory declaration referred to in TP4.5 shall contain a deposition by the Contractor that up to the date immediately preceding the Contractor's latest progress claim, all lawful obligations of the Contractor with regard to subcontractors and suppliers of material in respect of the Work under the Contract have been fully discharged.

Interim Certificate of Completion

- 4.7 Subject to TP1 and TP4.8, Her Majesty shall, not later than thirty (30) days after the date of issue of an Interim Certificate of Completion referred to in GC44.2, pay to the Contractor an amount that is equal to the amount referred to in TP1, less the aggregate of:
- 4.7.1 An amount that is equal to the Departmental Representative's estimate of the cost to Her Majesty of rectifying defects and deficiencies described in the Interim Certificate of Completion; and
- 4.7.2 an amount that is equal to the total of all payments made by Her Majesty under TP4.4.
- 4.8 It is a condition precedent to Her Majesty's obligation under TP4.7 that the Contractor has made and delivered to the Departmental Representative a statutory declaration described in TP4.9 in respect of an Interim Certificate of Completion referred to in GC44.2.
- 4.9 A statutory declaration referred to in TP4.8 shall contain a deposition by the Contractor that up to the date of the Interim Certificate of Completion the Contractor has:
- 4.9.1 Discharged all of the Contractor's lawful obligations to the subcontractors and suppliers of material in respect of the Work under the Contract; and
- 4.9.2 Discharged the Contractor's obligations referred to in GC14.6.

Final Certificate of Completion

- 4.10 Subject to TP1 and TP4.11, Her Majesty shall, not later than sixty (60) days after the date of issue of a Final Certificate of Completion referred to in GC44.1, pay the Contractor the amount referred to in TP1 less the sum of all payments that were made pursuant to TP4.4 and TP4.7.
- 4.11 It is a condition precedent to Her Majesty's obligation under TP4.10 that the Contractor has made and delivered a statutory declaration described in TP4.12 to the Departmental Representative.
- 4.12 A statutory declaration referred to in TP4.11 shall, in addition to the depositions described in TP4.9, contain a deposition by the Contractor that all of the Contractor's lawful obligations and any lawful claims against the Contractor that arose out of the performance of the Contract have been discharged and satisfied.

TP5 PROGRESS REPORT AND PAYMENT THEREUNDER NOT BINDING ON HER MAJESTY

Neither a progress claim referred to in TP4.3 nor any payment made by Her Majesty pursuant to these Terms of Payment shall be construed as an admission by Her Majesty that the Work, material or any part thereof is complete, is satisfactory or is in accordance with the Contract.

TP6 DELAY IN MAKING PAYMENT

- 6.1 Notwithstanding GC7 any delay by Her Majesty in making any payment when it is due pursuant to these Terms of Payment shall not be a breach of the Contract by Her Majesty.
- 6.2 Her Majesty shall be liable to pay to the Contractor simple interest at the average Bank Rate as defined in TP9.2.2 plus three percent (3%) per annum on any amount that is overdue, from the date such amount becomes overdue until the day prior to the date of payment, inclusive. No interest will be payable or paid in respect of payment unless the Contractor so requests after payment has become due.

6.3 Interest shall not be payable or paid unless the amount referred to in TP6.2 has been overdue for more than fifteen (15) days following:

6.3.1 The date the said amount became due and payable; or

6.3.2 The receipt by the Departmental Representative of the statutory declaration referred to in TP4.5, TP4.8 or TP4.11; whichever is the later, and

6.3.3 Interest shall not be payable or paid on overdue advance payments if any.

TP7 RIGHT OF SET-OFF

7.1 Without limiting any right of set-off or deduction given or implied by law or elsewhere in the Contract, Her Majesty may set-off any amount payable to Her Majesty by the Contractor under this Contract or under any current contract against any amount payable to the Contractor under this Contract.

7.2 For the purposes of TP7.1, "current contract" means a contract between Her Majesty and the Contractor:

7.2.1 under which the Contractor has an undischarged obligation to perform or supply work, labour or material; or

7.2.2 In respect of which Her Majesty has, since the date on which the Articles of Agreement were made, exercised any right to take the Work that is the subject of the Contract out of the Contractor's hands.

TP8 PAYMENT IN EVENT OF TERMINATION

If the Contract is terminated pursuant to GC41, Her Majesty shall pay the Contractor any amount that is lawfully due and payable to the Contractor as soon as is practicable under the circumstances.

TP9 INTEREST ON SETTLED CLAIMS

9.1 Her Majesty shall pay to the Contractor simple interest on the amount of a settled claim at an average Bank of Canada Rate plus one and a quarter percent (1.25%) from the date the settled claim was outstanding until the day prior to the date of payment.

9.2 For the purposes of TP9.1:

9.2.1 A claim is deemed to have been settled when an agreement in writing is signed by the Departmental Representative and the Contractor setting out the amount of the claim to be paid by Her Majesty and the items of work for which the said amount is to be paid.

9.2.2 An "average Bank Rate" means the discount rate of interest set by the Bank of Canada in effect at the end of each calendar month averaged over the period the settled claim was outstanding.

9.2.3 A settled claim is deemed to be outstanding from the day immediately following the date the said claim would have been due and payable under the Contract had it not been disputed.

9.2.4 A claim means a disputed amount subject to negotiation between Her Majesty and the Contractor under the Contract.

TP10 TAXES

10.1 If applicable, the VAT or Canadian Goods and Services Tax (GST) is to be shown separately on all invoices and progress claims for Work performed, and will be paid by Her Majesty. The Contractor agrees to remit any GST due to Revenue Canada.

10.2 The Government of Canada GST registration number is 121491807.

TP11 MOBILIZATION ADVANCE

Not applicable.

SECTION "III" - GENERAL CONDITIONS

GC1 INTERPRETATION**1.1** In the Contract:

- 1.1.1** Where reference is made to a part of the Contract by means of numbers receded by letters, the reference shall be construed to be a reference to the particular part of the Contract that is identified by that combination of letters and numbers and to any other part of the Contract referred to therein;
- 1.1.2** "Contract" means the Contract Documents referred to in the Articles of Agreement;
- 1.1.3** "Contract security" means any security given by the Contractor to Her Majesty in accordance with the Contract;
- 1.1.4** "Days" means continuous calendar days, including weekends and statutory public holidays;
- 1.1.5** "Departmental Representative" means the officer, employee or person engaged by Her Majesty who is designated pursuant to the Articles of Agreement and includes a person specially authorized by him to perform, on his behalf, any of his functions under the Contract and is so designated in writing to the Contractor;
- 1.1.6** "Former Public Office Holder" means an employee of the executive or senior manager categories who was employed by the Canadian federal public service during the period of one (1) year immediately preceding the date of this Contract;
- 1.1.7** "Material" includes all commodities, articles and things required to be furnished by or for the Contractor under the Contract for incorporation into the Work;
- 1.1.8** "Minister" includes a person acting for, or if the office is vacant, in place of the Minister and his successors in the office, and his or their lawful deputy and any of his or their representatives appointed for the purposes of the Contract;
- 1.1.9** "Person" includes, unless the context otherwise requires, a partnership, proprietorship, firm, joint venture, consortium and a corporation;
- 1.1.10** "Plant" includes all animals, tools, implements, machinery, vehicles, buildings, structures, equipment and commodities, articles and things other than material, that are necessary for the due performance of the Contract;
- 1.1.11** "Subcontractor" means a person to whom the Contractor has, subject to GC4, subcontracted the whole or any part of the Work;
- 1.1.12** "Superintendent" means the employee of the Contractor who is designated by the Contractor to act pursuant to GC19;
- 1.1.13** "Technical documentation" means designs, reports, photographs, surveys, drawings, plans, specifications, computer software, computer printouts, calculations and other data, information and material, prepared, collected, computed, drawn, or produced for the Work; and
- 1.1.14** "Work" includes, subject only to any express stipulation in the Contract to the contrary,

everything that is necessary to be done, furnished or delivered by the Contractor to perform the Contract.

- 1.2** The headings in the Contract documents, other than in the Plans and Specifications, form no part of the Contract but are inserted for convenience of reference only.
- 1.3** In interpreting the Contract, in the event of discrepancies or conflicts between anything in the Plans and Specifications and the General Conditions, the General Conditions govern.
- 1.4** Words importing the singular only also include the plural, and vice versa, where the context requires;
- 1.5** Headings or notes in the Contract shall not be deemed to be part thereof, or be taken into consideration in its interpretation;
- 1.6** "Herein," "hereby," "hereof," "hereunder" and similar expressions refer to the Contract as a whole and not to any particular subdivision or part thereof.
- 1.7** In interpreting the Plans and Specifications, in the event of discrepancies or conflicts between:
- 1.7.1** The Plans and Specifications, the Specifications govern;
- 1.7.2** The Plans, the Plans drawn with the largest scale govern; and
- 1.7.3** Figured dimensions and scaled dimensions, the figured dimensions govern.

GC2 SUCCESSORS AND ASSIGNS

The Contract shall inure to the benefit of and be binding upon the parties hereto and their lawful heirs, executors, administrators, successors and assigns.

GC3 ASSIGNMENT OF CONTRACT

The Contract may not be assigned by the Contractor, either in whole or in part, without the written consent of the Minister.

GC4 SUBCONTRACTING BY CONTRACTOR

- 4.1** Subject to this General Condition, the Contractor may subcontract any part of the Work.
- 4.2** The Contractor shall notify the Departmental Representative in writing of his intention to subcontract.
- 4.3** A notification referred to in GC4.2 shall identify the part of the Work, and the subcontractor with whom it is intended to subcontract.
- 4.4** The Departmental Representative may object to the intended subcontracting by notifying the Contractor in writing within six (6) days of receipt by the Departmental Representative of a notification referred to in GC4.2.
- 4.5** If the Departmental Representative objects to a subcontracting pursuant to GC4.4, the Contractor shall not enter into the intended subcontract.
- 4.6** The Contractor shall not, without the written consent of the Departmental Representative, change a subcontractor who has been engaged by him in accordance with this General Condition.
- 4.7** Every subcontract entered into by the Contractor shall adopt all of the terms and conditions of this Contract that are of general application.
- 4.8** Neither a subcontracting nor the Departmental Representative's consent to a subcontracting by the

	Contractor shall be construed to relieve the Contractor from any obligation under the Contract or to impose any liability upon Her Majesty.		express condition of the Contract that no member of the Canadian House of Commons shall be admitted to any share or part of the Contract or to any benefit arising therefrom.
GC5	AMENDMENTS		
	No amendment or change in any of the provisions of the Contract shall have any force or effect until it is reduced to writing and signed by both parties.	GC11	NOTICES
GC6	NO IMPLIED OBLIGATIONS	11.1	Any notice, consent, order, decision, direction or other communication, other than a notice referred to in GC11.4, that may be given to the Contractor pursuant to the Contract may be given in any manner.
6.1	No implied terms or obligations of any kind by or on behalf of Her Majesty shall arise from anything in the Contract and the express covenants and agreements therein contained and made by Her Majesty are the only covenants and agreements upon which any rights against Her Majesty are to be founded.	11.2	Any notice, consent, order, decision, direction or other communication required to be given in writing, to any party pursuant to the Contract shall, subject to GC11.4, be deemed to have been effectively given:
6.2	The Contract supersedes all communications, negotiations and agreements, either written or oral, relating to the Work that were made prior to the date of the Contract.	11.2.1	to the Contractor, if delivered personally to the Contractor or the Contractor's superintendent, or forwarded by mail, email or facsimile to the Contractor at the address set out in the Articles of Agreement; or
GC7	TIME OF THE ESSENCE	11.2.2	to Her Majesty, if delivered personally to the Departmental Representative, or forwarded by mail, email or facsimile to the Departmental Representative at the address set out in C1.
	Time is of the essence of the Contract.	11.3	Any such notice, consent, order, decision, direction or other communication given in accordance with GC11.2 shall be deemed to have been received by either party:
GC8	INDEMNIFICATION BY CONTRACTOR	11.3.1	If delivered personally, on the day that it was delivered;
8.1	The Contractor shall indemnify and save Her Majesty harmless from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings by whomever made, brought or prosecuted and in any manner based upon, arising out of, related to, occasioned by or attributable to the activities of the Contractor, his servants, agents, subcontractors and sub-subcontractors in performing the Work including an infringement or an alleged infringement of a patent of invention or any other kind of intellectual property.	11.3.2	If forwarded by mail, on the earlier of the day it was received and the sixth (6 th) day after it was mailed; and
8.2	For the purposes of GC8.1, "activities" includes any act improperly carried out, any omission to carry out an act and any delay in carrying out an act.	11.3.3	If forwarded by email or facsimile, twenty-four (24) hours after it was transmitted.
GC9	INDEMNIFICATION BY HER MAJESTY	11.4	A notice given under GC38.1.1, GC40 and GC41, if delivered personally, shall be delivered to the Contractor if the Contractor is doing business as a sole proprietor or, if the Contractor is a partnership or corporation, to an officer thereof.
9.1	Her Majesty shall, subject to the Crown Liability Act, the Patent Act, and any other law that affects Her Majesty's rights, powers, privileges or obligations, indemnify and save the Contractor harmless from and against all claims, demands, losses, costs, damage, actions, suits or proceedings arising out of his activities under the Contract that are directly attributable to:	GC12	MATERIAL, PLANT AND REAL PROPERTY SUPPLIED BY HER MAJESTY
9.1.1	Lack of or a defect in Her Majesty's title to the work site whether real or alleged; or	12.1	Subject to GC12.2, the Contractor is liable to Her Majesty for any loss of or damage to material, plant or real property that is supplied or placed in the care, custody and control of the Contractor by Her Majesty for use in connection with the Contract, whether or not that loss or damage is attributable to causes beyond the Contractor's control.
9.1.2	An infringement or an alleged infringement by the Contractor of any patent of invention or any other kind of intellectual property occurring while the Contractor was performing any act for the purposes of the Contract employing a model, plan or design or any other thing related to the Work that was supplied by Her Majesty to the Contractor.	12.2	The Contractor is not liable to Her Majesty for any loss or damage to material, plant or real property referred to in GC12.1 if that loss or damage results from and is directly attributable to reasonable wear and tear.
GC10	MEMBERS OF HOUSE OF COMMONS NOT TO BENEFIT	12.3	The Contractor shall not use any material, plant or real property referred to in GC12.1 except for the purpose of performing this Contract.
	As required by the Parliament of Canada Act, it is an	12.4	If the Contractor fails to make good any loss or damage for which he is liable under GC12.1 within a reasonable time after being required to do so by the Departmental Representative, the Departmental Representative may cause the loss or damage to be

	made good at the Contractor's expense, and the Contractor shall thereupon be liable to Her Majesty for the cost thereof and shall, on demand, pay to Her Majesty an amount equal to that cost.		
12.5	The Contractor shall keep such records of all material, plant and real property referred to in GC12.1 as the Departmental Representative from time to time requires and shall satisfy the Departmental Representative, when requested, that such material, plant and real property are at the place and in the condition in which they ought to be.		
GC13	MATERIAL, PLANT AND REAL PROPERTY BECOME PROPERTY OF HER MAJESTY		
13.1	Subject to GC14.7 all material and plant and the interest of the Contractor in all real property, licences, powers and privileges purchased, used or consumed by the Contractor for the Contract shall become the property of Her Majesty for the purposes of the Work and they shall continue to be the property of Her Majesty:		
13.1.1	In the case of material, until the Departmental Representative indicates that he is satisfied that it will not be required for the Work; and		
13.1.2	In the case of plant, real property, licenses, powers and privileges, until the Departmental Representative indicates that he is satisfied that the interest vested in Her Majesty therein is no longer required for the purposes of the Work.		
13.2	Material or plant that is the property of Her Majesty by virtue of GC13.1 shall not be taken away from the work site or used or disposed of except for the purposes of the Work without the written consent of the Departmental Representative.		
13.3	Her Majesty is not liable for loss of or damage from any cause to the material or plant referred to in GC13.1 and the Contractor is liable for such loss or damage notwithstanding that the material or plant is the property of Her Majesty.		
GC14	PERMITS AND TAXES PAYABLE		
14.1	The Contractor shall, within fifteen (15) days after the date of the Contract, tender to a municipal authority an amount equal to all fees and charges that would be lawfully payable to that municipal authority in respect of building permits as if the Work were being performed for a person other than Her Majesty.		
14.1.1	The Contractor shall be responsible for obtaining and pay for all necessary permits for all the Work to be undertaken under the Contract. He shall give all notices and comply with all laws, rules and regulations bearing on the conduct of the Work as drawn and specified.		
14.2	Within ten (10) days of making a tender pursuant to GC14.1, the Contractor shall notify the Departmental Representative of his action and of the amount tendered and whether or not the municipal authority has accepted that amount.		
14.3	If the municipal authority does not accept the amount tendered pursuant to GC14.1 the Contractor shall pay that amount to Her Majesty within six (6) days after the time stipulated in		
		GC14.2.	
14.4		For the purposes of GC14.1 to GC14.3 "municipal authority" means any authority that would have jurisdiction respecting permission to perform the Work if the owner were not Her Majesty.	
14.5		The Contractor shall pay any and all applicable taxes arising from or relating to the performance of the Work under the Contract. The Contractor shall also determine the extent of, and apply for, any and all exemptions that are, or may be, available due to the status of Her Majesty as a sovereign entity. Where the Contractor procures goods for incorporation into the Work, for such purposes, the Contractor shall be an agent of Her Majesty. Any such exemptions that are available shall be applied to the benefit of Her Majesty. The Contractor shall obtain and provide sufficient documentation from the relevant authorities as to the availability of such exemptions.	
14.6		In performing the Work under the Contract, the Contractor shall abide by all of the laws in force in the local jurisdiction. Should the Contractor fail to pay any dues or taxes payable under those laws, the Minister, after giving the Contractor seven (7) days prior written notice of his intention so to do, shall have the right to pay directly any such dues or taxes claimed, and deduct same from any payment due to the Contractor.	
14.7		For the purpose of the payment of any and all applicable taxes or the furnishing of security for the payment of any and all applicable taxes arising from or related to the performance of the Work under the Contract, the Contractor shall, notwithstanding the fact that all material, plant and interest of the Contractor in all real property, licences, powers and privileges, have become the property of Her Majesty after the time of purchase, be liable, as a user or consumer, for the payment or for the furnishing of security for the payment of any and all applicable taxes payable, at the time of the use or consumption of that material, plant or interest of the Contractor in accordance with the relevant legislation.	
GC15	PERFORMANCE OF WORK UNDER DIRECTION OF DEPARTMENTAL REPRESENTATIVE		
		The Contractor shall:	
15.1.1		Permit the Departmental Representative to have access to the Work and its site at all times during the performance of the Contract;	
15.1.2		Furnish the Departmental Representative with such information respecting the performance of the Contract as he may require; and	
15.1.3		Give the Departmental Representative every possible assistance to enable the Departmental Representative to carry out his duty to see that the Work is performed in accordance with the Contract and to carry out any other duties and exercise any powers specially imposed or conferred on the Departmental Representative under the Contract.	
GC16	COOPERATION WITH OTHER CONTRACTORS		
16.1		Where, in the opinion of the Departmental Representative, it is necessary that other contractors	

	or workers with or without plant and material, be sent onto the Work or its site, the Contractor shall, to the satisfaction of the Departmental Representative, allow them access and cooperate with them in the carrying out of their duties and obligation.		debris caused by Her Majesty's servants or contractors and workers referred to in GC16.1
16.2	If:		
16.2.1	the sending onto the Work or its site of other contractors or workers pursuant to GC16.1 could not have been reasonably foreseen or anticipated by the Contractor when entering into the Contract;	GC19	CONTRACTOR'S SUPERINTENDENT
16.2.2	the Contractor incurs, in the opinion of the Departmental Representative, extra expense in complying with GC16.1; and	19.1	The Contractor shall, forthwith upon the award of the Contract, designate a superintendent.
16.2.3	the Contractor has given the Departmental Representative written notice of his claim for the extra expense referred to in GC16.2.2 within thirty (30) days of the date that the other contractors or workers were sent onto the Work or its site;	19.2	The Contractor shall forthwith notify the Departmental Representative of the name, address and telephone number of a superintendent designated pursuant to GC19.1.
16.3	Her Majesty shall pay the Contractor the cost, calculated in accordance with GC48 to GC50, of the extra labour, plant and material that was necessarily incurred.	19.3	A superintendent designated pursuant to GC19.1 shall be in full charge of the operations of the Contractor in the performance of the Work and is authorized to accept any notice, consent, order, direction, decision or other communication on behalf of the Contractor that may be given to the superintendent under the Contract.
GC17	EXAMINATION OF WORK	19.4	The Contractor shall, until the Work has been completed, keep a competent superintendent at the work site during working hours.
17.1	If, at any time after the commencement of the Work but prior to the expiry of the warranty or guarantee period, the Departmental Representative has reason to believe that the Work or any part thereof has not been performed in accordance with the Contract, the Departmental Representative may have that Work examined by an expert of his choice.	19.5	The Contractor shall, upon the request of the Departmental Representative, remove any superintendent who, in the opinion of the Departmental Representative, is incompetent or has been conducting himself improperly and shall forthwith designate another superintendent who is acceptable to the Departmental Representative.
17.2	If, as a result of an examination of the Work referred to in GC17.1, it is established that the Work was not performed in accordance with the Contract, then, in addition to and without limiting or otherwise affecting any of Her Majesty's rights and remedies under the Contract either at law or in equity, the Contractor shall pay Her Majesty, on demand, all reasonable costs and expenses that were incurred by Her Majesty in having that examination performed.	19.6	Subject to GC19.5, the Contractor shall not substitute a superintendent without the written consent of the Departmental Representative.
GC18	CLEARING OF SITE	19.7	A breach by the Contractor of GC19.6 entitles the Departmental Representative to refuse to issue any certificate referred to in GC44 until the superintendent has returned to the work site or another superintendent who is acceptable to the Departmental Representative has been substituted.
18.1	The Contractor shall maintain the Work and its site in a tidy condition and free from the accumulation of waste material and debris, in accordance with any directions of the Departmental Representative.	GC20	NATIONAL SECURITY
18.2	Before the issue of an Interim Certificate of Completion referred to in GC44.2, the Contractor shall remove all the plant and material not required for the performance of the remaining Work, and all waste material and other debris, and shall cause the Work and its site to be clean and suitable for occupancy by Her Majesty's servants, unless otherwise stipulated in the Contract.	20.1	If the Minister is of the opinion that the Work is of a class or kind that involves the national security of Canada, he may order the Contractor:
18.3	Before the issue of a Final Certificate of Completion referred to in GC44.1, the Contractor shall remove from the Work and its site all of the surplus plant and material and any waste material and other debris.	20.1.1	To provide him with any information concerning persons employed or to be employed by him for purposes of the Contract; and
18.4	The Contractor's obligations described in GC18.1 to GC18.3 do not extend to waste material and other	20.1.2	To remove any person from the Work and its site if, in the opinion of the Minister, that person may be a risk to the national security.
		20.2	The Contractor shall, in all contracts with persons who are to be employed in the performance of the Contract, make provision for his performance of any obligation that may be imposed upon him under GC19 to GC21.
		20.3	The Contractor shall comply with an order of the Minister under GC20.1.
		GC21	UNSUITABLE WORKERS
			The Contractor shall, upon the request of the Departmental Representative, remove any person employed by him for purposes of the Contract who, in the opinion of the Departmental Representative, is incompetent or has conducted himself improperly, and the Contractor shall not permit a person who has been removed to return to the work

	site.		
GC22	INCREASED OR DECREASED COSTS	24.3	The Contractor shall provide all facilities necessary for the purpose of maintaining security, and shall assist any person authorized by the Minister to inspect or to take security measures in respect of the Work and its site.
22.1	The amount set out in the Articles of Agreement shall not be increased or decreased by reason of any increase or decrease in the cost of the Work that is brought about by an increase or decrease in the cost of labour, plant or material or any wage adjustment.	24.4	The Departmental Representative may direct the Contractor to do such things and to perform such additional Work as the Departmental Representative considers reasonable and necessary to ensure compliance with or to remedy a breach of GC24.1 to GC24.3.
22.2	Notwithstanding GC22.1 and GC35, an amount set out in the Articles of Agreement shall be adjusted in the manner provided in GC22.3, if any change occurs in a tax imposed under any sales tax legislation applicable under the governing law of this Contract relative to the purchase of tangible personal property to be incorporated into Real Property:	GC25	PUBLIC CEREMONIES AND SIGNS
22.2.1	Occurs after the date of the submission by the Contractor of his tender for the Contract;	25.1	The Contractor shall not permit any public ceremony in connection with the Work without the prior written consent of the Departmental Representative.
22.2.2	Applies to material; and	25.2	The Contractor shall not erect or permit the erection of any sign or advertising on the Work or its site without the prior written consent of the Departmental Representative.
22.2.3	Affects the cost to the Contractor of that material.	GC26	PRECAUTIONS AGAINST DAMAGE, INFRINGEMENT OF RIGHTS, FIRE, AND OTHER HAZARDS
22.3	If a change referred to in GC22.2 occurs, the appropriate amount set out in the Articles of Agreement shall be increased or decreased by an amount equal to the amount that is established by an examination of the relevant records of the Contractor referred to in GC51 to be the increase or decrease in the cost incurred that is directly attributable to that change.	26.1	The Contractor shall, at his own expense, do whatever is necessary to ensure that:
22.4	For the purpose of GC22.2, where a tax is changed after the date of submission of the tender but public notice of the change has been given by the appropriate local tax authorities before that date, the change shall be deemed to have occurred before the date of submission of the tender.	26.1.1	No person, property, right, easement or privilege is injured, damaged or infringed by reasons of the Contractor's activities in performing the Contract;
GC23	LABOUR AND MATERIAL	26.1.2	Pedestrian and other traffic on any public or private road or waterway is not unduly impeded, interrupted or endangered by the performance or existence of the Work or plant;
23.1	The Contractor shall at all time enforce strict discipline and good order amongst his employees, professional consultants and subcontractors and shall not employ on the Work any unfit person nor anyone unskilled in the Work assigned to him.	26.1.3	Fire hazards in or about the Work or its site are eliminated and, subject to any direction that may be given by the Departmental Representative, any fire is promptly extinguished;
23.2	The Contractor warrants that all materials and workmanship to be supplied by him shall be of a quality consistent with the specifications of the Contract.	26.1.4	The health and safety of all persons employed in the performance of the Work are not endangered by the method or means of its performance;
GC24	PROTECTION OF WORK AND DOCUMENTS	26.1.5	Adequate medical services are available to all persons employed on the Work or its site at all times during the performance of the Work;
24.1	The Contractor shall guard or otherwise protect the Work and its site, and protect the Contract, specifications, plans, drawings, information, material, plant and real property, whether or not they are supplied by Her Majesty to the Contractor, against loss or damage from any cause, and he shall not use, issue, disclose or dispose of them without the written consent of the Minister, except as may be essential for the performance of the Work.	26.1.6	Adequate sanitation measures are taken in respect of the Work and its site; and
24.2	If any document or information given or disclosed to the Contractor is assigned a security rating by the person who gave or disclosed it, the Contractor shall take all measures directed by the Departmental Representative to be taken to ensure the maintenance of the degree of security that is ascribed to that rating.	26.1.7	All stakes, buoys and marks placed on the Work or its site by or under the authority of the Departmental Representative are protected and are not removed, defaced, altered or destroyed.
		26.2	The Departmental Representative may direct the Contractor to do such things and to perform such additional Work as the Departmental Representative considers reasonable and necessary to ensure compliance with or to remedy a breach of GC26.1.
		26.3	The Contractor shall, at his own expense, comply with a direction of the Departmental Representative made under GC26.2.

GC27	INSURANCE	28.7	When the Contractor clears and cleans the Work and its site and restores and replaces the Work referred to in GC28.6, Her Majesty shall pay him out of the monies referred to in GC28.1 so far as they will there unto extend.
27.1	The Contractor shall, at his own expense, obtain and maintain insurance contracts in respect of the Work and shall provide evidence thereof to the Departmental Representative in accordance with the requirements of the Insurance Conditions in Section "IV."	28.8	Subject to GC28.7, payment by Her Majesty pursuant to GC28.7 shall be made in accordance with the Contract but the amount of each payment shall be one hundred percent (100%) of the amount claimed notwithstanding TP4.4.
27.2	The insurance Contracts referred to in GC27.1 shall:	GC29	CONTRACT SECURITY
27.2.1	be in a form, of the nature, in the amounts, for the periods and containing the terms and conditions specified in Insurance Conditions in Section "IV"; and	29.1	Not applicable.
27.2.2	Provide for the payment of claims under such insurance Contracts in accordance with GC28.	GC30	CHANGES IN THE WORK
GC28	INSURANCE PROCEEDS	30.1	Subject to GC5, the Departmental Representative may, at any time before he issues the Final Certificate of Completion:
28.1	In the case of a claim payable under a Builders Risk/Installation (All Risks) insurance Contract maintained by the Contractor pursuant to GC27, the proceeds of the claim shall be paid directly to Her Majesty, and:	30.1.1	Order Work or material in addition to that provided for in the Plans and Specifications; and
28.1.1	the monies so paid shall be held by Her Majesty for the purposes of the Contract; or	30.1.2	Delete or change the dimensions, character, quantity, quality, description, location or position of the whole or any part of the Work or material provided for in the Plans and Specifications or in any order made pursuant to GC30.1.1, if that additional Work or material, deletion, or change is, in his opinion, consistent with the general intent of the original Contract.
28.1.2	Her Majesty elects, shall be retained by Her Majesty, in which event they vest in Her Majesty absolutely.	30.2	The Contractor shall perform the Work in accordance with such orders, deletions and changes that are made by the Departmental Representative pursuant to GC30.1 from time to time as if they had appeared in and been part of the Plans and Specifications.
28.2	In the case of a claim payable under a General Liability insurance Contract maintained by the Contractor pursuant to GC27, the proceeds of the claim shall be paid by the insurer directly to the claimant.	30.3	The Departmental Representative shall determine whether or not anything done or omitted by the Contractor pursuant to an order, deletion or change referred to in GC30. 1 increased or decreased the cost of the Work to the Contractor.
28.3	If an election is made pursuant to GC28.1, the Minister may cause an audit to be made of the accounts of the Contractor and of Her Majesty in respect of the part of the Work that was lost, damaged or destroyed for the purpose of establishing the difference, if any, between:	30.4	If the Departmental Representative determines pursuant to GC30.3 that the cost of the Work to the Contractor has been increased, Her Majesty shall pay the Contractor the increased cost that the Contractor necessarily incurred for the additional Work calculated in accordance with GC49 or GC50.
28.3.1	the aggregate of the amount of the loss or damage suffered or sustained by Her Majesty, including any costs incurred in respect of the clearing and cleaning of the Work and its site and any other amount that is payable by the Contractor to Her Majesty under the Contract, minus any monies retained pursuant to GC28.1.2; and	30.5	If the Departmental Representative determines pursuant to GC30.3 that the cost of the Work to the Contractor has been decreased, Her Majesty shall reduce the amount payable to the Contractor under the contract by an amount equal to the decrease in the cost caused by the deletion or change referred to in GC30.1.2 and calculated in accordance with GC49.
28.3.2	The aggregate of the amounts payable by Her Majesty to the Contractor pursuant to the Contract up to the date of the loss or damage.	30.6	GC30.3 to GC30.5 are applicable only to a contract or a portion of a contract for which a Fixed Price Arrangement is stipulated in the Contract.
28.4	A difference that is established pursuant to GC28.3 shall be paid forthwith by the party who is determined by the audit to be the debtor to the party who is determined by the audit to be the creditor.	30.7	An order, deletion or change referred to in GC30. 1 shall be in writing, signed by the Departmental Representative and given to the Contractor in accordance with GC11.
28.5	When payment of a deficiency has been made pursuant to GC28.4, all rights and obligations of Her Majesty and the Contractor under the Contract shall, with respect only to the part of the Work that was the subject of the audit referred to in GC28.3, be deemed to have been expended and discharged.		
28.6	If an election is not made pursuant to GC28.1.2 the Contractor shall, subject to GC28.7, clear and clean the Work and its site and restore and replace the part of the Work that was lost, damaged or destroyed at his own expense as if that part of the Work had not yet been performed.		

GC31	INTERPRETATION OF CONTRACT BY DEPARTMENTAL REPRESENTATIVE		
31.1	If, at any time before the Departmental Representative has issued a Final Certificate of Completion referred to in GC44.1, any question arises between the parties about whether anything has been done as required by the Contract or about what the Contractor is required by the Contract to do, and, in particular but without limiting the generality of the foregoing, about:		
31.1.1	the meaning of anything in the Plans and Specifications;		
31.1.2	the meaning to be given to the Plans and Specifications in case of any error therein, omission therefrom, or obscurity or discrepancy in their wording or intention;		
31.1.3	whether or not the quality or quantity of any material or workmanship supplied or proposed to be supplied by the Contractor meets the requirements of the Contract;		
31.1.4	the Work and carrying out the Contract are adequate to ensure that the Work will be performed in accordance with the Contract and that the Contract will be carried out in accordance with its terms;		
31.1.5	what quantity of any kind of Work has been completed by the Contractor; or		
31.1.6	the timing and scheduling of the various phases of the performance of the Work, the question shall be decided by the Departmental Representative whose decision shall be final and conclusive in respect of the Work.		
31.2	The Contractor shall perform the Work in accordance with any decisions of the Departmental Representative that are made under GC31.1 and in accordance with any consequential directions given by the Departmental Representative.		
GC32	WARRANTY AND RECTIFICATION OF DEFECTS IN WORK		
32.1	Without restricting any warranty or guarantee implied or imposed by law or contained in the contract documents, the Contractor shall, at his own expense:		
32.1.1	Rectify and make good any defect or fault that appears in the Work or comes to the attention of the Minister with respect to those parts of the Work accepted in connection with the Interim Certificate of Completion referred to in GC44.2 within twelve (12) months from the date of the Interim Certificate of Completion; and		
32.1.2	Rectify and make good any defect or fault that appears in or comes to the attention of the Minister in connection with those parts of the Work described in the Interim Certificate of Completion referred to in GC44.2 within twelve (12) months from the date of the Final Certificate of Completion referred to in GC44.1.		
32.2	The Departmental Representative may direct the Contractor to rectify and make good any defect or fault referred to in GC32.1 or covered by any other		
		32.3	expressed or implied warranty or guarantee. A direction referred to in GC32.2 shall be in writing, may include a stipulation in respect of the time within which a defect or fault is required to be rectified and made good by the Contractor, and shall be given to the Contractor in accordance with GC11.
		32.4	The Contractor shall rectify and make good any defect or fault described in a direction given pursuant to GC32.2 within the time stipulated therein.
		GC33	NON-COMPLIANCE BY CONTRACTOR
		33.1	If the Contractor fails to comply with any decision or direction given by the Departmental Representative pursuant to GC18, GC24, GC26, GC31 or GC32, the Departmental Representative may employ such methods as he deems advisable to do that which the Contractor failed to do.
		33.2	The Contractor shall, on demand, pay Her Majesty an amount that is equal to the aggregate of all costs, expenses and damage incurred or sustained by Her Majesty by reason of the Contractor's failure to comply with any decision or direction referred to in GC33.1, including the cost of any methods employed by the Departmental Representative pursuant to GC33.1.
		GC34	PROTESTING DEPARTMENTAL REPRESENTATIVE'S DECISIONS
		34.1	The Contractor may, within ten (10) days after the communication to him of any decision or direction referred to in GC30.3 or GC33.1, protest that decision or direction.
		34.2	A protest referred to in GC34.1 shall be in writing, contain full reasons for the protest, be signed by the Contractor and be given to Her Majesty by delivery to the Departmental Representative.
		34.3	If the Contractor gives a protest pursuant to GC34.2, any compliance by the Contractor with the decision or direction that was protested shall not be construed as an admission by the Contractor of the correctness of that decision or direction, or prevent the Contractor from taking whatever action he considers appropriate in the circumstances.
		34.4	The giving of a protest by the Contractor pursuant to GC34.2 shall not relieve him from complying with the decision or direction that is the subject of the protest.
		34.5	Subject to GC34.6, the Contractor shall take any action referred to in GC34.3 within three (3) months after the date that a Final Certificate of Completion is issued under GC44.1, and not afterwards.
		34.6	The Contractor shall take any action referred to in GC34.3 resulting from a direction under GC32 within three (3) months after the expiry of a warranty or guarantee period and not afterwards.
		34.7	Subject to GC34.8, if Her Majesty determines that the Contractor's protest is justified, Her Majesty shall pay the Contractor the cost of the additional labour, plant and material necessarily incurred by the Contractor in carrying out the protested decision or direction.
		34.8	Costs referred to in GC34.7 shall be calculated in

- accordance with GC48 to GC50.
- GC35 CHANGES IN SOIL CONDITIONS AND NEGLECT OR DELAY BY HER MAJESTY**
- 35.1** Subject to GC35.2 no payment, other than a payment that is expressly stipulated in the contract, shall be made by Her Majesty to the Contractor for any extra expense or any loss or damage incurred or sustained by the Contractor.
- 35.2** If the Contractor incurs or sustains any extra expense or any loss or damage that is directly attributable to:
- 35.2.1** a substantial difference between the information relating to soil conditions at the work site that is contained in the Plans and Specifications or other documents supplied to the Contractor for his use in preparing his tender or a reasonable assumption of fact based thereon made by the Contractor, and the actual soil conditions encountered by the Contractor at the work site during the performance of the Contract; or
- 35.2.2** Any neglect or delay that occurs after the date of the Contract on the part of Her Majesty in providing any information or in doing any act that the Contract either Her Majesty to do or that would ordinarily be done by an owner in accordance with the usage of the trade, he shall, within ten (10) days of the date the actual soil conditions described in GC35.2.1 were encountered or the neglect or delay described in GC35.2.2 occurred, give the Departmental Representative written notice of his intention to claim for that extra expense or that loss or damage.
- 35.3** When the Contractor has given a notice referred to in GC35.2, he shall give the Departmental Representative a written claim for extra expense or loss or damage within thirty (30) days of the date that a Final Certificate of Completion referred to in GC44.1 is issued and not afterwards.
- 35.4** A written claim referred to in GC35.3 shall contain a sufficient description of the facts and circumstances of the occurrence that is the subject of the claim to enable the Departmental Representative to determine whether or not the claim is justified and the Contractor shall supply such further and other information for that purpose as the Departmental Representative requires from time to time.
- 35.5** If the Departmental Representative determines that a claim referred to in GC35.3 is justified, Her Majesty shall make an extra payment to the Contractor in an amount that is calculated in accordance with GC47 to GC50.
- 35.6** If, in the opinion of the Departmental Representative, an occurrence described in GC35.2.1 results in a savings of expenditure by the Contractor in performing the Contract, the amount set out in the Articles of Agreement shall, subject to GC35.7, be reduced by an amount that is equal to the saving.
- 35.7** The amount of the saving referred to in GC35.6 shall be determined in accordance with GC47 to
- GC49.
- 35.8** If the Contractor fails to give a notice referred to in GC35.2 and a claim referred to in GC35.3 within the times stipulated, an extra payment shall not be made to him in respect of the occurrence.
- GC36 EXTENSION OF TIME**
- 36.1** Subject to GC36.2, the Departmental Representative may, on the application of the Contractor made before the day fixed by the Articles of Agreement for completion of the Work or before any other date previously fixed under this General Condition, extend the time for its completion by fixing a new date if, in the opinion of the Departmental Representative, causes beyond the control of the Contractor have delayed its completion.
- 36.2** Not applicable.
- GC37 ASSESSMENTS AND DAMAGES FOR LATE COMPLETION**
- 37.1** For the purposes of this General Condition:
- 37.1.1** the Work shall be deemed to be completed on the date that an Interim Certificate of Completion referred to in GC44.2 is issued; and
- 37.1.2** "Period of delay" means the number of days commencing on the day fixed by the Contract for completion of the Work and ending on the day immediately preceding the day on which the Work is completed but does not include any day within a period of extension granted pursuant to GC36. 1, and any other day on which, in the opinion of the Departmental Representative, completion of the Work was delayed for reasons beyond the control of the Contractor.
- 37.2** If the Contractor does not complete the Work by the day fixed for its completion by the Articles of Agreement but completes it thereafter, the Contractor shall pay Her Majesty an amount equal to the aggregate of:
- 37.2.1** All salaries, wages and travelling expenses incurred by Her Majesty in respect of persons overseeing the performance of the Work during the period of delay;
- 37.2.2** The cost incurred by Her Majesty as a result of the inability to use the completed Work for the period of delay; and
- 37.2.3** All other expenses and damages incurred or sustained by Her Majesty during the period of delay as a result of the Work not being completed by the day fixed for its completion.
- 37.3** The Minister may waive the right of Her Majesty to the whole or any part of the amount payable by the Contractor pursuant to GC37.2 if, in the opinion of the Minister, it is in the public interest to do so.
- 37.3.1** Her Majesty may, without prejudice to any other method of recovery, deduct the amount of such damages from any monies due or become due to the Contractor. The payment or deduction of such damages shall not relieve the Contractor from his obligation to complete the Works, or from any other of his obligations

	and liabilities under the Contract.		used or provided by the Contractor under the Contract shall continue to be the property of Her Majesty without compensation to the Contractor.
GC38	TAKING THE WORK OUT OF THE CONTRACTOR'S HANDS	39.3	When the Departmental Representative certifies that any plant, material, or any interest of the Contractor referred to in GC39.2 is no longer required for the purposes of the Work, or that it is not in the interests of Her Majesty to retain that plant, material, or interest, it shall revert to the Contractor.
38.1	The Minister may, at his sole discretion, by giving a notice in writing to the Contractor in accordance with GC11, take all or any part of the Work out of the Contractor's hands, and may employ such means as he sees fit to have the Work completed if the Contractor:		
38.1.1	Has not, within six (6) days of the Minister or the Departmental Representative giving notice to the Contractor in writing in accordance with GC11, remedied any delay in the commencement or any default in the diligent performance of the Work to the satisfaction of the Departmental Representative;	GC40	SUSPENSION OF WORK BY MINISTER
38.1.2	Has defaulted in the completion of any part of the Work within the time fixed for its completion by the Contract;	40.1	The Minister may, when in his opinion it is in the public interest to do so, require the Contractor to suspend performance of the Work either for a specified or an unspecified period by giving a notice of suspension in writing to the Contractor in accordance with GC11.
38.1.3	Has become insolvent;	40.2	When a notice referred to in GC40.1 is received by the Contractor in accordance with GC11, he shall suspend all operations in respect of the Work except those that, in the opinion of the Departmental Representative, are necessary for the care and preservation of the Work, plant and material.
38.1.4	Has committed an act of bankruptcy;	40.3	The Contractor shall not, during a period of suspension, remove any part of the Work, plant or material from its site without the written consent of the Departmental Representative.
38.1.5	Has abandoned the Work;	40.4	If a period of suspension is thirty (30) days or less, the Contractor shall, upon the expiration of that period, resume the performance of the Work and he is entitled to be paid the extra cost, calculated in accordance with GC48 to GC50, of any labour, plant and material necessarily incurred by him as a result of the suspension.
38.1.6	Has made an assignment of the contract without the consent required by GC3; or	40.5	If, upon the expiration of a period of suspension of more than thirty (30) days, the Minister and the Contractor agree that the performance of the Work will be continued by the Contractor, the Contractor shall resume performance of the Work subject to any terms and conditions agreed upon by the Minister and the Contractor.
38.1.7	Has otherwise failed to observe or perform any of the provisions of the Contract.	40.6	If, upon the expiration of a period of suspension of more than thirty (30) days, the Minister and the Contractor do not agree that performance of the Work will be continued by the Contractor or upon the terms and conditions under which the Contractor will continue the Work, the notice of suspension shall be deemed to be a notice of termination pursuant to GC41.
38.2	If the whole or any part of the Work is taken out of the Contractor's hands pursuant to GC38.1:		
38.2.1	the Contractor's right to any further payment that is due or accruing under the Contract is, subject only to GC38.4, extinguished; and		
38.2.2	The Contractor is liable to pay Her Majesty, upon demand, an amount that is equal to the amount of all loss and damage incurred or sustained by Her Majesty in respect of the Contractor's failure to complete the Work.		
38.3	If the whole or any part of the Work that is taken out of the Contractor's hands pursuant to GC38.1 is completed by Her Majesty, the Departmental Representative shall determine the amount, if any, of the holdback or a progress claim that had accrued and was due prior to the date on which the Work was taken out of the Contractor's hands and that is not required for the purposes of having the Work performed or of compensating Her Majesty for any other loss or damage incurred or sustained by reason of the Contractor's default.		
38.4	Her Majesty shall pay the Contractor the amount determined not to be required pursuant to GC38.3.		
GC39	EFFECT OF TAKING THE WORK OUT OF THE CONTRACTOR'S HANDS	GC41	TERMINATION OF CONTRACT
39.1	The taking of the Work or any part thereof out of the Contractor's hands pursuant to GC38 does not operate so as to relieve or discharge him from any obligation under the Contract or imposed upon him by law except the obligation to complete the performance of that part of the Work that was taken out of his hands.	41.1	The Minister may terminate the Contract at any time by giving a notice of termination in writing to the Contractor in accordance with GC11.
39.2	If the Work or any part thereof is taken out of the Contractor's hands pursuant to GC38, all plant and material and the interest of the Contractor in all real property, licences, powers and privileges acquired,	41.2	When a notice referred to in GC41.1 is received by the Contractor in accordance with GC11, he shall, subject to any conditions stipulated in the notice, forthwith cease all operations in performance of the Contract.
		41.3	If the Contract is terminated pursuant to GC41.1, Her Majesty shall pay the Contractor, subject to GC41.4 an amount equal to:
		41.3.1	the cost to the Contractor of all labour, plant

- and material supplied by him under the Contract up to the date of termination in respect of a contract or part thereof for which a Unit Price Arrangement is stipulated in the Contract; or the lesser of:
- 41.3.2** An amount, calculated in accordance with the Terms of Payment, that would have been payable to the Contractor had he completed the Work; and
- 41.3.3** An amount that is determined to be due to the Contractor pursuant to GC49 in respect of a contract or part thereof for which a Fixed Price Arrangement is stipulated in the Contract less the aggregate of all amounts that were paid to the Contractor by Her Majesty and all amounts that are due to Her Majesty from the Contractor pursuant to the Contract.
- 41.4** If Her Majesty and the Contractor are unable to agree about an amount referred to in GC41.3 that amount shall be determined by the method referred to in GC50.
- GC42 CLAIMS AGAINST AND OBLIGATIONS OF THE CONTRACTOR OR SUBCONTRACTOR**
- 42.1** Her Majesty may, in order to discharge lawful obligations of and satisfy claims against the Contractor or a Subcontractor arising out of the performance of the Contract, pay any amount that is due and payable to the Contractor pursuant to the Contract directly to the obligees of and the claimants against the Contractor or the Subcontractor but such amount if any, as is paid by Her Majesty shall not exceed that amount which the Contractor would have been obliged to pay to such claimant pursuant to legislation applicable under the governing law of the Contract. Any such claimant need not comply with the provisions of such legislation setting out the steps by way of notice, registration or otherwise as might have been necessary to preserve or perfect any claim for lien or privilege which claimant might have had, however Her Majesty shall, prior to paying any such claims, provide the Contractor with ten (10) days prior written notice to the effect that She will be so doing.
- 42.2** Her Majesty will not make any payment as described in GC42.1 unless and until that claimant shall have delivered to Her Majesty:
- 42.2.1** A binding and enforceable Judgment or Order of a court of competent jurisdiction setting forth such amount as would have been payable by the Contractor to the claimant pursuant to the provisions of the legislation applicable under the governing law of this Contract ;
- 42.2.2** A final and enforceable award of an arbitrator setting forth such amount as would have been payable by the Contractor to the claimant pursuant to the provisions of the legislation applicable under the governing law of this Contract; or
- 42.2.3** The consent of the Contractor authorizing a payment.
- 42.3** For the purposes of determining the entitlement of a claimant pursuant to GC42.2.1 and GC42.2.2, the notice required by GC42.8 shall be deemed to
- replace the registration or provision of notice after the performance of Work as required by any applicable legislation and no claim shall be deemed to have expired, become void or unenforceable by reason of the claimant not commencing any action within the time prescribed by any applicable legislation.
- 42.4** The Contractor shall, by the execution of this Contract, be deemed to have consented to submit to binding arbitration at the request of any claimant those questions that need be answered to establish the entitlement of the claimant to payment pursuant to the provisions of GC42.1 and such arbitration shall have as parties to it any Subcontractor to whom the claimant supplied material, performed Work or rented equipment should such Subcontractor wish to be adjoined and Her Majesty shall not be a party to such arbitration and, subject to any agreement between the Contractor and the claimant to the contrary, the arbitration shall be conducted in accordance with the applicable legislation governing arbitration.
- 42.5** A payment made pursuant to GC42.1 is, to the extent of the payment, a discharge of Her Majesty's liability to the Contractor under the Contract and may be deducted from any amount payable to the Contractor under the Contract.
- 42.6** The Contractor shall comply with all laws in force in the jurisdiction where the Work is being performed relating to payment period, mandatory holdbacks, and creation and enforcement of mechanics' liens, builder's liens, privileges or similar legislation.
- 42.7** The Contractor shall discharge all his lawful obligations and shall satisfy all lawful claims against him arising out of the performance of the Work at least as often as the Contract requires Her Majesty to pay the Contractor.
- 42.8** The Contractor shall, whenever requested to do so by the Departmental Representative, make a statutory declaration deposing to the existence and condition of any obligations and claims referred to in GC42.6.
- 42.9** GC42.1 shall only apply to claims and obligations:
- 42.9.1** The notification of which has been received by the Departmental Representative in writing before payment is made to the Contractor pursuant to TP4.10 and within one hundred and twenty (120) days of the date on which the claimant;
- 42.9.1.1** Should have been paid in full under the claimant's contract with the Contractor or Subcontractor where the claim is for money that was lawfully required to be held back from the claimant; or
- 42.9.1.2** Performed the last of the services, Work or labour, or furnished the last of the material pursuant to the claimant's contract with the Contractor or Subcontractor where the claim is not for money referred to in GC42.9.1.1; and
- 42.9.2** The proceedings to determine the right to payment of which, pursuant to GC42.2, shall have commenced within one year from the

- date that the notice referred to in GC42.9.1 was received by the Departmental Representative, and the notification required by GC42.9. I shall set forth the amount claimed to be owing and the person who by contract is primarily liable.
- 42.10** Her Majesty may, upon receipt of a notice of claim under GC42.9.1, withhold from any amount that is due and payable to the Contractor pursuant to the Contract the full amount of the claim or any portion thereof.
- 42.11** The Departmental Representative shall notify the Contractor in writing of receipt of any claim referred to in GC42.9.1 and of the intention of Her Majesty to withhold funds pursuant to GC42.10 and the Contractor may, at any time thereafter and until payment is made to the claimant, be entitled to post, with Her Majesty, security in a form acceptable to Her Majesty in an amount equal to the value of the claim, the notice of which is received by the Departmental Representative and upon receipt of such security Her Majesty shall release to the Contractor any funds which would be otherwise payable to the Contractor, that were withheld pursuant to the provisions of GC42.10 in respect of the claim of any claimant for whom the security stands.
- GC43 SECURITY DEPOSIT - FORFEITURE OR RETURN**
- 43.1** If:
- 43.1.1** The Work is taken out of the Contractor's hands pursuant to GC38;
- 43.1.2** The Contract is terminated pursuant to GC41; or
- 43.1.3** The Contractor is in breach of or in default under the Contract;
- 43.2** Her Majesty may convert the security deposit, if any, to Her own use.
- 43.3** If Her Majesty converts the contract security pursuant to GC43.1, the amount realized shall be deemed to be an amount due from Her Majesty to the Contractor under the Contract.
- 43.4** Any balance of an amount referred to in GC43.3 that remains after payment of all losses, damage and claims of Her Majesty and others shall be paid by Her Majesty to the Contractor if, in the opinion of the Departmental Representative, it is not required for the purposes of the Contract.
- GC44 DEPARTMENTAL REPRESENTATIVE'S CERTIFICATES**
- 44.1** On the date that:
- 44.1.1** the Work has been completed; and
- 44.1.2** The Contractor has complied with the Contract and all orders and directions made pursuant thereto, both to the satisfaction of the Departmental Representative, the Departmental Representative shall issue a Final Certificate of Completion to the Contractor.
- 44.2** If the Departmental Representative is satisfied that the Work is substantially complete he shall, at any time before he issues a certificate referred to in GC44.1, issue an Interim Certificate of Completion to the Contractor, and for the purposes of GC44.2 the Work will be considered to be substantially complete:
- 44.2.1** When the Work under the Contract or a substantial part thereof is, in the opinion of the Departmental Representative, ready for use by Her Majesty or is being used for the purposes intended; and
- 44.2.2** when the Work remaining to be done under the Contract is, in the opinion of the Departmental Representative, capable of completion or correction at a cost of not more than:
- 44.2.2.1** Three percent (3%) of the first \$500,000;
- 44.2.2.2** Two percent (2%) of the next \$500,000, and
- 44.2.2.3** One percent (1%) of the balance of the value of the Contract at the time this cost is calculated.
- 44.3** For the sole purpose of GC44.2.2, where the Work or a substantial part thereof is ready for use or is being used for the purposes intended and the remainder of the Work or a part thereof cannot be completed by the time specified in C3, or as amended pursuant to GC36, for reasons beyond the control of the Contractor or where the Departmental Representative and the Contractor agree in writing not to complete a part of the Work within the specified time, the cost of that part of the Work which was either beyond the control of the Contractor to complete or the Departmental Representative and the Contractor have agreed in writing not to complete by the time specified shall be deducted from the value of the Contract referred to GC44.2.2 and the said cost shall not form part of the cost of the Work remaining to be done in determining substantial completion.
- 44.4** An Interim Certificate of Completion referred to in GC44.2 shall describe the parts of the Work not completed to the satisfaction of the Departmental Representative and all things that must be done by the Contractor:
- 44.4.1** before a Final Certificate of Completion referred to in GC44.1 will be issued; and
- 44.4.2** Before the twelve (12) month period referred to in GC32.1.2. shall commence for the said parts and all the said things.
- 44.5** The Departmental Representative may, in addition to the parts of the Work described in an Interim Certificate of Completion referred to in GC44.2, require the Contractor to rectify any other parts of the Work not completed to his satisfaction and to do any other things that are necessary for the satisfactory completion of the Work.
- 44.6** If the Contract or a part thereof is subject to a Unit Price Arrangement, the Departmental Representative shall measure and record the quantities of labour, plant and material, performed, used and supplied by the Contractor in performing the Work and shall, at the request of the Contractor, inform him of those measurements.
- 44.7** The Contractor shall assist and cooperate with the Departmental Representative in the performance of his duties referred to in GC44.6 and shall be entitled to inspect any record made by the Departmental

- Representative pursuant to GC44.6.
- 44.8** After the Departmental Representative has issued a Final Certificate of Completion referred to in GC44.1, he shall, if GC44.6 applies, issue a Final Certificate of Measurement.
- 44.9** A Final Certificate of Measurement referred to in GC44.8 shall:
- 44.9.1** contain the aggregate of all measurements of quantities referred to in GC44.6; and
- 44.9.2** Be binding upon and conclusive between Her Majesty and the Contractor as to the quantities referred to therein.
- GC45 RETURN OF SECURITY DEPOSIT**
- 45.1** After an Interim Certificate of Completion referred to in GC44.2 has been issued, Her Majesty shall, if the Contractor is not in breach of or in default under the Contract, return to the Contractor all or any part of the security deposit that, in the opinion of the Departmental Representative, is not required for the purposes of the Contract.
- 45.2** After a Final Certificate of Completion referred to in GC44.1 has been issued, Her Majesty shall return to the Contractor the remainder of any security deposit unless the Contract stipulates otherwise.
- 45.3** If the security deposit was paid into the Consolidated Revenue Fund of Canada, Her Majesty shall pay interest thereon to the Contractor at a rate established from time to time pursuant to section 21(2) of Canada's Financial Administration Act.
- GC46 CLARIFICATION OF TERMS IN GC47 TO GC50**
- 46.1** For the purposes of GC47 to GC50:
- 46.1.1** "Unit Price Table" means the table set out in the Contract; and
- 46.1.2** "Plant" does not include tools customarily provided by a tradesman in practising his trade.
- GC47 ADDITIONS OR AMENDMENTS TO UNIT PRICE TABLE**
- 47.1** Where a Unit Price Arrangement applies to the Contract or a part thereof the Departmental Representative and the Contractor may, by an agreement in writing:
- 47.1.1** Add classes of labour, plant or material, and units of measurement, prices per unit and estimated quantities to the Unit Price Table if any labour, plant or material that is to be included in the Final Certificate of Measurement referred to in GC44.8 is not included in any class of labour, plant or material set out in the Unit Price Table; or
- 47.1.2** subject to GC47.2 and GC47.3, amend a price per unit set out in the Unit Price Table for any class of labour, plant or material included therein if the Final Certificate of Measurement referred to in GC44.8 shows or is expected to show that the total quantity of that class of labour, plant or material actually, used or supplied by the Contractor in performing the Work is:
- 47.1.2.1** Less than eighty-five percent (85%) of that estimated total quantity; or
- 47.1.2.2** In excess of one hundred and fifteen percent (115%) of that estimated total quantity.
- 47.2** In no event shall the total cost of an item set out in the Unit Price Table that has been amended pursuant to GC47.1.2.1. exceed the amount that would have been payable to the Contractor had the estimated total quantity actually been performed, used or supplied.
- 47.3** An amendment that is made necessary by GC47.1.2.2 shall apply only to the quantities that are in excess of one hundred and fifteen percent (115%).
- 47.4** If the Departmental Representative and the Contractor do not agree as contemplated in GC47.1, the Departmental Representative shall determine the class and the unit of measurement of the labour, plant or material and, subject to GC47.2 and GC47.3, the price per unit therefor shall be determined in accordance with GC50.
- GC48 DETERMINATION OF COST - UNIT PRICE TABLE**
- Whenever, for the purposes of the Contract it is necessary to determine the cost of labour, plant or material, it shall be determined by multiplying the quantity of that labour, plant or material expressed in the Unit Price Table by the price of that unit set out by agreement in a unit price table which will be included in the Contract prior to signing.
- GC49 DETERMINATION OF COST - NEGOTIATION**
- 49.1** If the method described in GC48 cannot be used because the labour, plant or material is of a kind or class that is not set out in the Unit Price Table, the cost of that labour, plant or material for the purposes of the Contract shall be the amount agreed upon from time to time by the Contractor and the Departmental Representative.
- 49.2** For the purposes of GC49.1, the Contractor shall submit to the Departmental Representative any necessary cost information requested by the Departmental Representative in respect of the labour, plant and material referred to in GC49.1.
- GC50 DETERMINATION OF COST - FAILING NEGOTIATION**
- 50.1** If the methods described in GC47, GC48 or GC49 fail for any reason to achieve a determination of the cost of labour, plant and material for the purposes referred to therein, that cost shall be equal to the aggregate of:
- 50.1.1** all reasonable and proper amounts actually expended or legally payable by the Contractor in respect of the labour, plant and material that falls within one of the classes of expenditure described in GC50.2 that are directly attributable to the performance of the Contract;
- 50.1.2** an allowance for profit and all other expenditures or costs, including overhead, general administration costs, financing and interest charges, and every other cost, charge and expenses, but not including those referred to in GC50.1.1 or GC50.1.3 or of a class

- referred to in GC50.2, in an amount that is equal to ten percent (10%) of the sum of the expenses referred to in GC50.1.1, and interest on the costs determined under GC50.1.1 and GC50.1.3, which interest shall be calculated in accordance with TP9.
- 50.1.3** provided that the total cost of an item set out in the Unit Price Table that is subject to the provisions of GC47.1.2 does not exceed the amount that would have been payable to the Contractor had the estimated total quantity of the said item actually been performed, used or supplied.
- 50.2** For purposes of GC50.1.1, the classes of expenditure that may be taken into account in determining the cost of labour, plant and material are:
- 50.2.1** Payments to subcontractors;
- 50.2.2** Wages, salaries and travelling expenses of employees of the Contractor while they are actually and properly engaged on the Work, other than wages, salaries, bonuses, living and travelling expenses of personnel of the Contractor generally employed at the head office or at a general office of the Contractor unless they are engaged at the work site with the approval of the Departmental Representative;
- 50.2.3** Assessments payable under any statutory authority relating to workmen's compensation, employment insurance, pension plan or holidays with pay;
- 50.2.4** Rent that is paid for plant or an amount equivalent to the said rent if the plant is owned by the Contractor that is necessary for and used in the performance of the Work, if the rent or the equivalent amount is reasonable and use of that plant has been approved by the Departmental Representative;
- 50.2.5** Payments for maintaining and operating plant necessary for and used in the performance of the Work, and payments for effecting such repairs thereto as, in the opinion of the Departmental Representative, are necessary to the proper performance of the Contract other than payments for any repairs to the plant arising out of defects existing before its allocation to the Work;
- 50.2.6** Payments for material that is necessary for and incorporated in the Work, or that is necessary for and consumed in the performance of the Contract;
- 50.2.7** Payments for preparation, delivery, handling, erection, installation, inspection, protection and removal of the plant and material necessary for and used in the performance of the Contract; and
- 50.3** Any other payments made by the Contractor with the written approval of the Departmental Representative that are necessary for the performance of the Contract.
- GC51 RECORDS TO BE KEPT BY CONTRACTOR**
- 51.1** The Contractor shall:
- 51.1.1** Maintain full records of his estimated and actual cost of the Work together with all tender calls, quotations, contracts, correspondence, invoices, receipts and vouchers relating thereto;
- 51.1.2** Make all records and material referred to in GC51.1.1 available to audit and inspection by the Minister and the Deputy Receiver General for Canada or by persons acting on behalf of either or both of them, when requested;
- 51.1.3** Allow any of the persons referred to in GC51.1.2 to make copies of and to take extracts from any of the records and material referred to in GC51.1.1; and
- 51.1.4** Furnish any person referred to in GC51.1.2 with any information he may require from time to time in connection with such records and material.
- 51.2** The records maintained by the Contractor pursuant to GC51.1.1 shall be kept intact by the Contractor until the expiration of two (2) years after the date that a Final Certificate of Completion referred to in GC44.1 was issued or until the expiration of such other period of time as the Minister may direct.
- 51.3** The Contractor shall cause all subcontractors and all other persons directly or indirectly controlled by or affiliated with the Contractor and all persons directly or indirectly having control of the Contractor to comply with GC51.1 and GC51.2 as if they were the Contractor.
- GC52 CONFLICT OF INTEREST**
- It is a term of this Contract that no former public office holder who is not in compliance with the Government of Canada's Conflict of Interest and Post-Employment Code for Public Office Holders shall derive a direct benefit from this Contract.
- GC53 CONTRACTOR STATUS**
- 53.1** The Contractor shall be engaged under the contract as an independent Contractor.
- 53.2** The Contractor or any employee of the said Contractor is not engaged by the Contract as an employee, servant or agent of Her Majesty.
- 53.3** For the purposes of GC53.1 and GC53.2 the Contractor shall be solely responsible for any and all payments and deductions required to be made by law including those required for pension plans, employment insurance, workers' compensation or income tax.
- GC54 GOVERNING LAWS**
- The Contract shall be governed by the laws in force in the jurisdiction defined in section C14 of the Articles of Agreement.
- GC55 SOVEREIGN IMMUNITY**
- Notwithstanding any provision in this Contract, Her Majesty the Queen in Right of Canada, does not waive any immunity to which she is or may be entitled to by virtue of domestic or international law.
- GC56 HUMAN REMAINS, ARCHAEOLOGICAL REMAINS AND ITEMS OF HISTORICAL OR SCIENTIFIC INTEREST**

- 56.1 For the purposes of this clause:
- 56.1.1 Human remains means the whole or any part of a deceased human being, irrespective of the time that has elapsed since death;
- 56.1.2 Archaeological remains are items, artefacts or things made, modified or used by human beings in antiquity and may include, but not are limited to, stone, wood, or iron structures; monuments, bump deposits, bone artifacts, weapons, tools, coins, or pottery; and
- 56.1.3 Items of historical or scientific interest are naturally occurring or manufactured objects or things of any age that are not archaeological remains but may be of interest to society because of their historical or scientific significance, value, rarity, natural beauty, or other quality.
- 56.2 If, during the course of the Work, the Contractor encounters any object, item or thing which is described in clause GC56.1, or which resembles any object, item or thing described in clause GC56.1, the Contractor shall:
- 56.2.1 take all reasonable steps, including immediately stopping the Work in the affected area, to protect and preserve the object, item or thing;
- 56.2.2 immediately notify the Departmental Representative of the circumstances in writing; and
- 56.2.3 Take all reasonable steps to minimize additional costs which may accrue as a result of any work stoppage.
- 56.3 Upon receipt of a notification in accordance with GC56.2.2, the Departmental Representative shall, in a timely manner, determine whether the object, item, or things is one described in, or contemplated by, clause GC56.1, and shall notify the Contractor in writing of any action to be performed, or Work to be carried out, by the Contractor as a result of the Departmental Representative's determination.
- 56.4 The Departmental Representative may, at any time, enlist the services of experts, particularly an archaeologist or historian as appropriate, to assist in the investigation, examination, taking of measurements or other such recordings, placing of permanent protection around or removing of the object, item or thing encountered by the Contractor, and monitoring in case of further discoveries, and the Contractor shall, to the satisfaction of the Departmental Representative, allow them access and cooperate with them in the carrying out of their duties and obligations.
- 56.5 Human remains, archaeological remains and items of historical or scientific interest encountered at the site of the Work shall remain the property of her Majesty.
- 56.6 Accept as may be otherwise provided for in the contract, the provisions of GC30 shall apply.
- GC57 CONTAMINATED SITE CONDITIONS**
- 57.1 For the purposes of this clause, a contaminated site condition exists when toxic, radioactive or other hazardous substances or materials, or other pollutants, are found to be present at the site of the Work to the extent that they constitute a hazard, or potential hazard, to the environment, property, or the health or safety of any person.
- 57.2 If the Contractor encounters a contaminated site condition, or has reasonable grounds to believe that a contaminated site condition exists at the site of the Work, the Contractor shall:
- 57.2.1 take all reasonable steps, including stopping the Work, to ensure that no person suffers injury, sickness or death, and that neither property nor the environment is injured or destroyed as a result of the contaminated site condition;
- 57.2.2 immediately notify the Departmental Representative of the circumstances in writing; and
- 57.2.3 Take all reasonable steps to minimize additional costs which may accrue as a result of any work stoppage.
- 57.3 Upon receipt of a notification in accordance with GC57.2.2, the Departmental Representative shall, in a timely manner, determine whether a contaminated site condition as described in, or contemplated by, clause GC57.1, exists, and shall notify the Contractor in writing of any action to be taken, or Work to be performed, by the Contractor as a result of the Departmental Representative's determination.
- 57.4 If the Contractor's services are required by the Departmental Representative, the Contractor shall follow the direction of the Departmental Representative with regard to any excavation, treatment and disposal of the contaminated substances or materials.
- 57.5 The Departmental Representative may at any time, and at the Departmental Representative's sole discretion, enlist the services of experts and specialty contractors to assist in determining the existence of, and the extent and treatment of the contaminated site condition, and the Contractor shall, to the satisfaction of the Departmental Representative, allow them access and cooperate with them in the carrying out of their duties and obligations.
- 57.6 Accept as may be otherwise provided for in the Contract, the provisions of GC30 shall apply.
- GC58 CERTIFICATION - CONTINGENCY FEES**
- 58.1 The Contractor certifies that it has not directly or indirectly paid or agreed to pay and covenants that it will not directly or indirectly pay or agree to pay a contingency fee for the solicitation, negotiation or obtaining of this Contract to any person other than an employee acting in the normal course of the employee's duties.
- 58.2 All accounts and records pertaining to payments of fees or other compensation for the solicitation, obtaining or negotiation of the Contract shall be subject to the accounts and audit provisions of the Contract.
- 58.3 If the Contractor certifies falsely under GC58.1 or is in default of the obligations contained therein, Her Majesty may either take the Work out of the Contractor's hands in accordance with the provisions of the Contract to recover from the Contractor by way of reduction to the Contract amount or otherwise the full amount of the contingency fee.

- 58.4 For the purposes of GC58:
- 58.4.1 "Contingency fee" means any payment or other compensation that is contingent upon or is calculated upon the basis of a degree of success in soliciting or obtaining a Government contract or negotiation the whole or any part of its terms;
- 58.4.2 "Employee" means a person with whom the Contractor has an employer/employee relationship; and
- 58.4.3 "Person" includes an individual or a group of individuals, a corporation, a partnership, an organization and an association and, without restricting the generality of the foregoing, includes any individual who is required to file a return with the registrar pursuant to section 5 of the Lobbyist Registration Act R.S. 1985 c.44 (4th Supplement) as the same may be amended from time to time.
- GC59 DISPUTE SETTLEMENT**
- 59.1 **Mutual Discussions**
The Contractor and Her Majesty, which for the purpose of this GC 59.1 shall jointly be referred to as the "Parties" and severally as the "Party," agree that if any dispute arises out of or in connection with this Contract, including without limitation any question regarding its existence, validity, termination of rights or obligation of any party, the Parties shall attempt, for a period of thirty (30) days after receipt by one Party of a notice from the other Party of indicating:
- 59.1.1 the existence of the dispute
- 59.1.2 its basic substance; and
- 59.1.3 The other Party's decision to refer the dispute to arbitration in accordance with GC59 of the Contract, the Parties shall attempt to settle the dispute by mutual discussions between them.
- 59.2 **Referral to Arbitration**
Any such dispute that cannot be settled amicably by mutual discussion within the thirty (30) day period referred to above, shall be settled by arbitration under the arbitration of the Province of Ontario (the "Rules"). The venue of the arbitration shall be conducted in the province of Ontario, Canada. Any notice of arbitration, response or other communication given to or by a party to the arbitration shall be given and deemed received as provided in the Rules. The costs of the arbitration shall be determined and paid by the parties to the arbitration as provided in the Rules.
- 59.3 **Appointments of Arbitrators**
Each of the Parties has the right to appoint one (1) arbitrator. The two (2) arbitrators will in turn appoint the third arbitrator. Should either Party fail to appoint its respective arbitrator within thirty (30) days from the date requested by the other Party, or should the two (2) arbitrators so appointed fail to appoint the third arbitrator within thirty (30) days from the date of appointment of the second arbitrator then such arbitrator(s) shall be appointed by the chairman of the Attribution of the Association of Chartered Engineers in the Province of Ontario, Canada.
- 59.4 **No Legal Proceedings**
Each Party agrees that it will not institute any legal proceedings arising out of or in connection with this Contract, except only as provided in this GC34 and each party agrees that it will apply to the court having jurisdiction to homologate for legal enforcement the decision rendered by the arbitral tribunal. In the event any legal proceedings are instituted in any court to enforce any arbitration award, the person or persons against whom enforcement of that arbitration award is sought shall pay all costs, including without limitation the costs of legal counsel and translation fees, of the person or persons seeking to enforce the arbitration award.
- 59.5 **Award Binding**
The arbitration must be held within six (6) months of the date of appointment of the arbitrator and the arbitrator is authorized to assess costs against a party who has caused delay or who has failed to comply with any rules of the arbitration. The decision of the arbitrator shall be final, binding and incontestable and may be used as a basis for judgement thereon in the Province of Ontario, Canada, or elsewhere.
- 59.6 **Waivers**
The Parties expressly agree to waive Article 48.1 of Law No. 30 Year 1999 on Arbitration and Alternative Dispute Resolution, so that the mandate of the arbitrators duly constituted in accordance with the terms of this Contract shall remain in effect until a final arbitration award has been issued by the arbitrators.
- 59.7 **Enforcement of Awards**
For the purpose of enforcing any arbitration award, the Parties choose the general, permanent and not-exclusive domicile of the Office of the Registrar of the Province of Ontario, Canada, without prejudice to the Parties' rights to enforce any arbitration award in any court having jurisdiction over the other Party or its assets.
- GC60 FORCE MAJEURE**
- 60.1 **Relief from Performance**
Neither Her Majesty nor the Contractor shall be liable to the other for any delay in or failure to render, any act or thing to be performed pursuant to this Contract, to the extent that such delay or failure is caused by an event of force majeure. The effected party must use its best endeavours to eliminate the effects of the force majeure as soon as possible and resume performance hereunder.
- 60.2 **No termination**
This Contract must not be terminated by temporary force majeure and the rights and obligations of the Contractor and Her Majesty must be restored in full after any period of force majeure has ended.
- 60.3 **Payment of Moneys**
- 60.3.1 If as a consequence of money that is required to be paid by one Party pursuant to the terms and conditions of this Contract cannot be so paid in the manner directed by this Contract due to an event of force majeure, then the Party required to pay must notify the Party entitled to receive the money of the former's inability to pay and the reasons for it.

60.3.2 The Party entitled to receive the money will designate to the Party required to pay an alternative place for payment and the latter will remit the funds to that place for the Party entitled to receive the funds.

60.4 Force Majeure Events

Force majeure events shall include, without limitation, any act of God, civil commotion or delays caused by governmental restriction affecting all or any portion of the Work which prevents or materially restricts either party from performing its obligations hereunder for which such party is responsible

GC61 HEALTH AND SAFETY

61.1 The Contractor shall ensure, in fulfilling its contractual obligations under this Contract, that its employees and agents are appropriately equipped with all safety clothing and equipment required to perform the Work.

61.2 The Contractor shall further ensure that its employees and agents adhere to and follow all applicable health and safety regulations, standards and procedures in force in the jurisdiction and have been trained and will use all mandatory safety equipment imposed by local law when completing the Work under this Contract.

SECTION "IV" – INSURANCE CONDITIONS**IC1 PROOF OF INSURANCE**

- 1.1** The Contractor shall, at its own expense, obtain and maintain insurance as provided hereunder with companies subject to approval in writing by Her Majesty.
- 1.2** Immediately following notification of Contract award and preceding the start of any on-site Work, the Contractor shall have its insurance broker, agency or underwriter inform the Departmental Representative in writing that all insurance required hereunder is in force.
- 1.3** Within fourteen (14) days after acceptance of the Contractor's tender, the Contractor shall, unless otherwise directed in writing by the Departmental Representative, deposit with the Departmental Representative an Insurer's Certificate of Insurance in the form displayed in this document and, if requested by the Departmental Representative, the originals or certified true copies of all contracts of insurance maintained by the Contractor pursuant to the Insurance Coverage Requirements shown hereunder.

IC2 RISK MANAGEMENT

- 2.1** The provisions of the Insurance Coverage Requirements contained hereunder are not intended to cover all of the Contractor's obligations under GC8 of the General Conditions Section "III" of the Contract. Any additional risk management measures or additional insurance coverages the Contractor may deem necessary to fulfill its obligations under GC8 shall be at its own discretion and expense.

IC3 PAYMENT OF DEDUCTIBLE

- 3.1** The payment of monies up to the deductible amount made in satisfaction of a claim shall be borne by the Contractor.

IC4 TYPES OF INSURANCE REQUIRED

- 4.1** The Contractor will obtain the following types of commercial insurance coverage:
- 4.1.1** Comprehensive General Liability Insurance ("CGL"); and
 - 4.1.2** Builder's Risk - Direct Damage Insurance ("BR").

IC5 ADDITIONAL NAMED INSURED

- 5.1** Each insurance policy shall insure the Contractor, and shall include as Additional Named Insured, the Owner, being Her Majesty the Queen in right of Canada, represented by the Minister of Foreign Affairs and the Employees or servants of both Her Majesty and the Contractor.

IC6 PERIOD OF INSURANCE COVERAGE

- 6.1** Unless otherwise directed in writing by the Departmental Representative, the policies required hereunder shall attach from the date of contract award and shall be maintained until the day of issue of the Final Certificate of Completion.

IC7 NOTIFICATION

- 7.1** Each insurance policy shall contain a provision that thirty (30) days prior written notice shall be given by the Insurer to the Departmental Representative in the event of any material change in, cancellation of, or expiration of coverage. Any notice affecting a material change in, cancellation of, or expiration of coverage received by the Contractor shall be transmitted forthwith to the Departmental Representative.

PART I - COMPREHENSIVE GENERAL LIABILITY (CGL)**CGL1 LIMITS**

- 1.1 The policy shall be written on a form similar to that known and referred to in the insurance industry as IBC 2100 - Commercial General Liability policy (Occurrence form) and shall provide for limit of liability of not less than the amount stated in C9, inclusive of Bodily Injury and Property Damage for any one occurrence or series of occurrences arising out of one cause. Legal or defence costs incurred in respect of a claim or claims shall not operate to decrease the limit of liability.

CGL2 COVERAGES

- 2.1 The policy shall include but not necessarily be limited to the following coverages:
- 2.1.1 All premises, property and operations necessary or incidental to the performance of this Contract;
 - 2.1.2 Personal injury;
 - 2.1.3 Bodily injury and Property Damage on an "occurrence" basis;
 - 2.1.4 "Broad Form" Property Damage including the loss of use of property;
 - 2.1.5 Removal or weakening of support of any property, building or land whether such support be natural or otherwise;
 - 2.1.6 Elevator Liability (including Escalators, Hoists and Similar Devices);
 - 2.1.7 Contingent Employer's Liability;
 - 2.1.8 Owner's and Contractor's Protective Liability;
 - 2.1.9 Contractual and Assumed Liabilities under this Contract;
 - 2.1.10 Completed Operations and Products Liability;
The insurance shall continue for a period of at least two (2) years beyond the date of the Departmental Representative's Final Certificate of Completion for the Completed Operations Hazard.
 - 2.1.11 Cross Liability;
The clause shall be written as follows:
Cross Liability
The insurance as is afforded by this policy shall apply in respect to any claim or action brought against any one Insured by any other Insured. The coverage shall apply in the same manner and to the same extent as though a separate policy had been issued to each Insured. The inclusion herein of more than one Insured shall not operate to increase the limit of the Insurer's liability.
 - 2.1.12 Severability of Interests Clause;
The clause shall be written as follows:
Severability of Interests
This policy, subject to the limits of liability stated herein, shall apply separately to each Insured in the same manner and to the same extent as it a separate policy had been issued to each. This inclusion herein of more than one insured shall not increase the limit of the Insurer's liability.
- 2.2 Period of Insurance Coverage:
The period of required insurance coverage for all insurance elements listed in CGL2: Coverages shall be from the date of execution of this contract until the date of issuance by the Departmental Representative of the Final Certificate of Completion.

CGL3 ADDITIONAL EXPOSURES

- 3.1 The policy shall be endorsed to include the following exposures or hazards if the Work is subject thereto:
- 3.1.1 Blasting;
 - 3.1.2 Pile driving and caisson work;
 - 3.1.3 Underpinning;
 - 3.1.4 Risks associated with the activities of the contractor on an active airport;
 - 3.1.5 Radioactive contamination resulting from the use of commercial isotopes; and
 - 3.1.6 Damage to the portion of an existing building beyond that directly associated with an addition, renovation or installation contract. (The care, custody and control exclusion shall not apply.).

CGL4 INSURANCE PROCEEDS

4.1 Insurance Proceeds from this policy are payable directly to a Claimant/Third Party.

CGL5 DEDUCTIBLE

5.1 The policy shall be issued with a deductible amount of not more than \$500.00 CAD per occurrence applying to Property Damage claims only.

PART II - BUILDER'S RISK - DIRECT DAMAGE (BR)**BR1 SCOPE OF POLICY**

- 1.1** The policy shall be written on an "All Risks" basis granting coverage similar to that provided by the form known and referred to in the Insurance Industry as "Builders' Risk Comprehensive Form."

BR2 PROPERTY INSURED

- 2.1** The property insured shall include:
- 2.1.1** The Work and all property, equipment and materials intended to become part of the finished Work at the site of the project while awaiting, during and after installation, erection or construction including testing;
 - 2.1.2** Expenses incurred in the removal from the construction site of debris of the property insured, including demolition of damaged property, de-icing and de-watering, occasioned by loss, destruction or damage to such property and in respect of which insurance is provided by this policy; and
 - 2.1.3** Equipment and materials required for the execution or temporary protection of the Work.

BR3 INSURANCE PROCEEDS

- 3.1** Insurance Proceeds from this policy are payable in accordance with GC28 of the General Conditions of the Contract.
- 3.2** The policy shall provide that the proceeds thereof are payable to Her Majesty or as the Minister may direct.
- 3.3** The Contractor shall do such things and execute such documents as are necessary to effect payment of the proceeds.

BR4 AMOUNT OF INSURANCE

- 4.1** The amount of insurance shall not be less than the sum of the contract value plus the declared value (if any) set forth in the contract documents of all material and equipment supplied by Her Majesty at the site of the project to be incorporated into and to form part of the finished Work.

BR5 DEDUCTIBLE

- 5.1** The policy shall be issued with a deductible amount of not more than \$1,000.00 CAD.

BR6 EXCLUSION QUALIFICATIONS

- 6.1** The policy may be subject to the standard exclusions but the following qualifications shall apply:
- 6.1.1** Faulty materials, workmanship or design may be excluded only to the extent of the cost of making good thereof and shall not apply to loss or damage resulting therefrom;
 - 6.1.2** Loss or damage caused by contamination by radioactive material may be excluded except for loss or damage resulting from commercial isotopes used for industrial measurement, inspection, quality control, radiographic or photographic use; and
 - 6.1.3** Use and occupancy of the project or any part or section thereof shall be permitted where such is for the purposes for which the project is intended upon completion.

BROKER'S CERTIFICATE OF INSURANCE

(TO BE DELIVERED TO THE DEPARTMENTAL REPRESENTATIVE BEFORE THE START OF ANY ON-SITE WORK)

COVERING:
DESCRIPTION OF WORK: _____

LOCATION OF WORK: _____

ISSUED BY:
BROKER/AGENT: _____

ADDRESS: _____

ISSUED TO: FOREIGN AFFAIRS, TRADE AND DEVELOPMENT CANADA
ADDRESS: 125 SUSSEX DRIVE, OTTAWA, ONTARIO CANADA K1A 0G2

NAMED INSURED:
CONTRACTOR: _____

ADDRESS: _____

This document certifies that the following policies of Insurance are at present in force covering all operations of the Insured, effective from _____ 20__ in connection with Foreign Affairs, Trade and Development Canada, for the _____ made between the Named Insured and Foreign Affairs, Trade and Development Canada.

TYPE	POLICY NUMBER	EXPIRY DATE OF LIABILITY			LIMITS	DEDUCTIBLE
		DAY	MONTH	YEAR		
Comprehensive General Liability						
Builder's Risk "All Risks"						

Each of these policies provides coverages as specified in Insurance Conditions Section "IV" which form part of this Contract.

The Insurer agrees to notify Her Majesty and the Named Insured in writing thirty (30) days prior to any material change in, cancellation of, or expiration of any policy or coverage.

Name - Broker/Agent's Authorized Representative Signature-Broker/Agent's Authorized Representative Date Telephone Number

ISSUANCE OF THIS CERTIFICATE SHALL NOT LIMIT OR RESTRICT THE RIGHT OF HER MAJESTY TO REQUEST AT ANY TIME DUPLICATE CERTIFIED COPIES OF SAID INSURANCE POLICIES.

INSURER'S CERTIFICATE OF INSURANCE

(TO BE DELIVERED TO THE DEPARTMENTAL REPRESENTATIVE
BEFORE THE START OF ANY ON-SITE WORK)

COVERING:

DESCRIPTION OF WORK: _____

LOCATION OF WORK: _____

ISSUED BY:

BROKER/AGENT: _____

ADDRESS: _____

ISSUED TO: FOREIGN AFFAIRS, TRADE AND DEVELOPMENT CANADA

ADDRESS: 125 SUSSEX DRIVE, OTTAWA, ONTARIO CANADA K1A 0G2

NAMED INSURED:

CONTRACTOR: _____

ADDRESS: _____

This document certifies that the following policies of Insurance are at present in force covering all operations of the Insured, effective from _____ 20__ in connection Foreign Affairs, Trade and Development Canada, for the _____ made between the Named Insured and Foreign Affairs, Trade and Development Canada.

TYPE	POLICY NUMBER	EXPIRY DATE OF LIABILITY			LIMITS	DEDUCTIBLE
		DAY	MONTH	YEAR		
Comprehensive General Liability						
Builder's Risk "All Risks"						

Each of these policies provides coverages as specified in Insurance Conditions Section "IV" which form part of this Contract.

The Insurer agrees to notify Her Majesty and the Named Insured in writing thirty (30) days prior to any material change in, cancellation of, or expiration of any policy or coverage.

Name - Insurer's_____
Signature- Insurer's_____
Date_____
Telephone Number_____
Authorized Representative Authorized Representative

ISSUANCE OF THIS CERTIFICATE SHALL NOT LIMIT OR RESTRICT THE RIGHT OF HER MAJESTY TO REQUEST AT ANY TIME DUPLICATE CERTIFIED COPIES OF SAID INSURANCE POLICIES.

APPENDIX “A” – STATEMENT OF WORK (SOW)

Project Title: Mechanical and Electrical Upgrades, New Delhi, India

Location of Project: High Commission Canada (HCC), 7/8 Shantipath, Chanakyapuri, New Delhi, India – 110 021

General: Defined terms/Acronyms used in this Statement of Work.

High Commission of Canada: HCC or Mission
Chancery or High Commission of Canada office building: CH
Immigration, Refugees, Citizenship Canada: IRCC
Departmental Representative (DR): Government of Canada and/or Global Affairs Canada (GAC) authorized project representative
Temporary Resident Unit: TRU (IRCC space with largest worker density in the CH)
Rooftop Unit # 1, 2 or 3: RTU1; RTU2; RTU3
Dedicated Outside Air Handling Unit or Heat Recovery Unit #1: DOA / HRU-1
Metasys Control Panel: CP

This Statement of Work provides an overview of the required mechanical and electrical work for this project at the High Commission of Canada (HCC) in New Delhi, India. Project implementation design and specification details are provided on the enclosed mechanical and electrical drawings and specifications and in referenced Code and Standards documents.

The primary scope of this project includes the supply and installation (i.e. complete replacement) of the three (3) existing RTUs (RTU1, 2 and 3) and one existing DOA unit (i.e. HRU-1), all located on the roof of the ground floor IRCC offices located on the north side of the CH building. The replacement of the existing CP for the rooftop units is also included in the scope of work. Although the majority of the project work is mechanical and electrical in discipline, some structural and architectural works may also be necessary, pertaining to rooftop unit support-base requirements and restoration of walls, roof and other building components to their pre-construction condition.

In addition to the replacement of RTU1-3, HRU-1 and CP, there is optional work related to sprinklers and emergency lighting.

Option 1 includes changes to existing sprinklers in designated basement and third floor areas. The work includes minor demolition work and the supply and installation of sprinkler line, fittings and heads. All requirements of this scope are provided on the enclosed project design drawings and specifications.

Option 2 includes the supply and installation of additional emergency system egress lighting throughout the CH. This work also includes other minor work associated with the removal/disposal of existing emergency lighting and signage items and the requirement of the contractor to restore all walls, ceilings, etc. to their pre-construction state. Locations and details of the emergency lighting devices to be supplied and installed are included in the design drawings and specifications for this scope.

Background

The IRCC department in the HCC CH building in New Delhi is one of the largest IRCC departments that the Government of Canada has abroad. It serves as the hub for all of India as well as for some other neighbouring countries in Southeast Asia. The large IRCC Department has seen further significant growth over recent years. To provide an appropriate working environment and to increase density of the IRCC workspaces for the Canadian and local staff in the department, IRCC workspaces throughout the CH have been retrofitted with new ergonomic workstation furniture as Phase 1 of this project. This Phase 1 work was completed mid-February 2020.

To support the increased density of the workspaces and the associated volume demands for conditioned ventilation air, as well as the need to address deteriorating New Delhi air quality, the three existing RTUs, HRU-1 and the associated CP have been identified to be replaced and upgraded. (All units are also beyond their remaining operational life.) The replacement of the rooftop units and all associated electrical supply/connections, and the lightning protection system for all equipment, is Phase 2 of the project.

The three RTUs and the single HRU-1 that have been identified to be replaced are located on the north side of the CH building, readily accessible from the pedestrian and vehicle areas near the building. The units are located on the roof of the single storey TRU space; the new units will be situated in generally the same location and footprint of the existing units. The associated Metasys Control Panel for the equipment is located in the janitor closet on the ground floor, below the RTU/HRU-1 locations.

In addition to the mechanical unit replacements above the TRU space, additional mechanical and electrical upgrades have been identified in order to address other life safety deficiencies throughout the CH. The required improvements include sprinkler line modifications and head changes in basement and 3rd floor rooms of the CH; and emergency lighting and egress signage upgrades throughout the basement and all three upper floors of the CH building. Both life safety requirements are a result of accommodation and wall/office changes completed previously over a number of years and because of the recent increases in density with the IRCC Phase 1 furniture improvements.

Objective

The objective of the Phase 2 Mechanical/Electrical Upgrades portion of the New Delhi project is to complete the required improvements to the IRCC working environment at the HCC and to address life safety deficiencies throughout the CH as a whole.

As the Phase 1 furniture replacement portion of the project, commenced in May 2019 and completed in February 2020, attention to the second and final phase of the project is now the principal focus. Phase 2 of the project is required to be complete by December 31, 2021.

As stated above, the mechanical units requiring replacement serve the critical IRCC TRU office spaces. The TRU operations are required to continue on an uninterrupted work schedule (8am-4:30pm M-T; 8am-12pm F) throughout the duration of the Mechanical Upgrade work. As such, the contractor is required to complete the majority of the work outside of regular business hours. Although there will be opportunities for some contractor work to occur during IRCC business hours, all loud and otherwise disruptive activities, including any shutdown time of the ventilation units, will require coordination and prior approval by the Departmental Representative.

The award of the contract for the replacement of the mechanical units and the required procurement, delivery and installation work may result in the installation of the equipment having to be installed in unfavourable climatic conditions (i.e. non-winter season in Delhi) for the contractor and the IRCC/TRU occupants. The contractor is required to ensure acceptable (i.e. to the Departmental Representative) TRU office temperature, humidity levels and air quality conditions are maintained during all TRU office occupant working hours. If weekend/after-hours periods are insufficient for suitable office environmental conditions to be reinstated and maintained throughout the TRU occupant working times, the contractor will be responsible for providing appropriate temporary/portable cooling/humidity control/filtration equipment to the satisfaction of the Departmental Representative.

Despite the constraints resulting from the ongoing COVID-19 global pandemic situation, and restrictions potentially continuing into the project equipment implementation/construction period, the contractor's schedule for completing this project in an efficient manner as expeditiously as possible will need to be maintained to ensure a December 31, 2021 completion date for all work under the contract. If the contractor is not provided access to the Mission compound or work locations by HCC Operations or by the Departmental Representative for more than 120 days after Contract Award due to COVID-19 restrictions, negotiations for a revised completion date will occur between the contractor and the Departmental Representative.

Scope of Work

As introduced above, this Phase 2 project scope of work includes, as a minimum, the following mechanical and electrical scope of work:

- i. Decommissioning, including all electrical and ducting disconnections, breakdown of the existing roof-mounted units, and removal/disposal of components from the roof and site. Airflow measurements of the existing ventilation units are to be gathered prior to removal of the units.

The decommissioning and removal of the old equipment will require coordination with the installation of the new equipment in order to minimize down-time as work in the office spaces below will continue throughout.

Identification of the power and control cables that will be replaced or added-to will also be required prior to proceeding with existing equipment removals.

- ii. Order/delivery, site supply and installation of three (3) rooftops mechanical units; one dedicated outdoor/fresh air unit (HRU-1); one Metasys Control Panel (CP) unit. Rooftop unit bases are also required to be structurally designed or validated to ensure they can accommodate the new roof-mounted mechanical units and minimize vibration and noise to office spaces below.

The scope includes mechanical, electrical and associated architectural work, as specified on the package design drawings and specifications. Lightning protection works throughout the overall RTU, HRU-1 rooftop area is also part of the project scope for the contractor.

All associated duct transitions, electrical cable tray, cable and connection hardware are to be provided by the bidder and installed by the contractor's forces per the design drawings and specifications. All hoisting equipment and appropriate safety measures during craning of the equipment from/to the roof is the responsibility of the contractor.

All shop drawings are to be approved by the designed Departmental Representative prior to ordering the mechanical units and the associated mechanical and electrical equipment.

Replacement of the approved Metasys CP, currently located on the ground floor below the rooftop equipment, shall ultimately connect the new mechanical equipment to the existing building automation system, controlled from the central Monitoring Room located in the Service Building west of the CH. Contractor commissioning of the new equipment shall include training and acceptance of the equipment by the Monitor Room and Mission Operations personnel.

Installation of the new controller, workstation, sensors and associated wiring in preparation for the rooftop unit replacements is required prior to proceeding with the installation of the new units. Controller and new workstation programming must be completed in preparation for, and prior to the unit replacements.

As with the decommissioning and removal of the old rooftop equipment, coordination for the installation of the new equipment is required with the Departmental Representative to ensure downtime of the ventilation system is minimized.

- iii. If **Option 1** is exercised, the contractor will be responsible for coordinating with the Departmental Representative to obtain escorted building access to the basement and third floor sprinkler work locations as indicated on the drawings and to complete the sprinkler line/fitting and head changes per the design drawings and specifications. Site clean-up and restoration of finishes are required to the satisfaction of the Departmental Representative.

Sprinkler head changes are required throughout designated Work Areas in basement rooms (specifically rooms 039 and 041; and room 025/026/027) and in a small office location of the 3rd floor. Scope includes all associated piping and connections to existing sprinkler and fire protection system lines, commissioning and testing of the system as specified in the associated package drawings and specifications for this scope. All ceiling/architectural restoration work necessary to complete the Option 1 sprinkler scope of work and to restore finishes to original conditions is also included in the scope.

Although the extent of sprinkler works is small and specific to isolated basement and 3rd floor office areas, the work is required to occur outside of normal office hours. Work may proceed during evenings and/or weekends provided sprinklers are functional at the end of each work activity shift. Appropriate fire-watch procedures/measures are required from the time the existing sprinklers are inoperable to completion of the work. All lines and heads throughout the designated work area are to be tested and certified prior to requesting acceptance and placing the modified system into service. As-built drawings and all line, valve and head labelling is required.

- iv. If **Option 2** is exercised, the contractor will be responsible for coordinating with the Departmental Representative to obtain escorted building access to all emergency lighting, signage and panel locations as indicated on the electrical emergency lighting design drawings.

This scope includes supply and installation of all associated directional signage and electrical cable works as specified. All associated ceiling/wall architectural restoration work required to restore finishes to their original condition is also included as part of this scope.

Due to the large number of emergency lighting and signage devices to be supplied and installed by the contractor, the work associated with their installation (i.e. ceiling and wall mounting; electrical cabling within ceiling spaces to the respective distribution panels; and connection to existing panels) will impact business functions throughout the CH. Coordination with the Departmental Representative on site is required to ensure as much preparatory work as possible occurs prior to commencing the device installations and electrical connections.

All device testing, validation and commissioning is required as part of this scope, as are all as-built drawings and all device and panel labelling.

- v. The contractor will be responsible for all workers on the HCC site and for quality control of all work completed by their own forces and by their sub-trades. Ongoing site clean-up is required and acceptance of work area clean-up by the Departmental Representative is mandatory at the end of each contractor work shift.
- vi. The Departmental Representative will be the point of contact on site throughout the work however; additional subject matter experts and design representatives will also be present on site with the contractor at times of equipment start-up, commissioning and testing/certification.

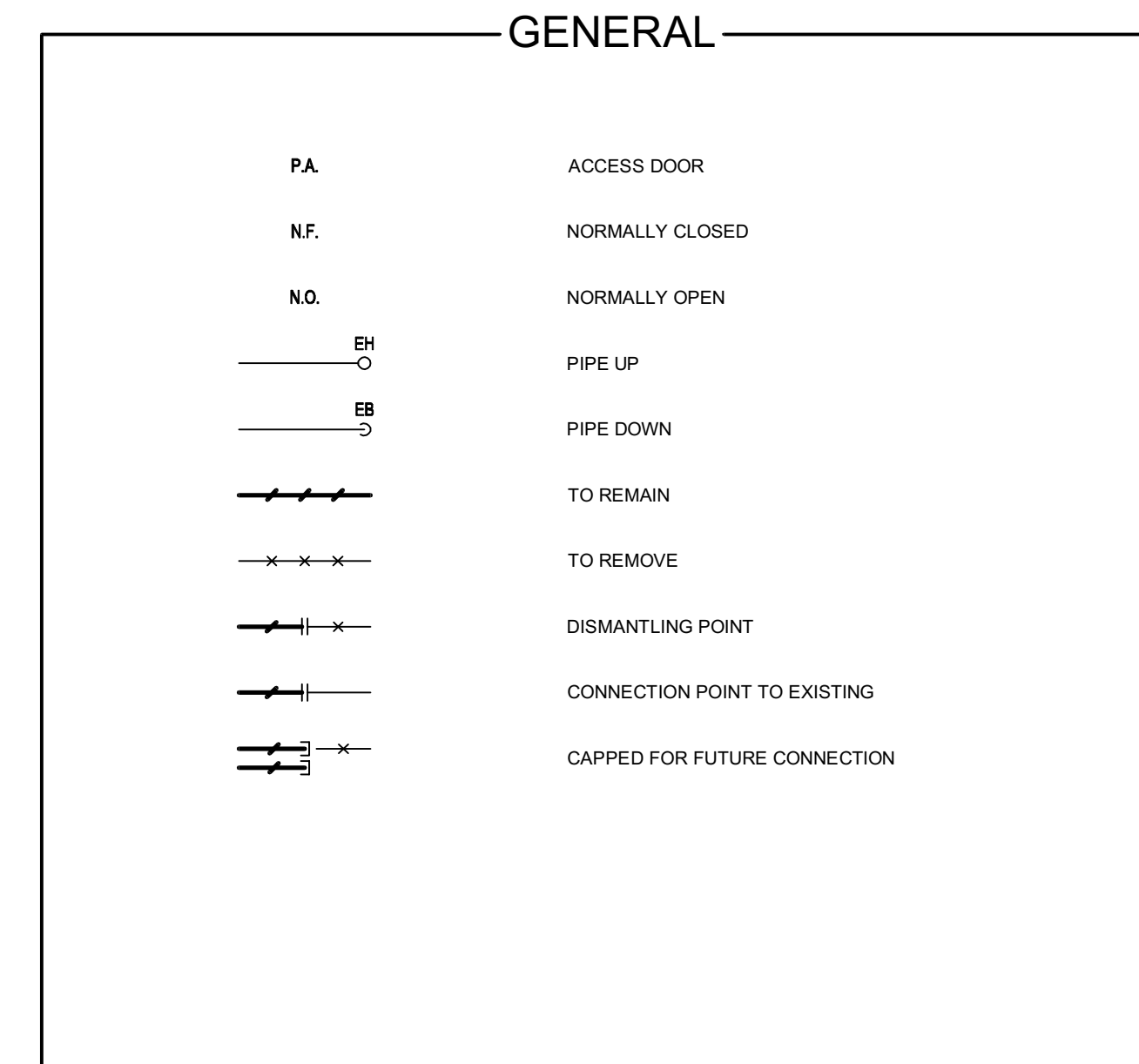
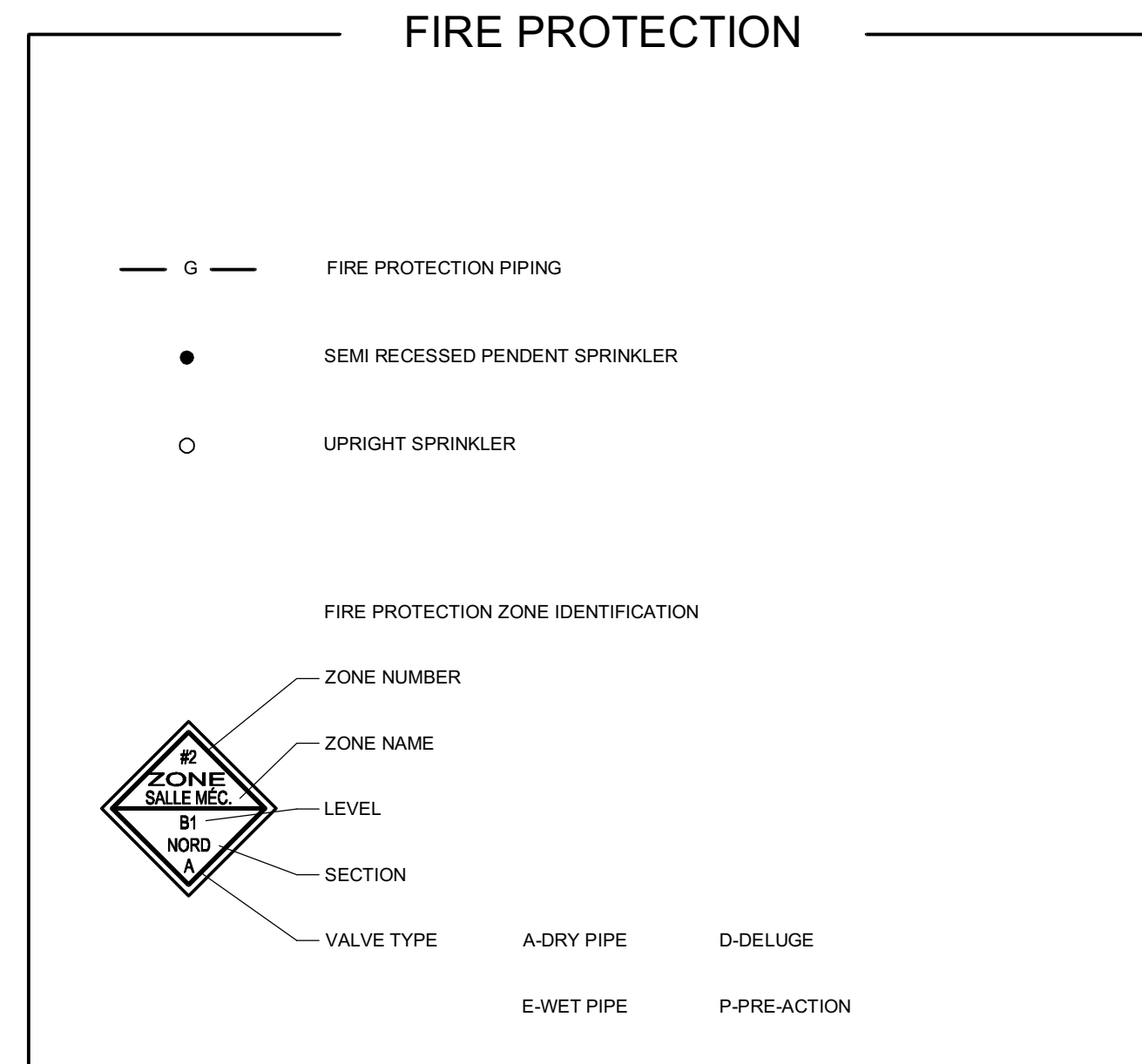
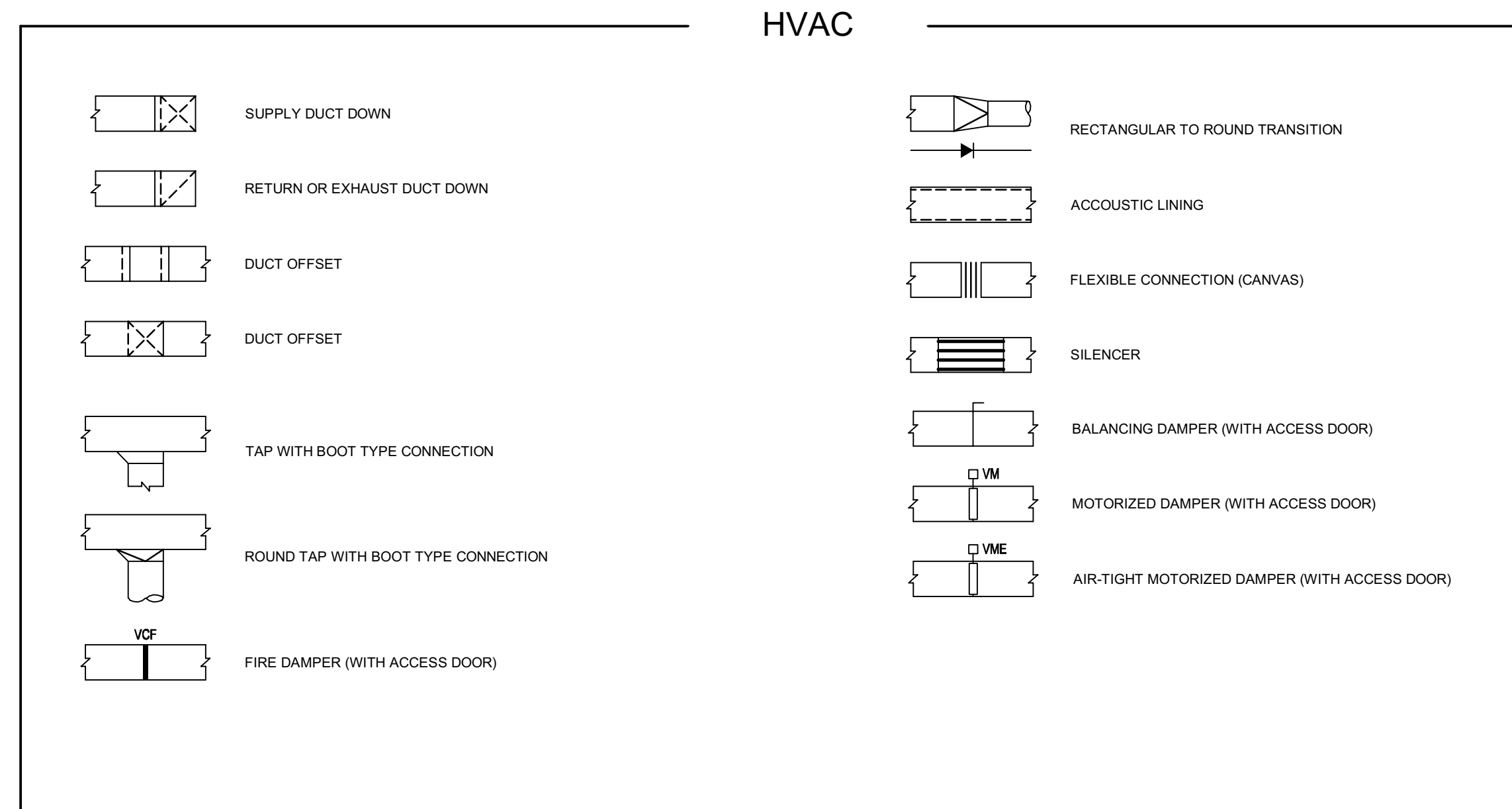
Proposed Schedule

All Schedule dates based on an assumed 6 January, 2021 Contract Award date.

Contract Award (CA)	6 January 2021
Project Start-up	11 January 2021
Shop Dwgs Issued for Review/Acceptance	22 January 2021
RTU/HRU Equipment Orders Placed	1 February 2021
Site Delivery of RTUs/HRU (12 wks)	26 April 2021
Start of Site Work (Sprinkler; Emerg. Lighting; RTU/HRU)	3 May 2021
Completion of RTU/HRU Installations (8 wks)	28 June 2021
Completion of RTU/HRU Commissioning (3 wks)	19 July 2021

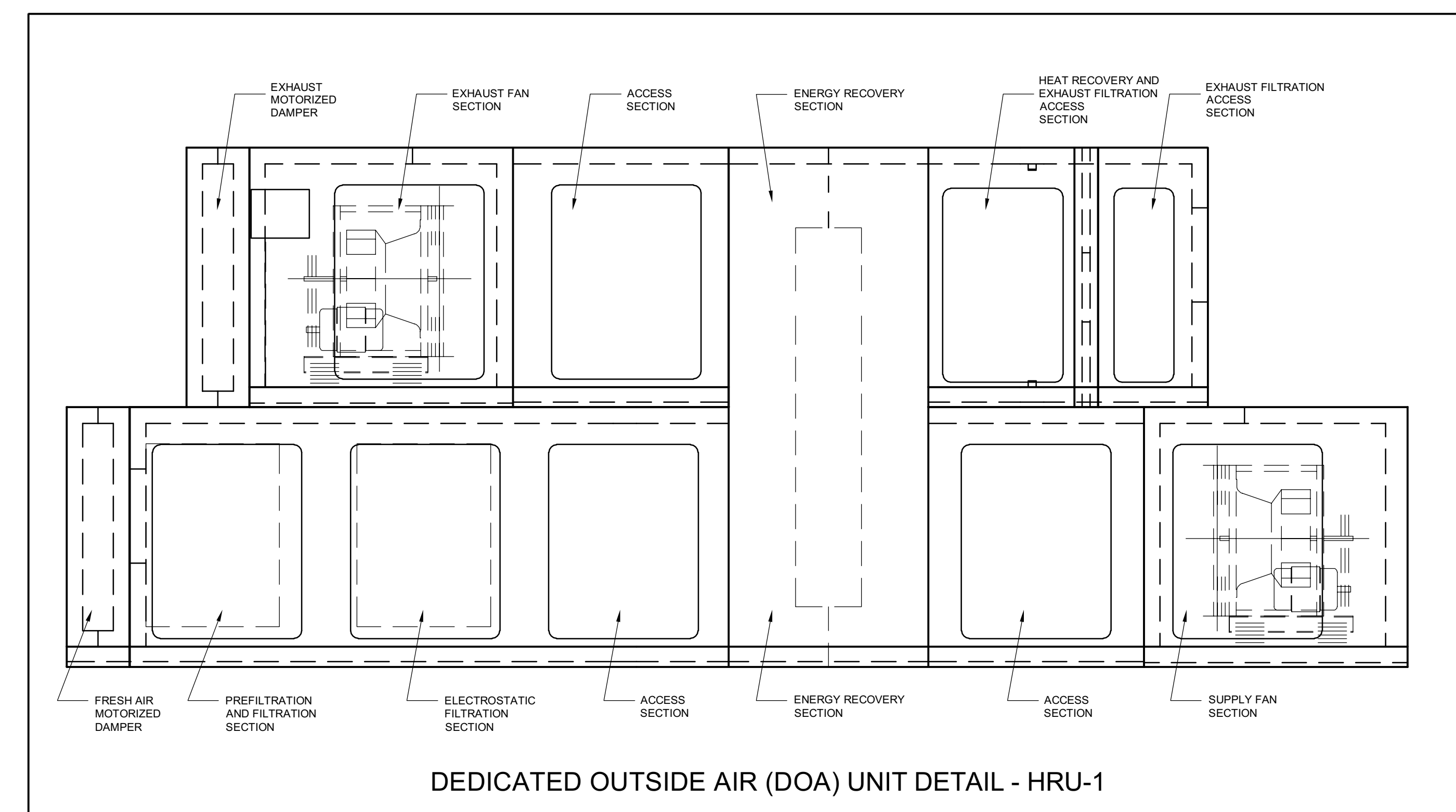
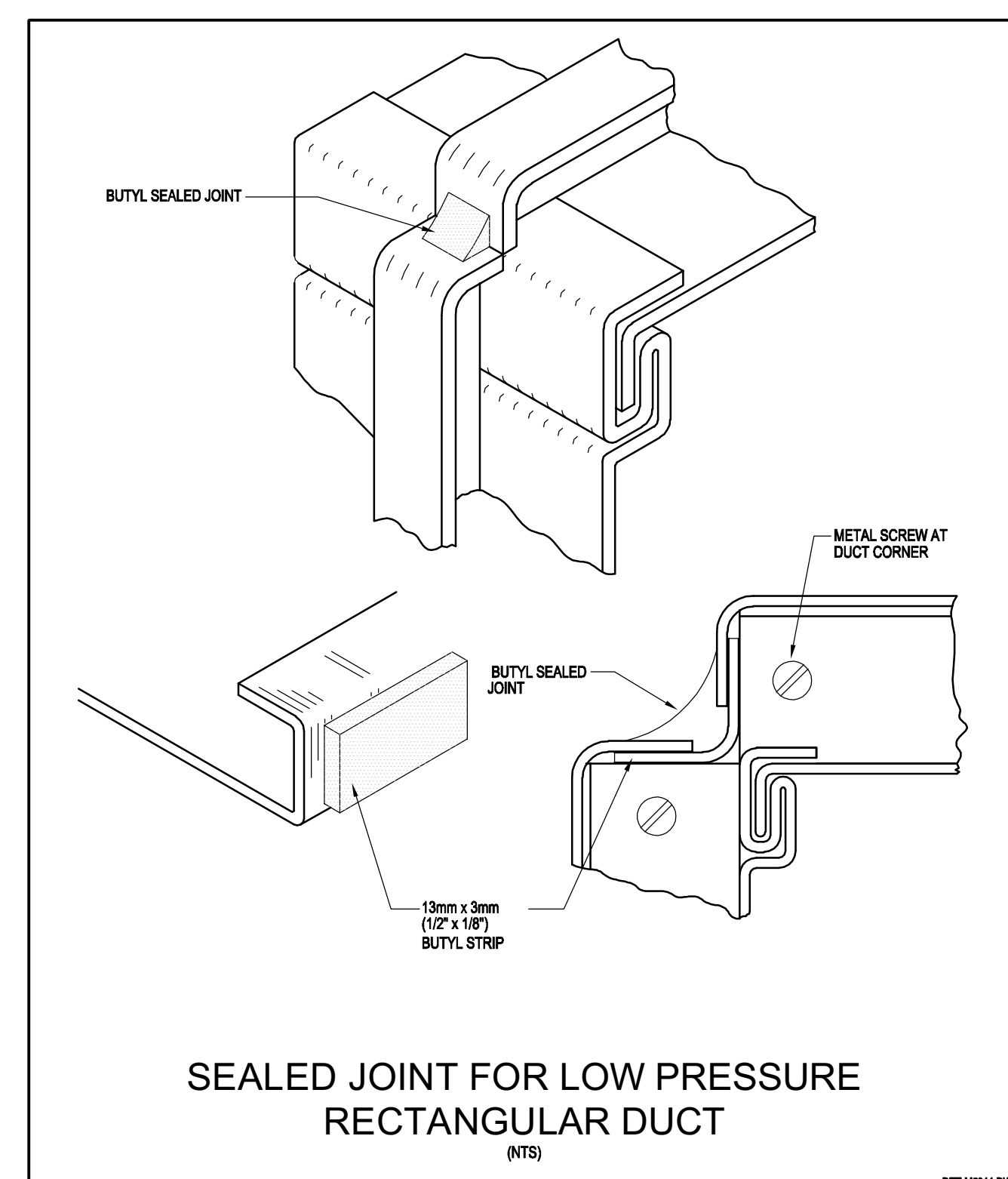
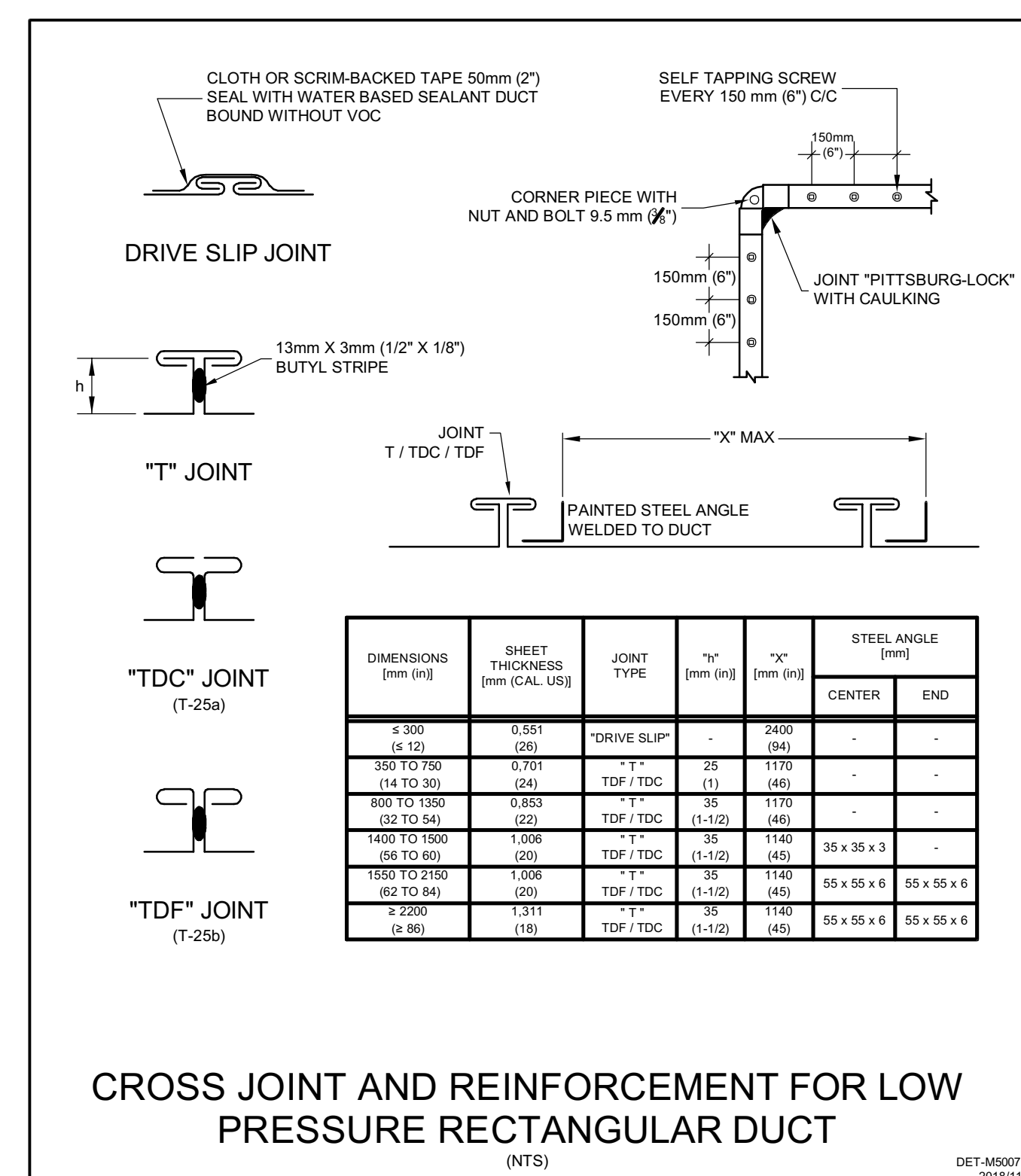
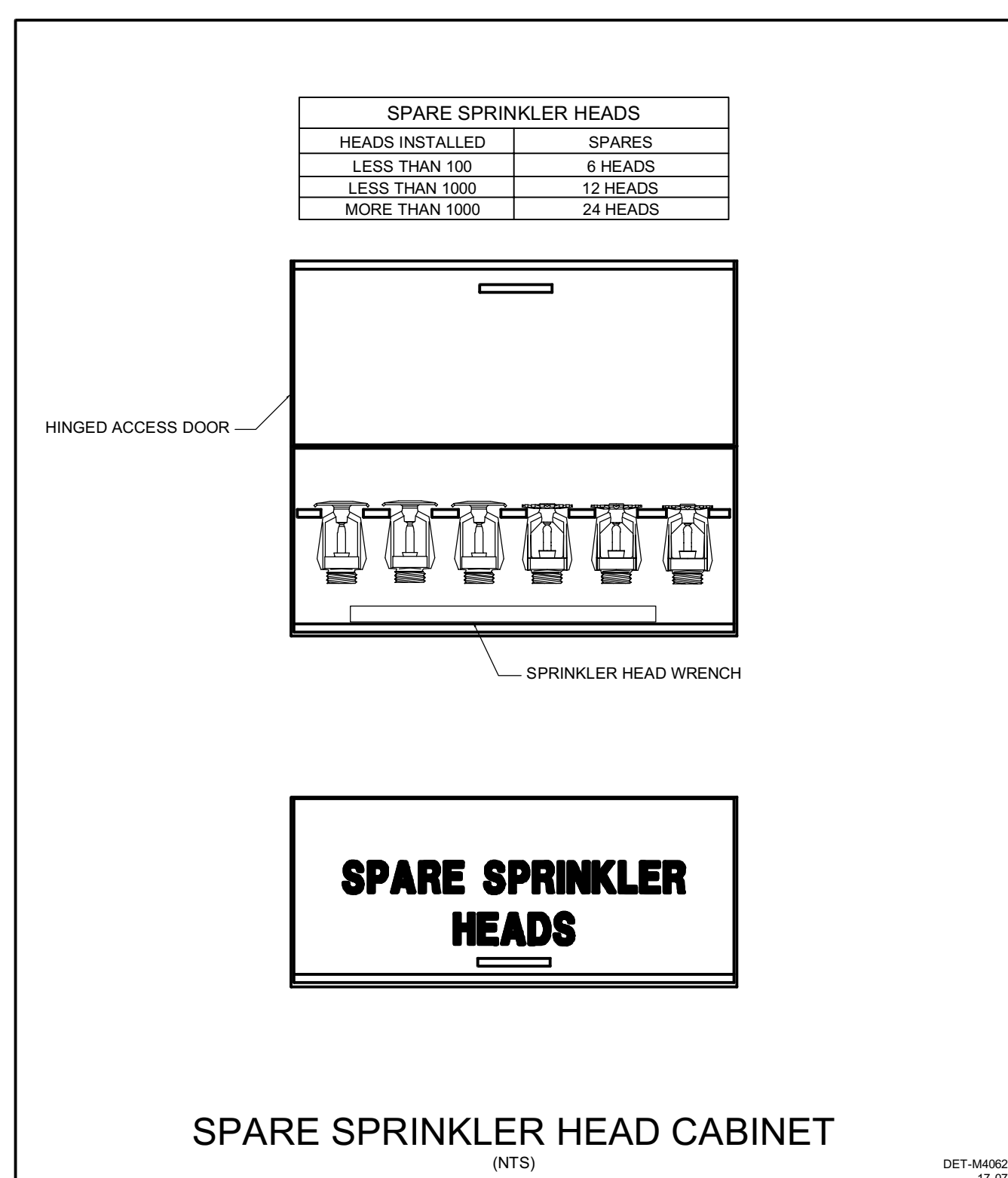
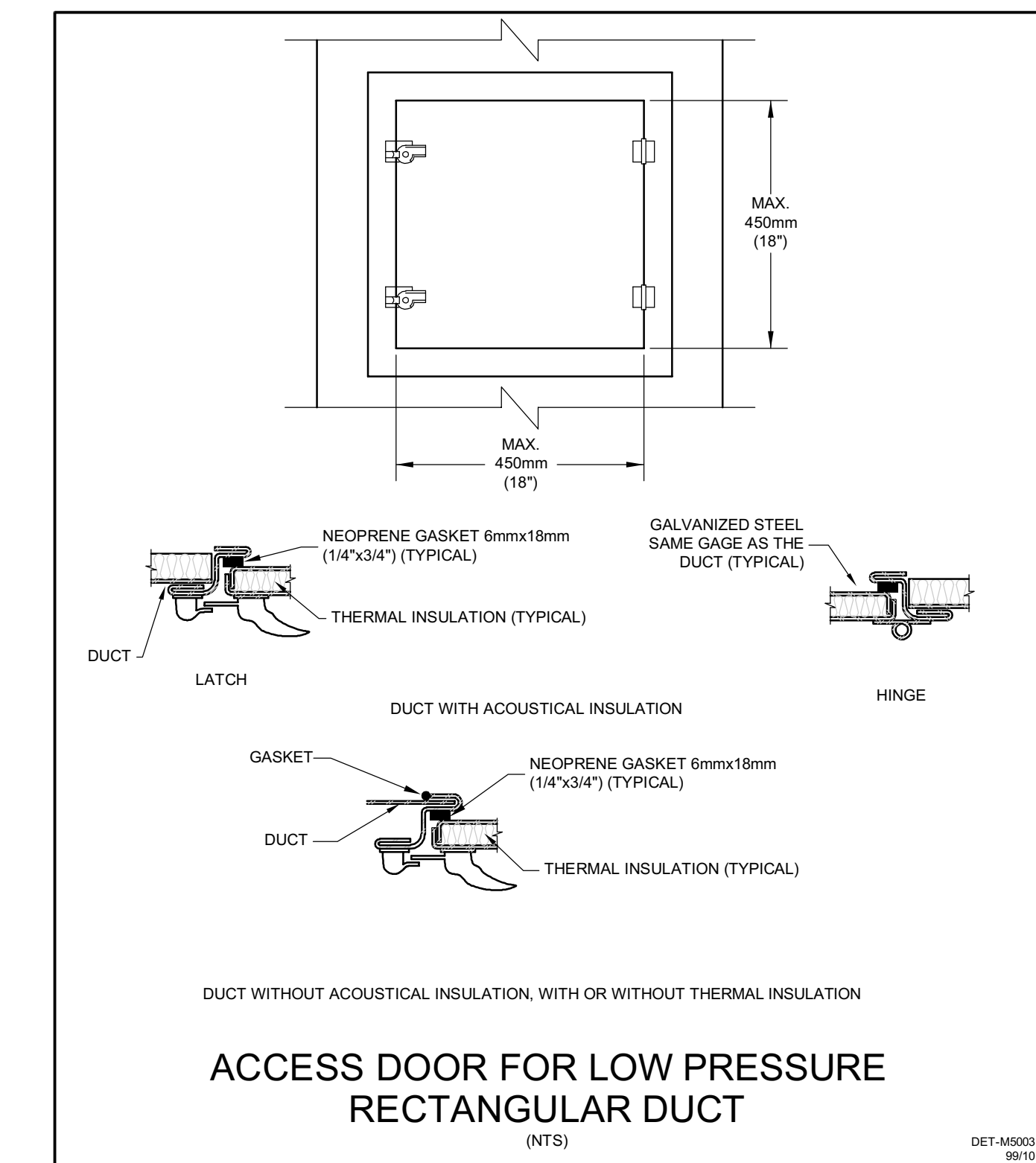
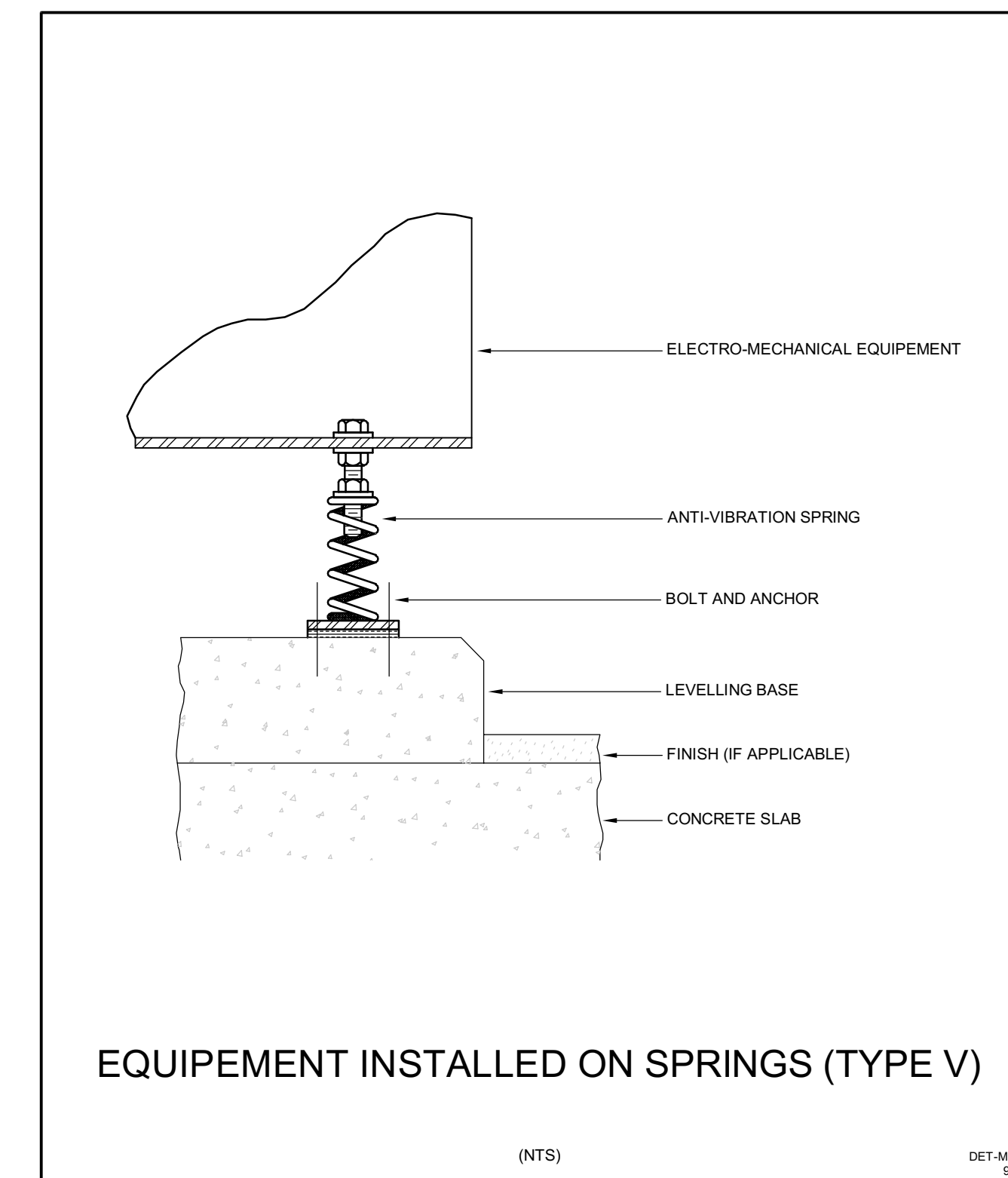
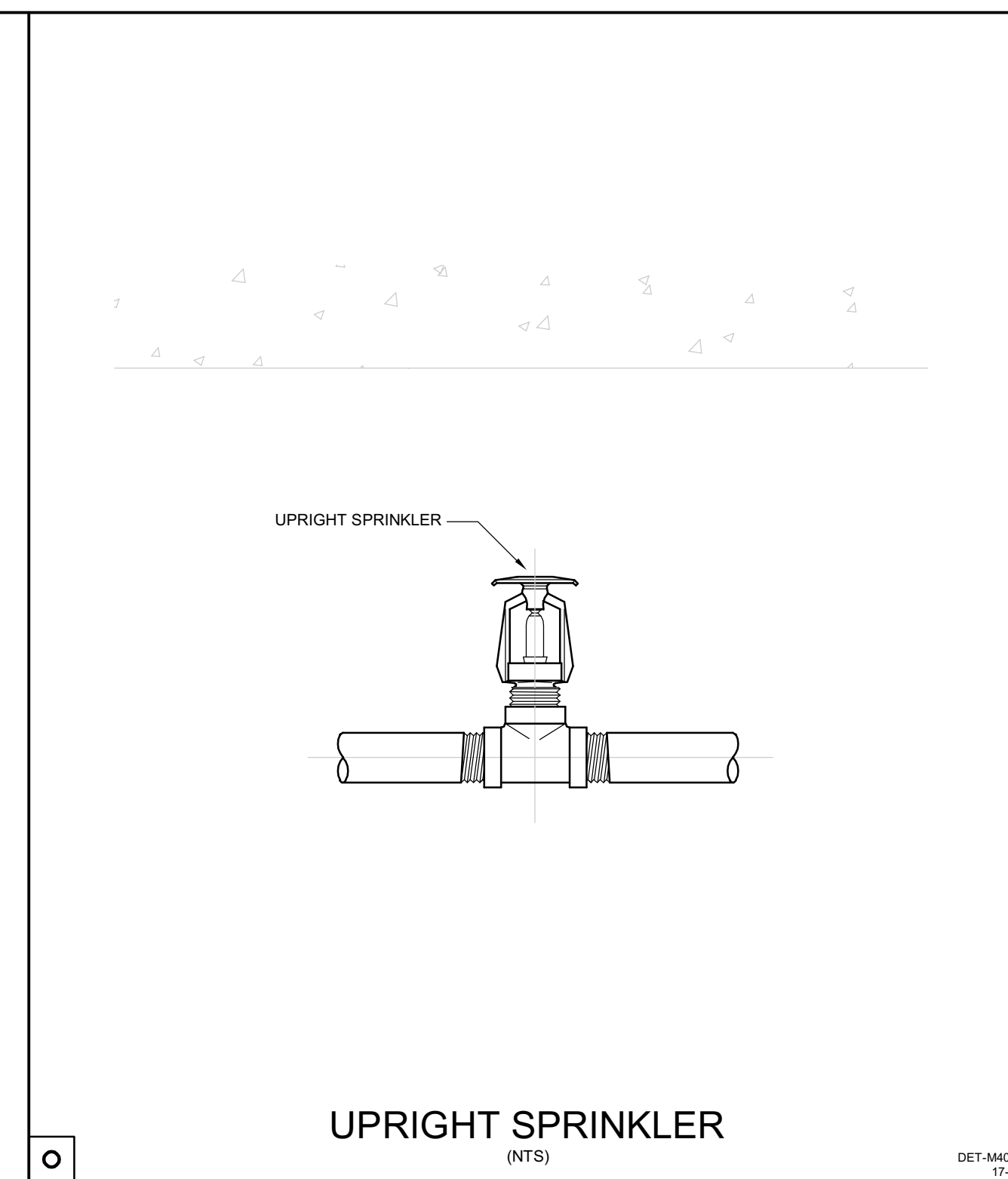
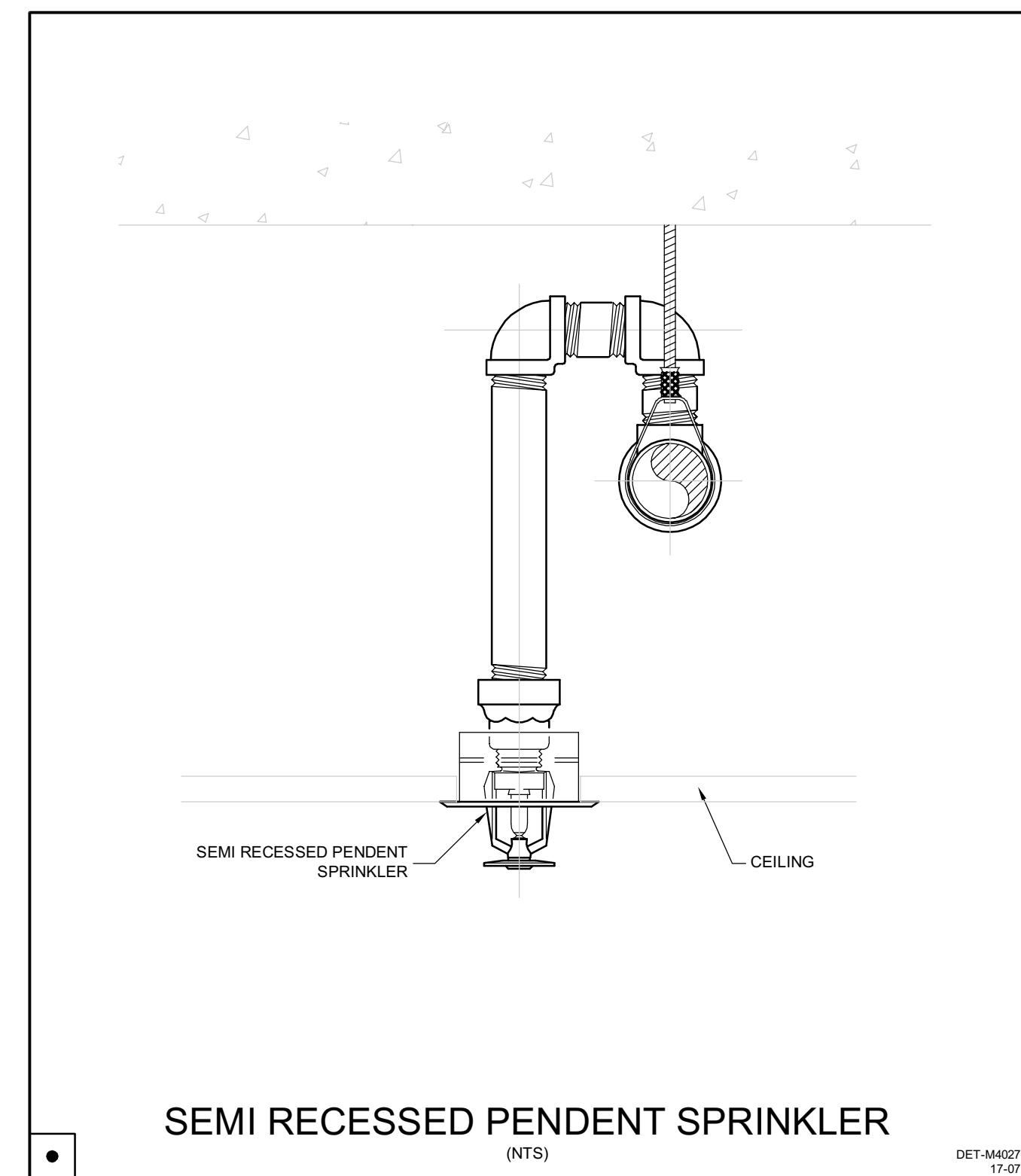
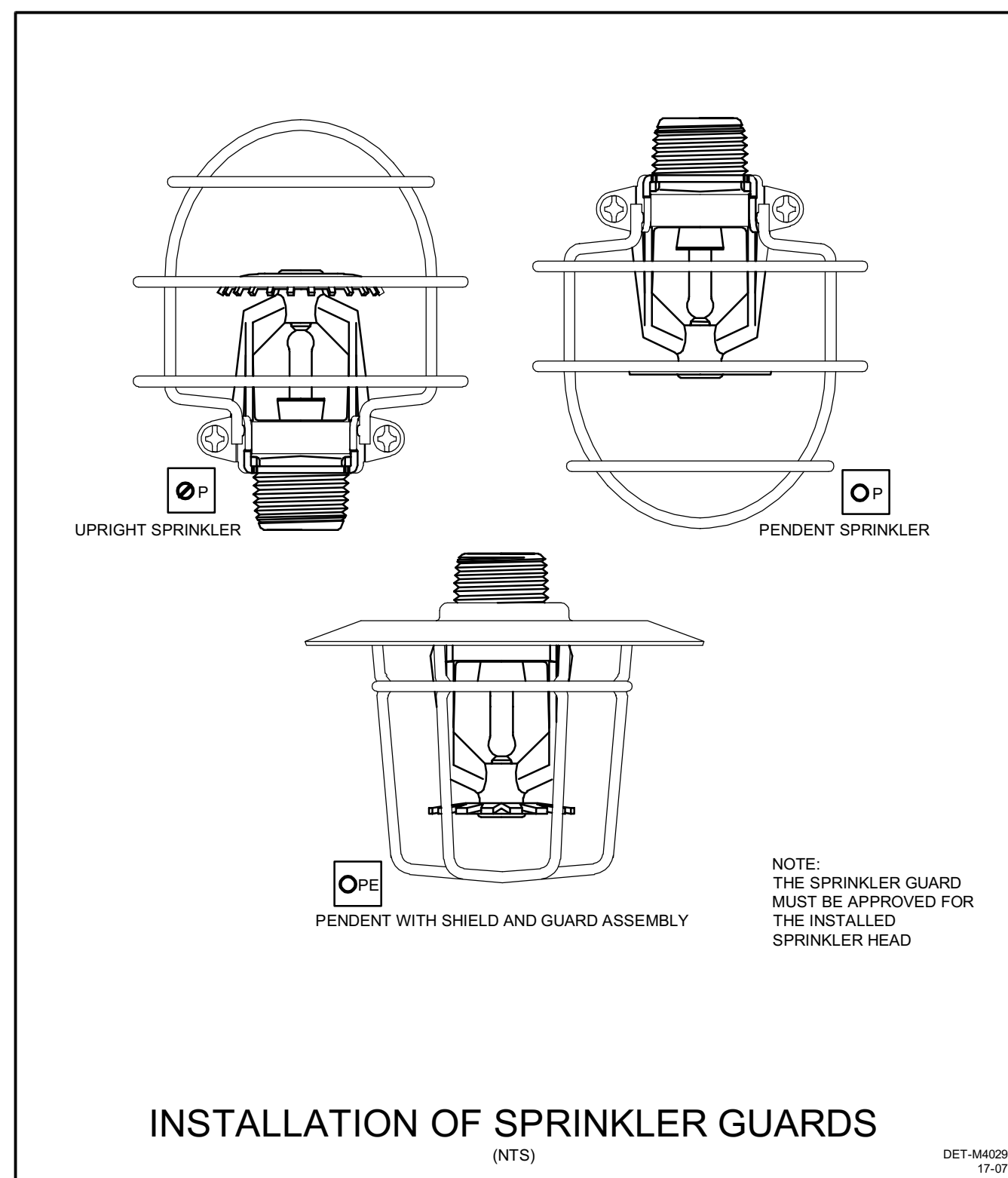
Completion of Sprinkler & Lighting Installations
Deficiencies Rectified (end HB period)
Project Handover/Close

30 July 2021
15 September 2021
6 October 2021



DRAWING LIST

✓	M-01	MECHANICAL LEGEND, DETAIL AND DRAWING LIST
✓	M-02	MECHANICAL SITE PLAN
✓	M-03	MECHANICAL FIRE PROTECTION EXISTING LAYOUT NEW LAYOUT
✓	M-04	MECHANICAL VENTILATION DEMOLITION
✓	M-05	MECHANICAL VENTILATION NEW LAYOUT
✓	M-06	CONTROL DRAWING



THESE DOCUMENTS SHOULD NOT BE USED FOR CONSTRUCTION

project north / nord à gauche / true north / nord exact

ISSUED FOR TENDER 2020-02-24

revision description date initial / revision description date initiales



asia pacific region / région de l'Asie le pacifique

project title / titre du projet

CANADIAN HIGH COMMISSION / EMBASSY

CHANCERY PHASE 2 HVAC UPGRADE

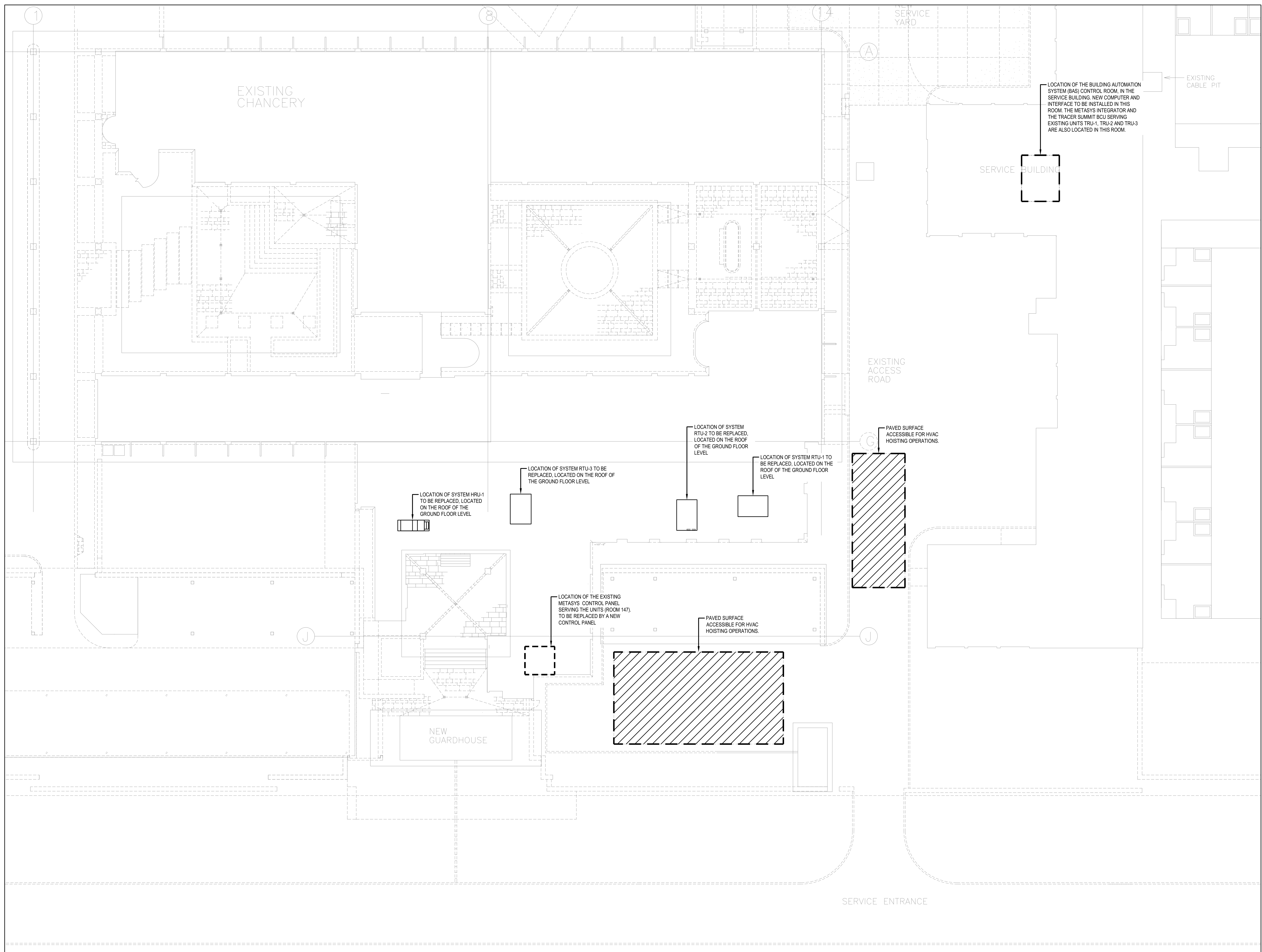
78 BHANTAPATH, CHANNAYAPUR

drawing title / titre du dessin

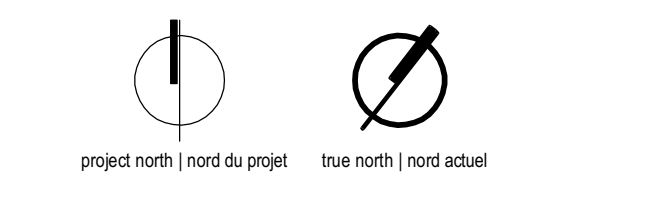
MECHANICAL LEGEND, DETAIL AND DRAWING LIST

author / architecte
 designed by / conçu par M. PRÉMEAU
 drawn by / dessiné par L. KOUJAKOU
 approved by / approuvé par M. PRÉMEAU
 property number / numéro du projet 522 0 070
 scale / échelle NONE
 date / date 2020-02-24
 sheet number / numéro de la page 1 of 6
 drawing number / numéro du dessin

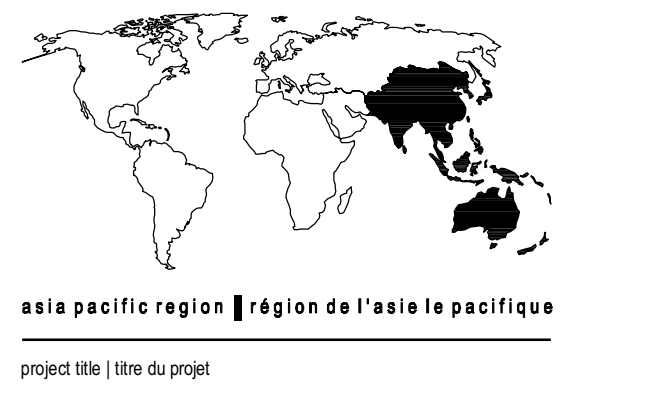
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revision	description / date / title / revision / description / date / title
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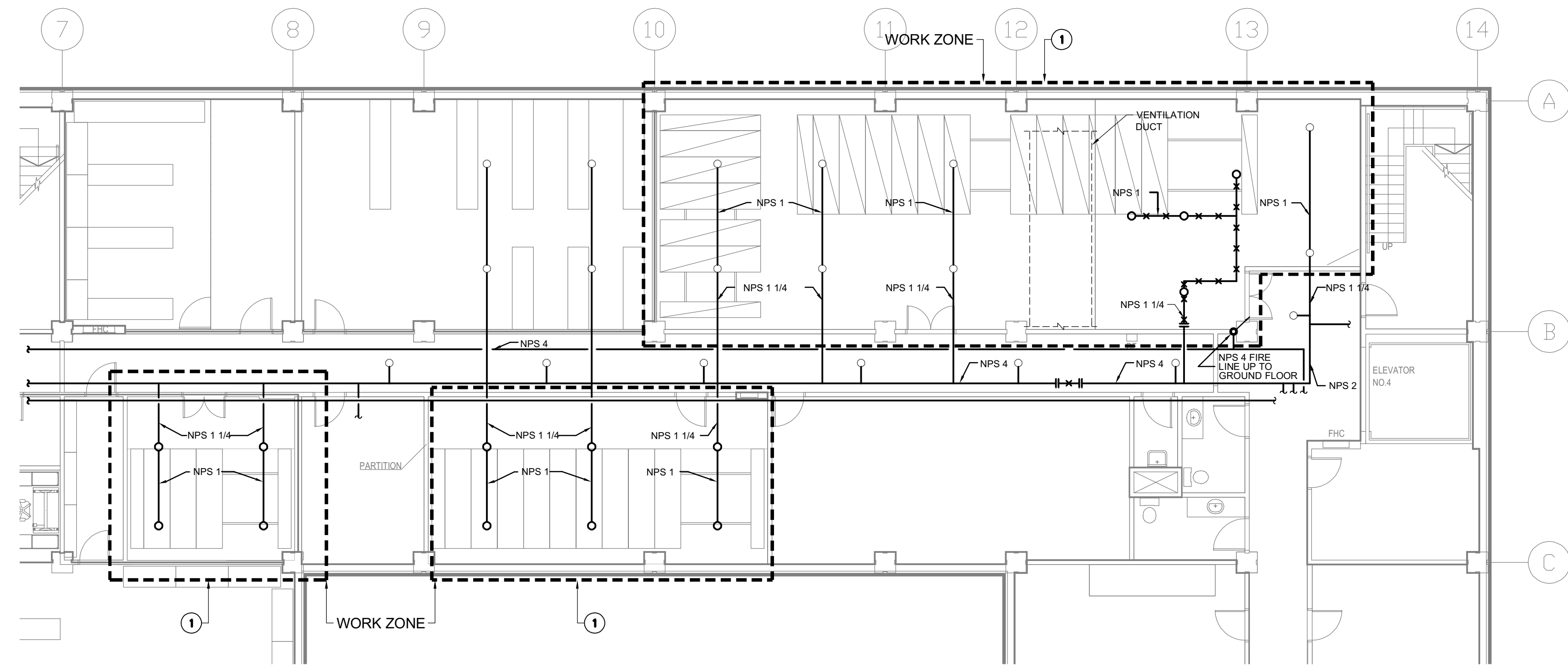
CANADIAN HIGH COMMISSION / EMBASSY
CHANCERY
PHASE 2 HVAC UPGRADE

MECHANICAL
SITE PLAN

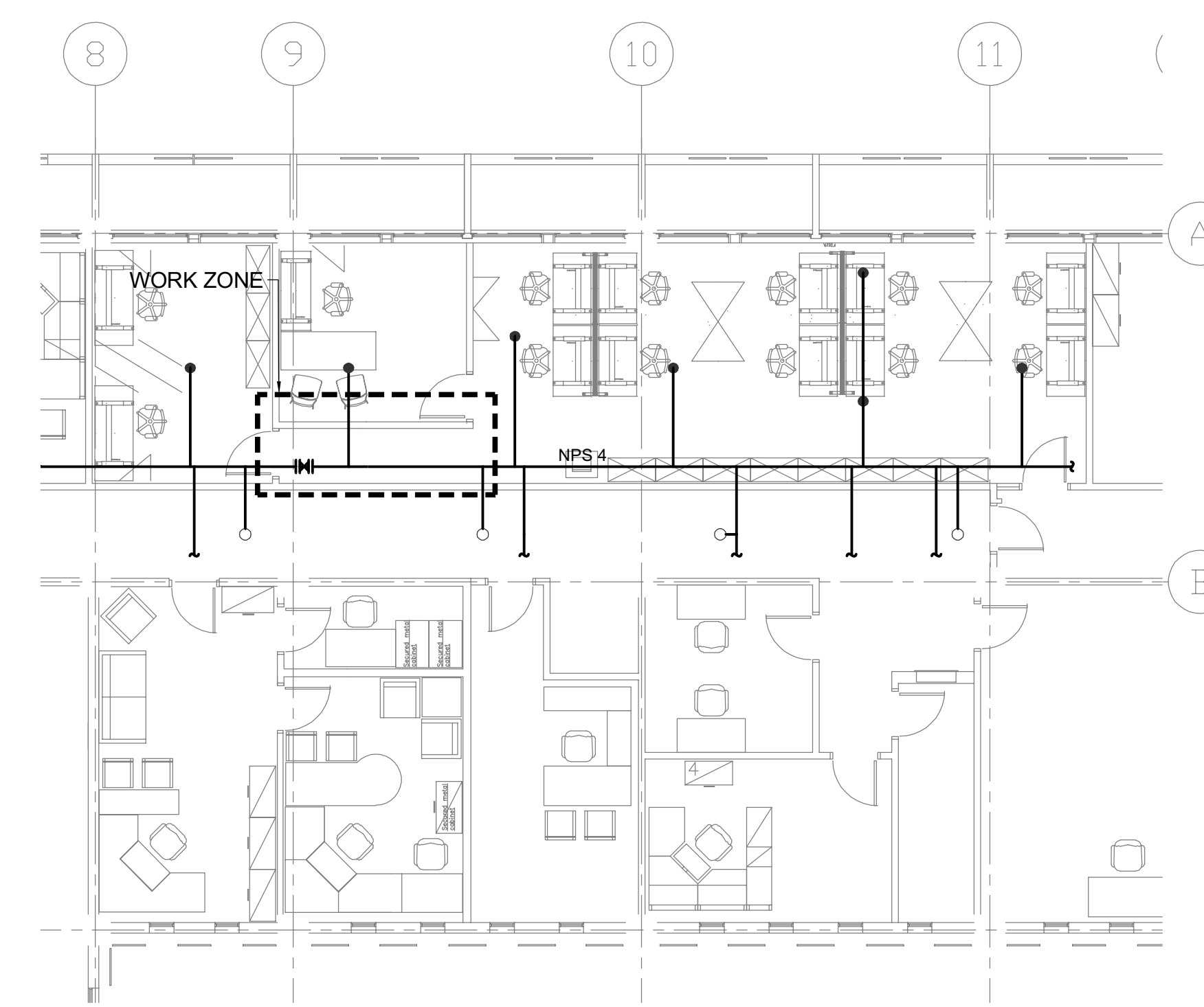
architect / architecte	
designed by / conçu par	M. PRIMEAU
drawn by / dessiné par	L. KOJAKU
approved by / approuvé par	M. PRIMEAU
property number / numéro de propriété	522 0 070
scale / échelle	1:125
date / date	2020-02-24
sheet number / numéro de la page	2 of 6
drawing number / numéro du dessin	



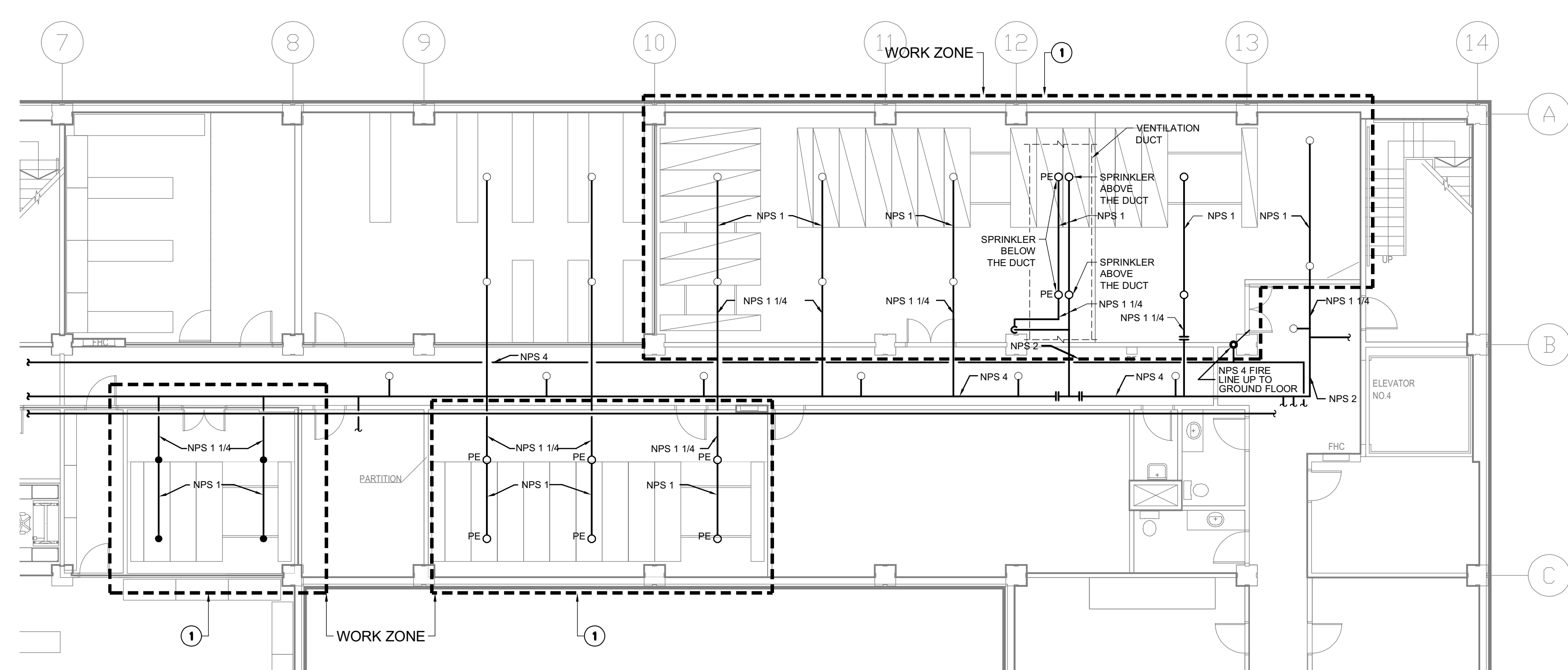
systems évolués de bâtiments
www.bps.ca



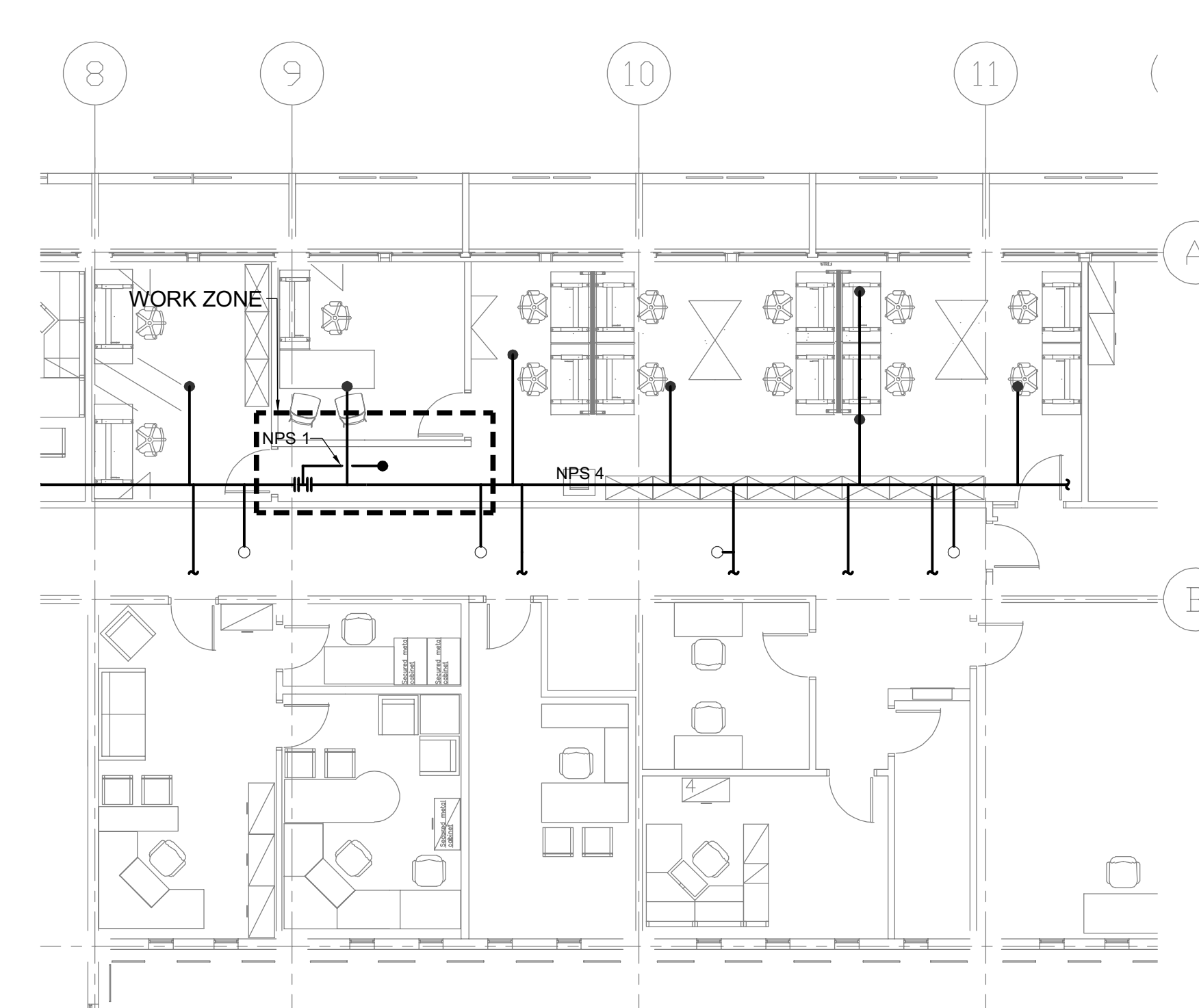
BASEMENT FLOOR PLAN - EXISTING LAYOUT



THIRD FLOOR PLAN - EXISTING LAYOUT



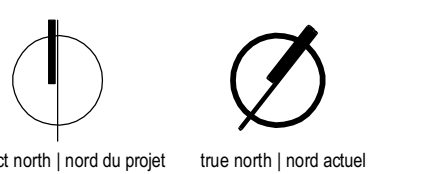
BASEMENT FLOOR PLAN - NEW LAYOUT



THIRD FLOOR PLAN - NEW LAYOUT

SPECIFIC NOTE:
① ALL SPRINKLER HEADS IN THE WORK ZONE MUST BE REPLACED WITH RAPID RESPONSE HEADS.

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ISSUED FOR TENDER 2020-09-25
W.P.

revision description date initial / revision description date initiales



asia pacific region / région de l'asie le pacifique

project title / titre du projet

CANADIAN HIGH COMMISSION / EMBASSY

CHANCERY
PHASE 2 HVAC UPGRADE

718 SHANTIPATH, CHANAKYAPUR

drawing title / titre du dessin

MECHANICAL
FIRE PROTECTION
EXISTING LAYOUT
NEW LAYOUT

architect / architecte

designed by / conçu par M. PRIMEAU

drawn by / dessiné par L. KOUJAKOU

approved by / approuvé par M. PRIMEAU

property number / numéro du projet 522 0 070

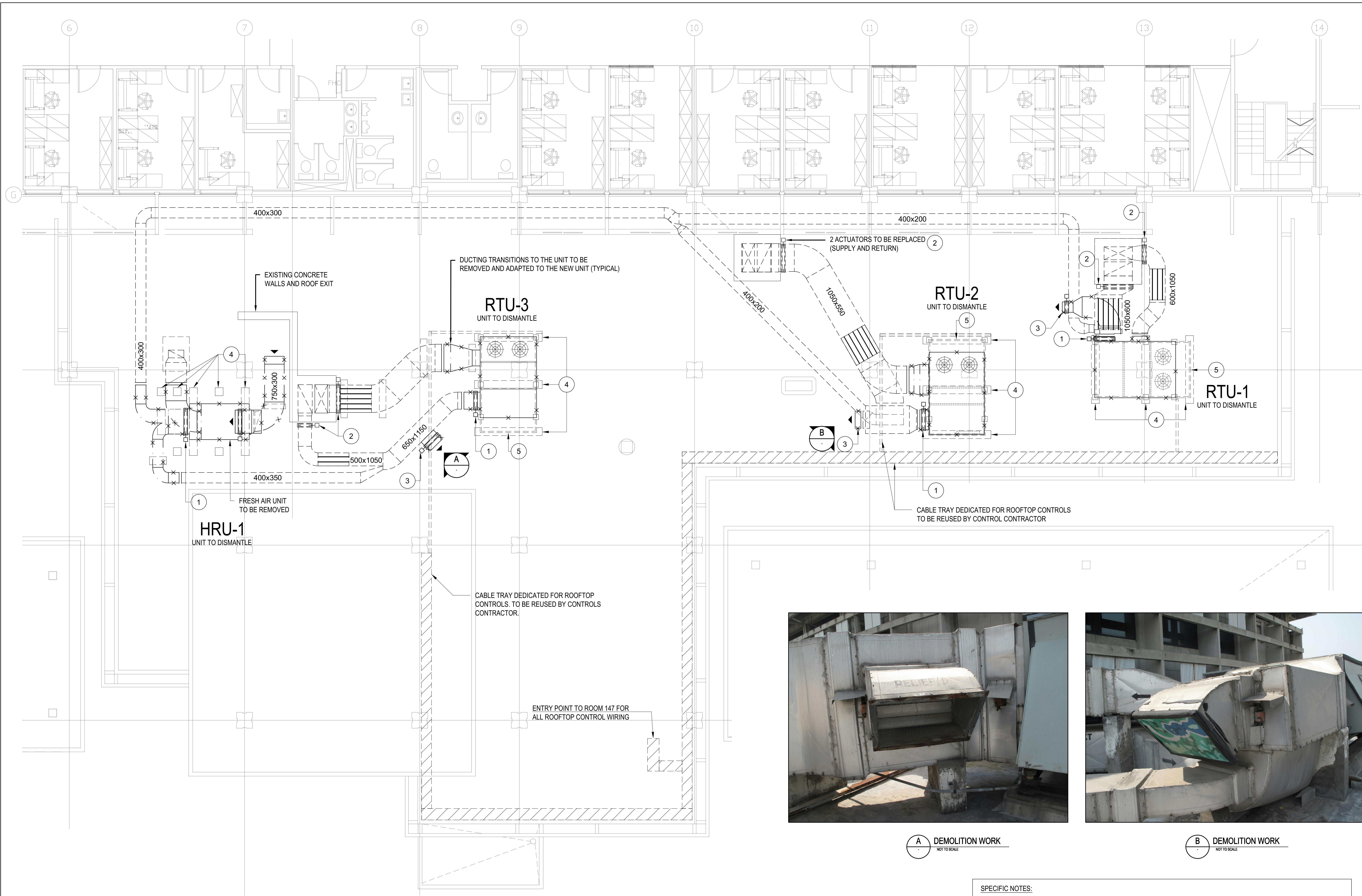
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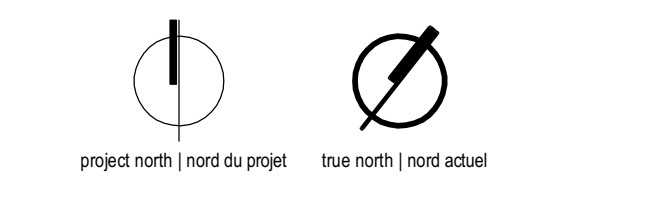
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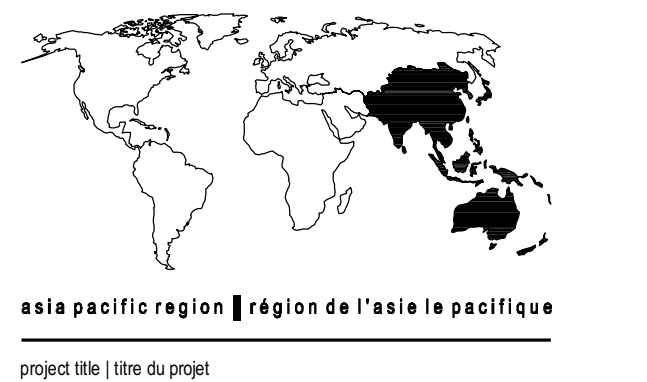
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CANADIAN HIGH COMMISSION / EMBASSY

CHANCERY PHASE 2 HVAC UPGRADE

78 BHANUPATHI, CHANNAYAPURU

drawing title / titre du dessin

MECHANICAL VENTILATION DEMOLITION

checked / vérifiée	
designed by / conçu par	M. PRIMEAU
drawn by / dessiné par	L. KOUJAKOU
approved by / approuvé par	M. PRIMEAU
property number / numéro de propriété	522 0 070
scale / échelle	AUSCINE
date / date	2020-02-24
sheet number / numéro de la page	4 of 6
drawing number / numéro du dessin	

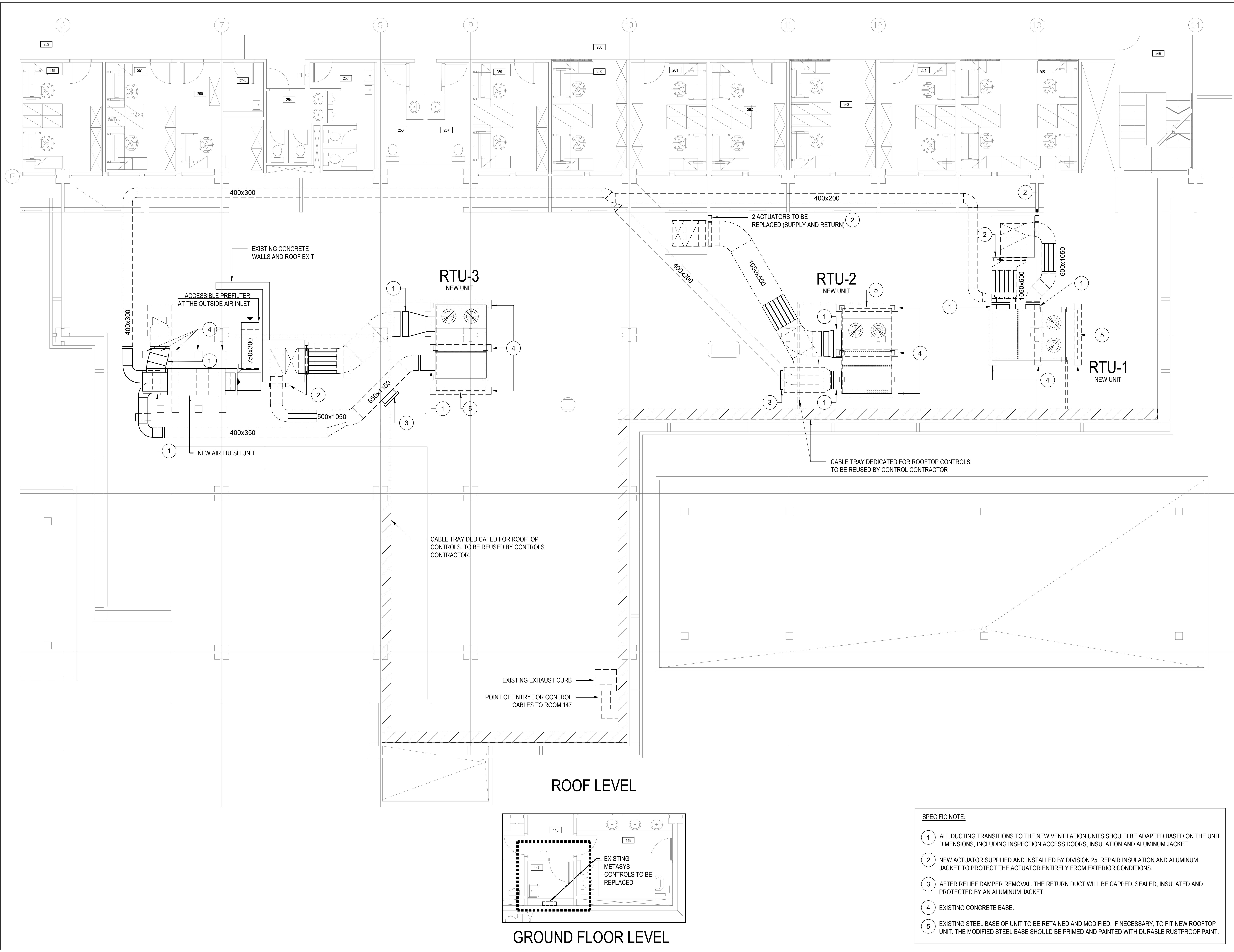


A DEMOLITION WORK NOT TO SCALE

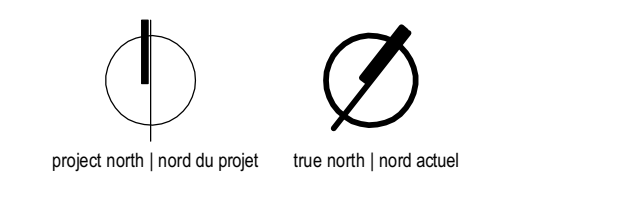


B DEMOLITION WORK NOT TO SCALE

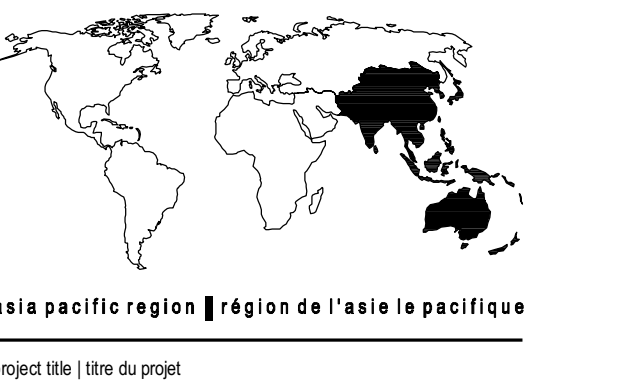
- SPECIFIC NOTES:**
- 1 REMOVE ACTUATOR AND ASSOCIATED DUCT WORK.
 - 2 VENTILATION DAMPER TO BE KEPT IN PLACE. REPLACE THE ACTUATOR (SUPPLIED BY DIVISION 25) AND REPAIR INSULATION AND METAL JACKET TO PROTECT THE ACTUATOR ENTIRELY FROM EXTERIOR CONDITIONS.
 - 3 RELIEF DAMPER EXHAUST TO BE CANCELLED. REMOVE ASSOCIATED DUCTWORK, DAMPER AND ACTUATOR. THE RETURN DUCT WILL BE CAPPED, SEALED, INSULATED AND PROTECTED BY AN ALUMINUM JACKET.
 - 4 EXISTING CONCRETE BASE.
 - 5 STEEL BASE OF EXISTING UNIT TO BE RETAINED AND MODIFIED, IF NECESSARY, TO FIT NEW ROOFTOP UNIT. MODIFIED STEEL BASE SHOULD BE PRIMED AND PAINTED WITH DURABLE RUSTPROOF PAINT.



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W.P.

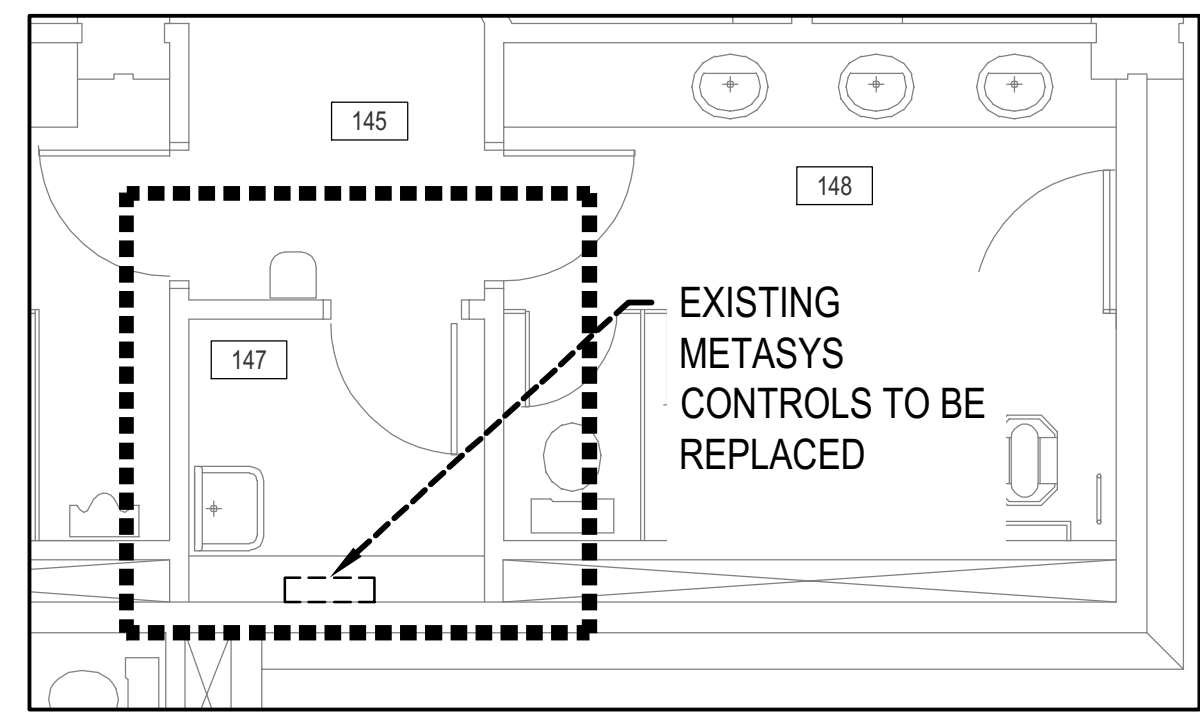


CANADIAN HIGH COMMISSION / EMBASSY
CHANCERY
PHASE 2 HVAC UPGRADE
78 SHANTIPATH, CHANNAYAPUR

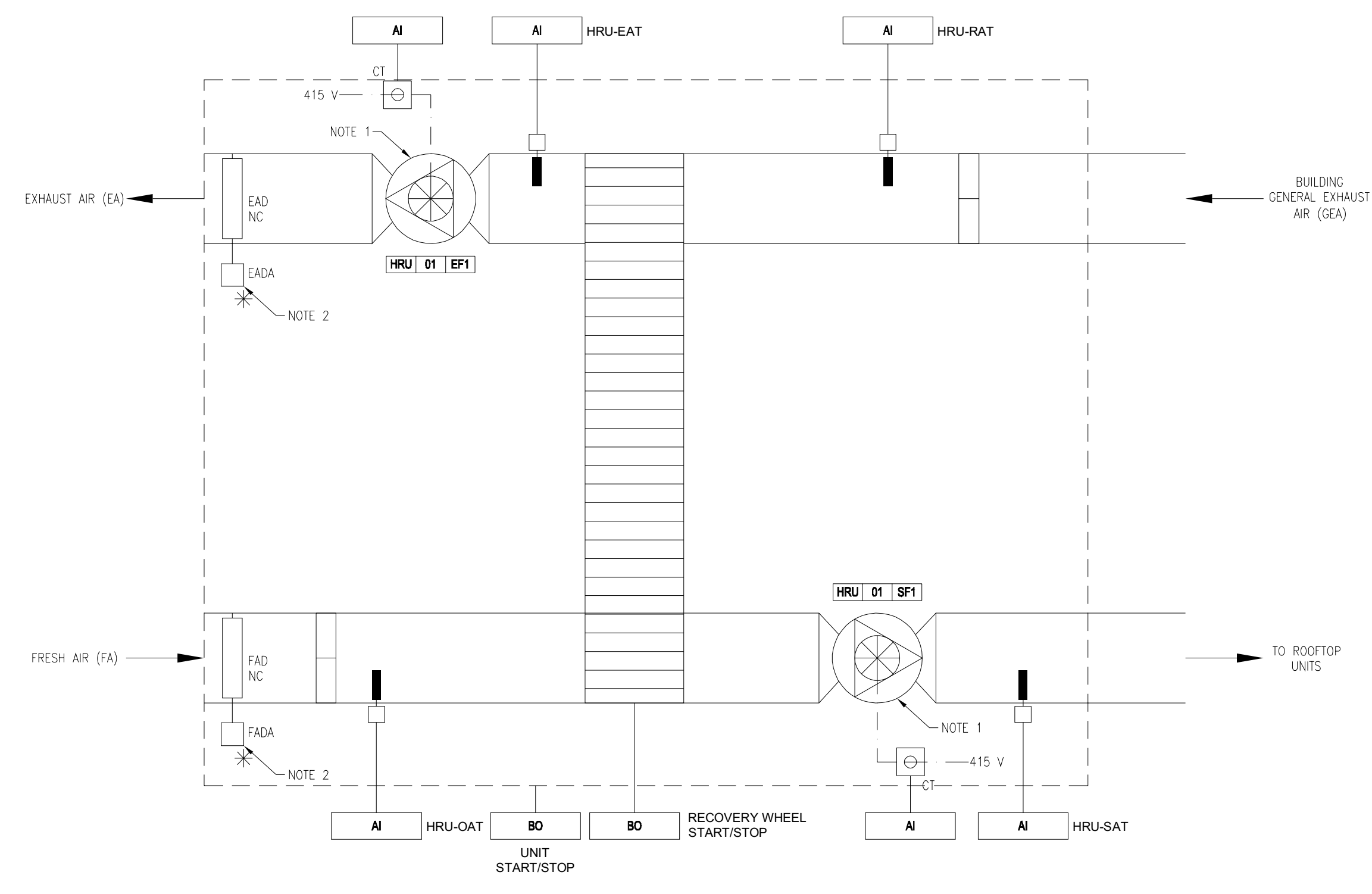
MECHANICAL VENTILATION NEW LAYOUT

Table with project metadata including architect, designer, and dates.

- SPECIFIC NOTE:
1 ALL DUCTING TRANSITIONS TO THE NEW VENTILATION UNITS SHOULD BE ADAPTED BASED ON THE UNIT DIMENSIONS, INCLUDING INSPECTION ACCESS DOORS, INSULATION AND ALUMINUM JACKET.
2 NEW ACTUATOR SUPPLIED AND INSTALLED BY DIVISION 25. REPAIR INSULATION AND ALUMINUM JACKET TO PROTECT THE ACTUATOR ENTIRELY FROM EXTERIOR CONDITIONS.
3 AFTER RELIEF DAMPER REMOVAL, THE RETURN DUCT WILL BE CAPPED, SEALED, INSULATED AND PROTECTED BY AN ALUMINUM JACKET.
4 EXISTING CONCRETE BASE.
5 EXISTING STEEL BASE OF UNIT TO BE RETAINED AND MODIFIED, IF NECESSARY, TO FIT NEW ROOFTOP UNIT. THE MODIFIED STEEL BASE SHOULD BE PRIMED AND PAINTED WITH DURABLE RUSTPROOF PAINT.

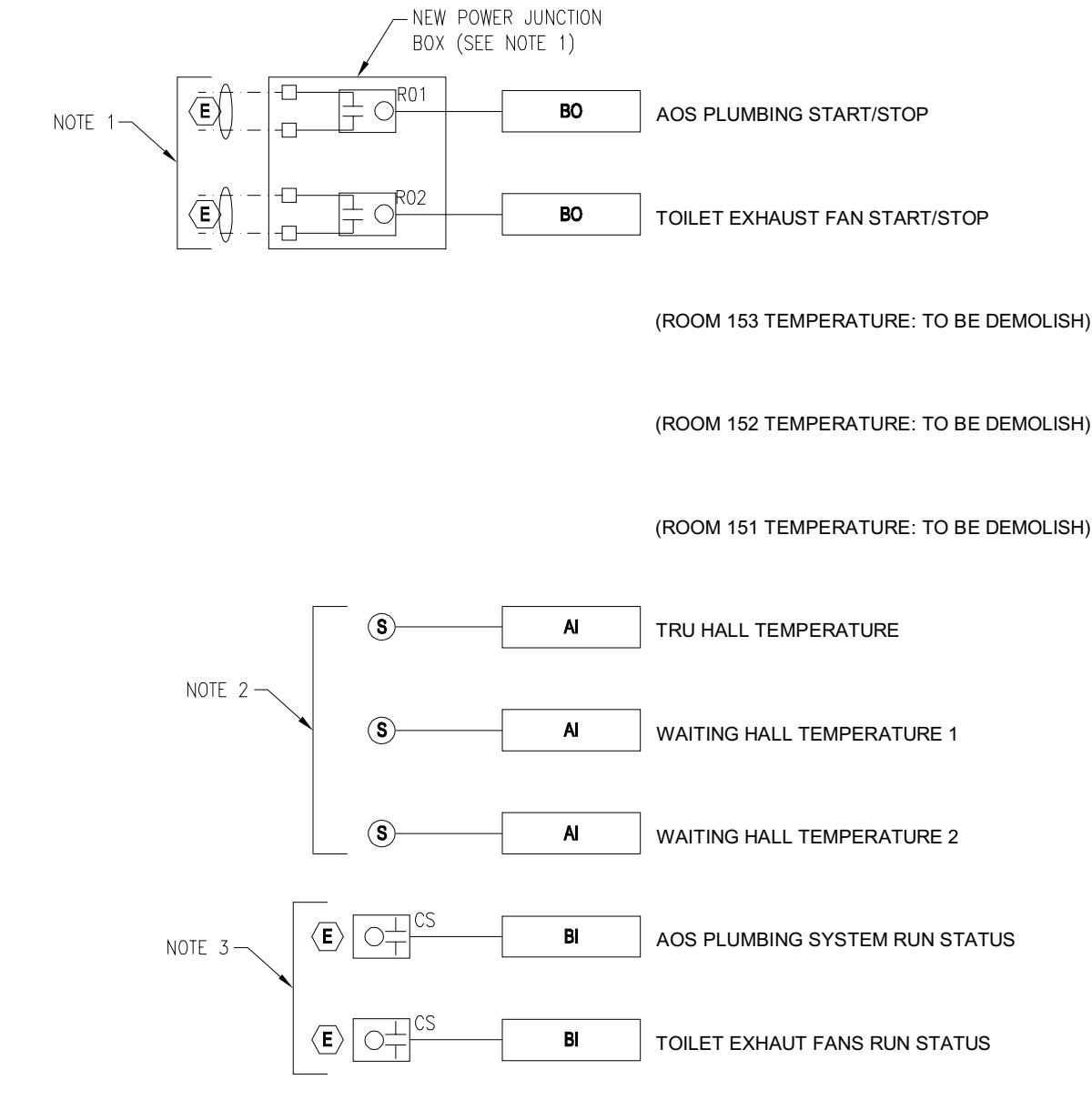


GROUND FLOOR LEVEL



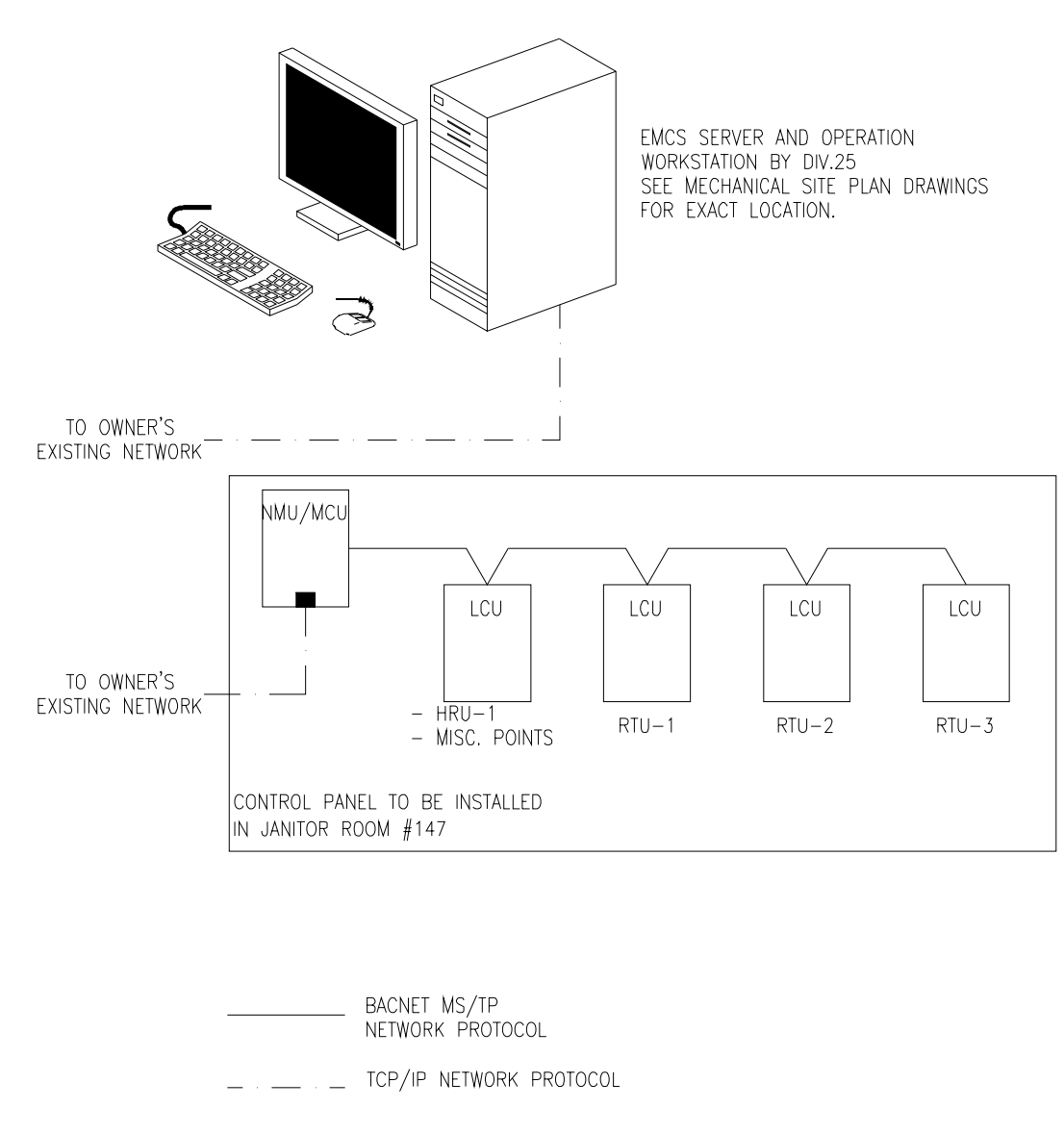
- NOTE 1:** CONSTANT FLOW ON EC MOTOR, ADJUST SPEED AT START UP IN COORDINATION WITH BALANCING AND CONTROL CONTRACTORS.
- NOTE 2:** ACTUATORS PROVIDED WITH UNIT. WIRING BY UNIT'S SUPPLIER (DIVISION 25).
- HRU-01 - Heat recovery air unit**
- System stopped
 - Supply and exhaust fans are off.
 - Heat recovery wheel is off.
 - Miscellaneous dampers are at their normal position.
 - System starting
 - The digital controller starts the system according to a programmed schedule, to be determined with the owner. The system may also be started manually at the dynamic graphic interface.
 - The digital controller commands the outside air dampers to open. Upon receiving the end switch's open proof, the unit fans start.
 - Upon receiving the fans' running status, all controls are operational.
 - System running
 - Fan speeds
 - Supply and exhaust fan speeds are to be determined at balancing according to specified constant air flows.
 - Temperature control
 - When the RTU is in cooling demand
 - The digital controller starts the heat recovery wheel if the outside temperature (HRU-OAT) is 2°C above the return temperature (HRU-RAT).
 - When the RTU is in heating demand
 - The digital controller starts the heat recovery wheel if the outside temperature (HRU-OAT) is 2°C above the return temperature (HRU-RAT).
 - Alarm
 - An alarm is transmitted to the ECMS if a fan false running status is detected by the current transducers.

HRU-1
HEAT RECOVERY AIR UNIT



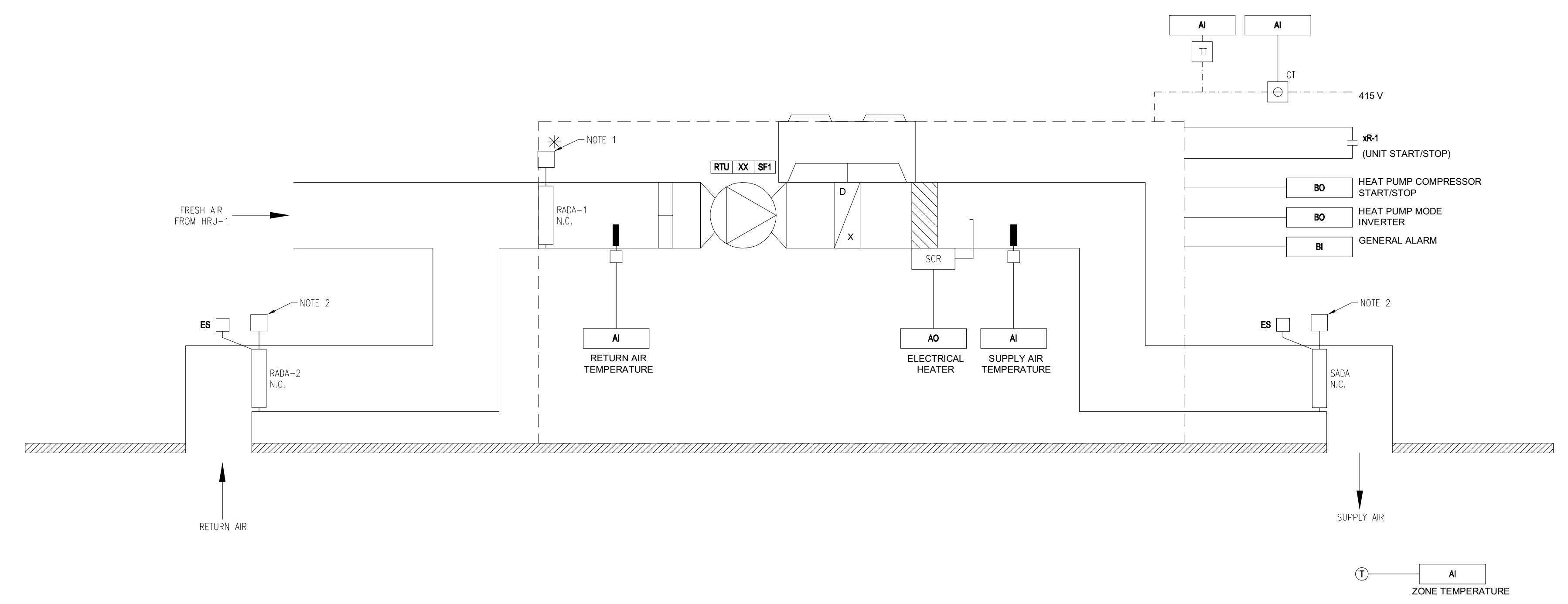
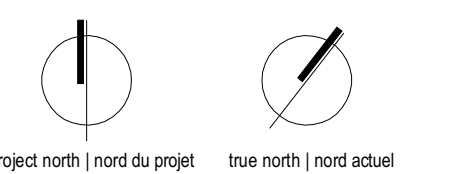
- GENERAL NOTE:** THESE EXISTING POINTS ARE ON JOHNSON CONTROLS METASYS CONTROLLER IN JANITOR ROOM #147. RECOVER THE ABOVE MENTIONED POINTS AND DEMOLISH THE PANEL TO MAKE ROOM FOR THE NEW CONTROL PANEL.
- NOTE 1:** PROVIDE NEW COMMAND RELAYS IN A NEW POWER JUNCTION BOX. REWIRE EXISTING POWER TERMINALS TO THE POWER JUNCTION BOX.
- NOTE 2:** REPLACE EXISTING SENSORS WITH NEW DDC CONTROLLER COMPATIBLE ONES. EXISTING WIRING TO BE KEPT. REWIRE EXISTING TERMINALS TO NEW CONTROL PANEL.
- NOTE 3:** EXISTING CURRENT SWITCH AND WIRING TO BE KEPT. REWIRE EXISTING TERMINALS TO NEW CONTROL PANEL.
- AOS Plumbing system**
- System stopped
 - Fans off.
 - System starting
 - The digital controller starts the system according to a programmed schedule, to be determined with the owner. The system may also be started manually at the dynamic graphic interface.
 - Alarm - An alarm is transmitted to the ECMS if a fan false running status is detected by the current transducers.
- Toilet exhaust system**
- System stopped
 - Fans off.
 - System starting
 - The digital controller starts the system according to a programmed schedule, to be determined with the owner. The system may also be started manually at the dynamic graphic interface.
 - Alarm - An alarm is transmitted to the ECMS if a fan false running status is detected by the current transducers.

MISCELLANEOUS COMMANDS AND MONITORING POINTS



BMS NETWORK ARCHITECTURE

THESE DOCUMENTS SHOULD NOT BE USED FOR CONSTRUCTION



- NOTE 1:** ACTUATORS PROVIDED WITH UNIT. WIRING BY UNIT'S SUPPLIER (DIVISION 25).
- NOTE 2:** WEATHERPROOF IP68/67 ACTUATORS PROVIDED AND INSTALLED BY DIVISION 25. SEE SPECIFICATIONS.
- RTU-X - Rooftop units**
- System stopped
 - Fan off.
 - Heat pump is off.
 - Miscellaneous dampers are at their normal position.
 - System starting
 - The digital controller starts the system according to a programmed schedule, to be determined with the owner. The system may also be started manually at the dynamic graphic interface.
 - The digital controller commands the outside air dampers to open. Upon receiving the end switch's open proof, the unit fans start.
 - Upon receiving the fans' running status, all controls are operational.
 - System running
 - Temperature control
 - When the RTU is in cooling demand
 - The digital controller starts the heat pump in cooling mode to satisfy the supply air temperature set point.
 - The digital controller starts the heat pump in heating mode and modulates the electrical heater in heating mode until the supply air temperature set point is reached. The digital controller then sends a coast command to the heat pump (set the current threshold during start up).
 - The supply air temperature set point is not reached for 15 minutes.
 - Alarm
 - The set general alarm is activated.
 - The measured unit power voltage is 10% below or above 415 V.
 - The current load is below... (trip one minute after the digital controller has sent a coast command to the heat pump).
 - The supply air temperature set point is not reached for 15 minutes.

(3 TYP.) RTU-X
ROOFTOP UNITS

EMCS	ENERGY MANAGEMENT AND CONTROLS SYSTEM	SYMBOL	DESCRIPTION
NC	NORMALLY CLOSED	[Symbol]	FAN
NO	NORMALLY OPEN	[Symbol]	VARIABLE FLOW FAN
AL	ALARM	[Symbol]	DAMPER
HL	HIGH LEVEL	[Symbol]	ELECTRICAL HEATING COIL
LL	LOW LEVEL	[Symbol]	DIRECT EXPANSION COOLING COIL
MD	MOTORIZED DAMPER	[Symbol]	END SWITCH
AMD	AIRTIGHT MOTORIZED DAMPER	[Symbol]	TEMPERATURE TRANSMITTER
EA	EXHAUST AIR	[Symbol]	ELECTRIC COMMAND RELAY
FA	FRESH AIR	[Symbol]	ROOM ELECTRONIC THERMOSTAT WITH DISPLAY SCREEN AND SETTING BUTTONS
SA	SUPPLY AIR	[Symbol]	PHYSICAL CONTROL POINT AI: ANALOG INPUT BI: BINARY INPUT AO: ANALOG OUTPUT BO: BINARY OUTPUT
RA	RETURN AIR	[Symbol]	WIRING BY CONTROL CONTRACTOR
MCU	MASTER CONTROL UNIT	[Symbol]	CABLE BY ELECTRICAL CONTRACTOR
LCU	LOCAL CONTROL UNIT	[Symbol]	
TCU	TERMINAL CONTROL UNIT	[Symbol]	
NMU	NETWORK MANAGEMENT UNIT	[Symbol]	
MPS	MANUAL RESET FREEZESTAT	[Symbol]	
LTS	LOW TEMPERATURE SWITCH	[Symbol]	
HTL	HIGH TEMPERATURE LIMIT	[Symbol]	
SP	SET POINT	[Symbol]	
[Symbol]	EXISTING CONTROL EQUIPMENT	[Symbol]	
*	EQUIPMENT SUPPLIED BY OTHERS. WIRING BY DIVISION 25 IF NOT OTHERWISE MENTIONED.	[Symbol]	

LEGEND

- JOHNSON CONTROLS MG3000 DIGITAL CONTROLLER.
- JOHNSON CONTROLS CONTROL PANEL IN JANITOR ROOM #147 (SEE GENERAL NOTE ABOUT MISCELLANEOUS COMMAND AND MONITORING POINTS).
- ALL EXISTING FIELD CONTROL, INSTRUMENTS AND CONTROL WIRING EXCEPT OTHERWISE MENTIONED.
- RTUs RELIEF DAMPER ACTUATORS.
- RTUs CURRENT AND TENSION TRANSDUCERS.

DEMOLITION LIST

POINT TYPE	POINT DESCRIPTION
BO	HRU-1 UNIT START/STOP
BO	HRU-1 RECOVERY WHEEL START/STOP
AI	HRU-1 SUPPLY AIR CURRENT TRANSDUCER
AI	HRU-1 EXHAUST FAN CURRENT TRANSDUCER
AI	HRU-1 OUTSIDE AIR TEMPERATURE SENSOR
AI	HRU-1 SUPPLY AIR TEMPERATURE SENSOR
AI	HRU-1 RETURN TEMPERATURE SENSOR
AI	HRU-1 EXHAUST TEMPERATURE SENSOR
BO	RTU-X UNIT START/STOP
BO	RTU-X COMPRESSOR START/STOP
BO	RTU-X MODE INVERTER
AI	RTU-X GENERAL ALARM
AI	RTU-X RETURN AIR TEMPERATURE
AI	RTU-X SUPPLY AIR TEMPERATURE
AI	RTU-X ZONE TEMPERATURE
AI	RTU-X POWER SUPPLY V CURRENT LOAD
AI	RTU-X POWER SUPPLY V TENSION
BO	AOS PLUMBING START/STOP
BO	TOILET EXHAUST FAN START/STOP
AI	TRU HALL TEMPERATURE
AI	WAITING HALL TEMPERATURE 1
AI	WAITING HALL TEMPERATURE 2
BI	AOS PLUMBING SYSTEM RUN STATUS
BI	TOILET EXHAUST FANS RUN STATUS

PHYSICAL POINT LIST

ISSUED FOR TENDER 2020-09-25 V.P.

version description date initial / revision description date initial



ALIA PACIFIC REGION / région de l'Asie du Pacifique
project site / site du projet

CANADIAN HIGH COMMISSION / EMBASSY

CHANCERY
PHASE 2 HVAC UPGRADE

78 SHANTAPATI, CHANNAYAPUR

drawing title / titre du dessin

CONTROL
DRAWING

checked / vérifié	-
designed by / conçu par	V. POLJOUIN
drawn by / dessiné par	V. POLJOUIN
approved by / approuvé par	V. POLJOUIN
project number / numéro du projet	522-020
scale / échelle	AUCUNE
date / date	2020-09-24
sheet number / numéro de la page	6 of 6
drawing number / numéro du dessin	



advanced building
solutions

THE HIGH COMMISSION OF CANADA, NEW DELHI, INDIA
Phase 2 – HVAC Upgrade

Specifications – Mechanical

2020-02-24

Project: 2015-123-113

Contract Number: ARD16400-533

**THE HIGH COMMISSION OF CANADA,
7/8, SHANTIPATH, CHANAKYAPURI
NEW DELHI, DELHI, INDIA
110021**

CHANCERY – PHASE 2 – HVAC UPGRADE

DIVISIONS 20, 21, 23 AND 25



**Issued for tender
September 25th, 2020**



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- 21 13 13 WET PIPE SPRINKLER SYSTEMS

DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING (HVAC):

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- 23 05 00 COMMON WORK RESULTS FOR HVAC
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- 23 05 53.01 MECHANICAL IDENTIFICATION
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- 1.3 VERIFICATION OF THE DRAWINGS AND SPECIFICATIONS
- 1.4 PRODUCTS USED FOR TENDERS AND EQUIVALENCY
- 1.5 SUBSTITUTION OF MATERIALS
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- 1.8 TAXES
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- 1.23 PLACEMENT OF PIPING AND DUCTS
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- 1.25 LAYOUT AND ACCESS TO THE EQUIPMENT
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- 1.46 BREAKDOWN OF COSTS



PART 2 PRODUCT

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED



Part 1 General

1.1 DEFINITION

- .1 The terms "Contractor", "General Contractor" and "Supervisor" refer to the person or entity designated as in contract with the Owner or Manager of the works.
- .2 The expressions "section", "sections", "each section", "each related section", "performed by section" and "supplied by section" refers to the firm responsible for the work of that section.
- .3 The terms "Engineer" and "Engineers" mean the firm or the Designated Representative of the engineering firm that issued the engineering section, specifications or plans related to the work covered by these documents.

1.2 EXAMINATION OF THE SITES

- .1 Before submitting its bid, each bidder must visit and inspect the site to become familiar with everything that could affect the works in any way. No later claims due to ignorance of local conditions will be considered by the Owner.

1.3 VERIFICATION OF THE DRAWINGS AND SPECIFICATIONS

- .1 Only drawings and specifications marked "for tender" should be used for the calculation of bids.
- .2 Check that the copy of the documents is complete: number of drawings, specifications' number of pages.
- .3 Specialties mentioned in the titles of the drawings are to facilitate the work of each section and should not be regarded as restrictive.
- .4 Drawings indicate the approximate placements of equipment. Each section must check the exact emplacements before any installation.
- .5 During bids, each section must study the mechanical and electrical drawings and specifications and notify the Engineer at least five working days before submission of his tender of any contradictions, errors or omissions that can be observed.
- .6 During the execution of the works, notify the Architect or Engineer of any inconsistency, error or omission discovered before starting the work.
- .7 The Engineer reserves the right to interpret the contents of mechanical and electrical drawings and specifications.



1.4 PRODUCTS USED FOR TENDERS AND EQUIVALENCY

- .1 Each section must prepare an overall price for a tender based only on the products described in the drawings and specifications. The person preparing the tender must not assume that the manufacturers' materials and equipment whose names appear on the "MANUFACTURER LIST" are automatically equivalent. Each section is solely responsible for the verification and validation of equivalence (and, where appropriate, of the special manufacturing requirements for it) of the product that will need to be used from a manufacturer on the list.
- .2 All modifications required by the usage of an equivalent material or device to that specified is to be performed at the cost of the division supplying the device, even if it applies to other specialties and if implications are discovered after the acceptance of the substitution request.

1.5 SUBSTITUTION OF MATERIALS

- .1 Equipment and materials from manufacturers other than those mentioned in the manufacturer list may be substituted only after the presenting the tender, provided that they are approved according to the following procedure:
 - .1 Equivalency requests must be made by the relevant section only. They must be submitted within a maximum of fifteen business days following the signing of the contract. They must be accompanied by the following documents:
 - .1 Original tender for the specified products.
 - .2 Tender received for products to be substituted.
 - .3 Justification of the request.
 - .4 Proofs of equivalency.
 - .2 The submission of equivalency requests to periods other than that mentioned above will only be considered for reasons truly exceptional and extraordinary.
- .2 The main points of comparison are construction, performance, capacity, dimensions, weight, encumbrance, technical specifications, parts' availability, maintenance, delivery delays, the evidence of tried and true equipment in service and impact on other specialties.
- .3 Any changes caused by the use of an equivalent equipment or material is to the cost of the section that provided the equipment, even when it applies to other specialties, and even if the implications are made apparent after the substitution request is accepted.
- .4 Any request for substitution will be rejected if it were to impede or delay the execution of the works.

1.6 IMPORTANT NOTE: SUPPLY AND INSTALL

- .1 Supply and install all materials and equipment described in this specification and/or shown in the drawings, whether the term "supply and install" is used or not. See also the article "MINOR WORKS".



1.7 LAWS, REGULATIONS AND PERMITS

- .1 All laws and regulations issued by the authorities having jurisdiction relating to the works described herein apply. Each section is required to comply with them without additional compensation.
- .2 Each section must obtain, at its expense, all necessary permits and certificates, pay all costs for drawing approvals and for inspections required by organisations having jurisdiction.
- .3 Submit to the Engineer a copy of the drawings bearing the seal of approval of the relevant inspection services.
- .4 Upon completion of the works, obtain and submit to the Owner, complete with a copy of the mailing slip for the package sent to the Engineer, all permits, approval certificates, and other obtained from the different offices and departments that have jurisdiction over this building.
- .5 Restrictions regarding tobacco usage:
 - .1 It is prohibited to smoke inside the building. Comply with restrictions applying to tobacco usage on the building property.
- .6 Discovery of dangerous materials:
 - .1 If materials applied by spray or trowel, likely to contain asbestos, polychlorinated biphenyls (PCBs), moulds or other designated hazardous materials are discovered during demolition, immediately stop work.
 - .1 Take corrective action and immediately notify the Owner.
 - .2 Do not restart work until written instruction is received.

1.8 TAXES

- .1 Pay all taxes required by law.

1.9 MINOR WORKS

- .1 Each section is required to provide all the required components and to do all the jobs which, although not specified in the estimate, are necessary for the operation of the equipment and to complete the work included in his contract.

1.10 TOOLS AND SCAFFOLDING

- .1 On the worksite, provide the full range of tools required for the proper execution of the work. Also supply, erect, and remove the scaffolding required to perform the work.

1.11 COOPERATION WITH OTHER TRADES

- .1 Each section must:
 - .1 Cooperate with other trades working in the same building or on the same project.
 - .2 Keep itself informed of additional drawings issued to these other trades.
 - .3 Ensure that these drawings do not come in conflict with its work.



- .4 Organize its work so as not to interfere in any way with other work done in the building.
- .5 Collaborate with the other sections to determine the location of accesses in walls and ceilings.
- .2 During the work, if necessary, the relevant section must remove and replace the tiles or access doors to reach its equipment and repair, at its own expense, all the damage it has caused. Protect the furniture and return the premises to a clean condition when the work is completed.

1.12 SCHEDULING OF OPERATIONS

- .1 Plan and execute work in such a way as to minimally disturb the normal use of the building.
- .2 During the tender process of the contract, present a schedule for the work in the form of a bar graph (Gantt diagram), specifying the expected steps in the work until completion, including the project milestones. Once the schedule is reviewed and approved, take necessary action to ensure the project progresses on schedule. Do not modify the calendar without consulting the Engineer and the Owner.
- .3 Work in occupied areas must be performed outside of normal work hours, Monday to Friday between 18 h and 7 h, as well as on Saturdays, Sundays and holidays.

1.13 MATERIALS

- .1 Unless otherwise indicated, use new materials clear of imperfections or defects, in the required quality, bearing the approval labels CSA, ULC, FM, AMCA, ARI and other according to the specialties.

1.14 PROTECTION OF WORKS AND MATERIALS

- .1 Each section must protect its installations against all damage, from any cause, during the execution of works until the work is accepted in a definitive manner.
- .2 All equipment and materials stored on-site must be adequately protected, sheltered from bad weather, or any other possible damage.
- .3 At the end of each workday, seal with a screw cap or a suitable metal cap all openings in conduits of any kind.

1.15 SHOP DRAWINGS

- .1 Before fabrication or order of any component, submit a PDF copy by email for approval. Each drawing or data sheet should be submitted as a distinct PDF file. The PDF name should include the section, article and name of the article title in the specifications (example: 00_00_00_0.00_Equipment XYZ.pdf).



- .2 Drawings must include the dimensions, weight, number of attachment points, centre of gravity, seismic requirements, wiring schematics, capacities, controls schematics, curves, space requirements for maintenance and operation, and all other relevant information. If present, clearly indicate the location and dimensions of plumbing, heating, cooling, electrical, etc., connections by device. Each drawing must be verified, coordinated, signed, and dated by the relevant section before being submitted for approval.
- .3 Shop drawings must be relevant to the proposed equipment. The sheets from general catalogs are not accepted as shop drawings. Each drawing must be preceded by a title page indicating with the name of the project, the consultant's name, the date and identification tag of the equipment shown in the drawings and specifications. The title page must also include the revision number of the documents as well as the expected delivery date of the product. Drawings must be prepared and signed by the supplier. Drawings pulled from the supplier's website are not accepted.
- .4 Drawings for non-catalogued items must be specifically prepared for the project.
- .5 The verification of shop drawings is general and has the main purpose of avoiding as many errors as possible in manufacturing. This verification does not relieve the relevant section of its liability for errors, omissions, information, dimensions, quantity of equipment, etc., appearing in their drawings.
- .6 The verification of the shop drawings by the Engineers does not diminish the responsibility of the supplier to ensure that the equipment meets all applicable codes and standards, as well as the requirements in this specification.
- .7 When shop drawings are resubmitted or installed, inform the Engineer in writing of changes made, other than those requested by the Engineer.
- .8 When equipment is manufactured before the verification of the shop drawings by the Engineer, the Engineer may refuse the equipment. The Contractor is responsible for any costs associated with the refusal.
- .9 The drawings must be in English.

1.16 COORDINATION DRAWINGS

- .1 General:
 - .1 Coordination drawings, also called composite drawing, are required in all cases where interference between different trades' works need such drawings to illustrate that the work is realizable.
 - .2 Coordination drawings must show clearly and precisely all the work involved, those of the relevant section and those done by others.
- .2 Description:



- .1 Coordination drawings consist of dimensioned plans, to scale, indicating the position of the equipment, ducts, piping, valves and other accessories with cuts and details required, complete with piping and duct dimensions, locations of sleeves, openings, anchorages and supports, relative positions with structure, architectural works, mechanical and electrical work, the positioning of the access doors, the clearances required for the maintenance of equipment and all other disciplines.
- .2 Each mechanical and electrical section must provide on their coordination drawings the details of their levelling bases and housekeeping pads.
- .3 Preparation:
 - .1 Each relevant section must make their coordination drawings and coordinate them with other disciplines.
 - .2 All drawings must be coordinated by the Contractor in collaboration with all sections.
 - .3 The coordination drawings for each sector must be submitted all at once for verification.
 - .4 The section "VENTILATION – AIR-CONDITIONING" is responsible for coordinating drawings with each section. These sections must provide all the data, diagrams, drawings and diagrams necessary for this coordination work.
 - .5 The section "VENTILATION – AIR-CONDITIONING" must prepare a drawing with its own work with all data and dimensions necessary and incorporate all the information provided by the other sections.
- .4 Collaboration:
 - .1 Close collaboration must exist between the sections in order to determine the location of their respective work and avoid incompatibilities.
- .5 Distribution of coordination drawings:
 - .1 Before submitting the drawings to the Engineer for verification, the general Contractor and each of the sections must sign the plans.
 - .2 Submit to the Engineer two paper copies and one emailed digital PDF copy of the scaled coordination drawings signed by the General and Sub Contractors for verification.
 - .3 Once commented on, the drawings will be corrected by the relevant section, and, if required, resubmitted.
- .6 Responsibility:
 - .1 Each section is directly responsible for the placement and exact dimensions of openings, perforations and sleeves, the location of its equipment, pipes and ducts, whether the structural, Architectural or Engineering drawings are included or not.
 - .2 The Division 23 (section "VENTILATION – AIR-CONDITIONING") must ensure the full coordination of its work with the coordination drawings.
 - .3 No compensation will be given for the modifications of the work for the purpose of coordination and integration of the electromechanical systems.



- .4 Notwithstanding the responsibility of coordinating the integration, work cannot be implemented without prior verification of the coordination drawings. Each section must redo, at its expense, all work nonconforming to the coordination drawings without any compensation based on a misinterpretation of the scope and limitations of its work. Such misinterpretations do not relieve the relevant section of its responsibilities and obligations to provide complete and duly proven, ready to operate systems in fully integrated and in perfect condition.
- .5 Verification of the coordination drawings by the Engineer serves to ensure that the technical requirements appear to be generally met. The Engineer does not check the quality of the coordination carried out by the Contractors.
- .7 Pre-existing work:
 - .1 Coordination drawings should account for existing mechanical, electrical, structural and Architectural installations as well as planned work.
- .8 Coordination drawings are required for:
 - .1 Work on the fire sprinkler and fire prevention.
 - .2 All ventilation work – air conditioning.
 - .3 Work performed by a section that could have implications on the work of another section.
 - .4 Places described in sections of the Divisions 21, 23, 25 and 26.
 - .5 This clause is not restrictive. Coordination drawings may be demanded for places deemed necessary.
 - .6 For all work on automatic sprinklers, the coordination drawings are the responsibility of the Division 21.
- .9 Original coordination drawings:
 - .1 At the end of the work a USB flash drive (containing the "dwg") is to be included with each O&M manual and two paper copies of the as-builts are to be submitted to the Owner, for no additional charge, by each section.

1.17 USING DIGITAL MODELS FOR COORIDNATION

- .1 DWG plans:
 - .1 Where approved by the Owner Representative, the Engineer may provide to the Contractor the digital DWG plans which were used to produce contractual documents.
 - .2 The Contractor must respect the "RESPONSIBILITY WAIVER – DWG PLANS" form included at the end of this section, understanding the limitations of using the digital plans, and complete and sign the form. Submit the duly completed form to the Engineer.
 - .3 The Engineer reserves the right to not provide the design files to the Contractor and/or related sections.



- .4 The Engineer reserves the right to claim fees for the conversion of design files and specifications issued "for tender" to the format or edition requested by the Contractor and/or related section.

1.18 TECHNICAL REQUESTS FOR INFORMATION

- .1 The Contractor must submit all requests for information (RFIs) by email.
- .2 All correspondence and/or document submitted via project management software by the Contractor or a Sub Contractor will not be reviewed and will be not be considered as submitted/received.
- .3 Technical Requests for Information:
 - .1 Each question must be submitted using a standardized RFI form.
 - .2 Each PDF RFI form may include only one question.
 - .3 Each question must be assigned a sequential number to facilitate tracking.
 - .4 The Contractor is responsible to review questions submitted by other sections to ensure that answers are not present in the contractual documents or previously provided, and to track progress of the RFIs to ensure work is not delayed.
 - .5 The RFI form must include, at minimum:
 - .1 Submission date of the question.
 - .2 Name of the sender and recipient.
 - .3 Subject line.
 - .4 Clearly formulated question.
 - .5 Clips of the plans, specifications and photos relating to the question.
 - .6 Proposed solutions.
 - .7 Sufficient space for the engineer to respond to the question on the form.

1.19 FRAMES AND ACCESS DOORS

- .1 Unless otherwise specified, recessed frames and access doors in walls and ceilings, other than easily removable ceilings, shall be provided by the relevant section but installed by the company responsible for the construction of walls and ceilings.
- .2 Each mechanical and electrical section shall determine the size and location of doors in such a way as to ensure easy access to all baffles, control devices, fire dampers, valves, vents, cleanouts, siphons, sieves, traps, ventilation units, pull boxes, electrical appliances, etc.
- .3 The doors must be at the same fire resistance specified for the walls and ceilings.
- .4 These frames and doors shall be built-in, constructed of 1.6129 mm (16-gauge) galvanized sheet metal with a layer of sealant. Hidden frames with exposed line with face flush with wall or ceiling, concealed hinge, 150° opening with lock and key (except on fire doors). The door must self-closing.
- .5 The types of frames and doors are as follows:



- .1 Walls made of brick, concrete block, finished in tile, poured cement blocks covered with gypsum boards or other similar finish: Karp no DSC-214M.
- .2 Ceilings and walls of plaster or with cement finish or other similar finish: Karp KDW.
- .3 Firewalls: Karp no KRP150FR, in steel, 16-gauge, with 50 mm (2") of insulation in the door, fire resistance of ULC 1½ h, with self-closing mechanism and without lock/latch.
- .6 All Contractors must coordinate in order to provide the same type of door for all mechanical and electrical sections.

1.20 UP TO DATE DRAWINGS

- .1 Each section must, at its expense, clearly indicate all changes, additions, etc., on a separate copy of the drawings and specifications, so as to have a complete and accurate copy of the work as executed and materials installed when the contract is completed. In particular, any displacement, even minor, of underground piping must be indicated with precision
- .2 This copy of the drawings must be kept up to date and be available on site.
- .3 Deliver these plans to the Owner at the end of the works

1.21 OPERATION AND EQUIPMENT MAINTENANCE INSTRUCTION MANUALS

- .1 Each section must provide the Owner with four copies of manuals with detailed instructions for the operation and maintenance of all equipment and appliances included in his contract. Also provide a USB flash drive.
- .2 These manuals must contain:
 - .1 A list and illustration of all equipment components: pumps, fans, filters, controls, burners, alarm panels, lighting fixtures, transformer stations, generators, fire alarms, etc.
 - .2 A copy of the approved shop drawings, and as executed.
 - .3 The instructions for lubrication published by the manufacturers with the specifications of the oils and greases to be used and the frequency of lubrication.
 - .4 function of each valve. This glossary should contain a separate chapter for all shut down (or emergency) valves and main valves. The numbering code must be approved.
 - .5 A diagram of the controls with explanatory text.
 - .6 A list of legends of the piping, the piping identification codes, and ventilation systems.
 - .7 A list of the systems' final calibration values, as approved.
 - .8 A list of the different sub-Contractors with names, addresses, and phone numbers.
 - .9 A list of representatives and/or manufacturers of the installed equipment with names, addresses, and phone numbers.



- .10 These instructions must contain all the graphics, curves, capacities and other data provided by the manufacturers concerning the operation and details of all mechanical and electrical equipment installed in the building.
- .11 The fan graphics must clearly indicate the specified operating capacities and the required horsepower. These graphics should also indicate the serial number, fan model, and the operating speed.
- .3 The entirety must be written in English.
- .4 Divide each manual in the sections using blank sheets which have coloured tabs with the necessary identification. For example: "CENTRAL SYSTEM FAN". At the beginning of the manual, insert a table of contents with the title of each section and identification of the corresponding tab.
- .5 Each manual is covered with a black cardboard, allowing the binding of loose sheets with 215 mm x 275 mm (8" x 11") binding strips.
- .6 Submit one PDF copy to the Engineer for comment. Once approved, provide three (3) copies of the manual to the Owner and one to the Engineer.
- .7 These manuals should be submitted before final trials. Provide an empty section to later add calibration and commissioning reports.

1.22 CONCEALED WORK

- .1 Do not conceal any work, material, such as pipes, boxes, etc. before the installation has been verified.
- .2 If a section does not comply with this requirement, it will have to pay the cost of all work required to proceed to the examination of the works.
- .3 Unless otherwise indicated, all piping and ducts must be concealed in partitions, walls, between floors, in ceilings, etc. The cost of all necessary leveling shall be borne by the Contractor.
- .4 Reread the articles "COOPERATION WITH OTHER TRADES" and "TESTING".

1.23 PLACEMENT OF PIPING AND DUCTS

- .1 No pipe may be in contact with another. Allow a clearance of at least 15 mm (½") between them. No piping may be in contact with any part of the building. Take special care in the case of piping through a steel beam.
- .2 Take particular care to conserve space in vital areas, including in the case of piping rising along columns.
- .3 Any piping or ducting that may possibly be covered by insulation must be installed at a sufficient distance from walls, ceilings, columns or other piping, ducts, and equipment to facilitate the insulation of the pipe or duct.
- .4 Any piping or ducting placed horizontally must be installed to maximize the headroom of the area. This is of particular importance in rooms where ceilings are suspended, such as in parking lots and warehouses.



- .5 Exposed piping should be straight and generally, parallel to the framework.
- .6 Consider the symmetry with respect to the piping of the apparent equipment. Consult the Departmental Representative if necessary.
- .7 Before installing a pipe or duct, make note of the location of the other mechanical, electrical, Architectural and structural work to avoid interference, otherwise the relevant section will be required to move the pipe or duct at its expense.
- .8 When uninsulated piping passes through a wall or a poured concrete floor, install rigid insulation on the pipe before casting, after the installation of the pipe, so that the concrete does not come into contact with the pipe.

1.24 MANUFACTURERS' INSTRUCTIONS

- .1 Install the various pieces of prefabricated materials and equipment, in accordance with the manufacturer's instructions. Obtain all relevant instructions.
- .2 Ensure the presence of the manufacturers' representative to attest the conformity of the installation.

1.25 LAYOUT AND ACCESS TO THE EQUIPMENT

- .1 Install the equipment so that they are easily accessible for maintenance, disassembly, repair, and moving.
- .2 Pay particular attention to the motors, belts, bushings, heat exchangers and boiler tubes, fittings, valves, controls, rotating shafts, etc.
- .3 If necessary, install access doors and accessories, such as extensions for the lubrication of bushings, etc.
- .4 Installation of equipment:
 - .1 Ensure that maintenance and disassembly can be done without having to move the connecting elements of the piping and ducts, by the use of union fittings, flanges or valves, and without the building structural members or other installations being obstacles. Dismantling must be possible without emptying networks and/or stopping the power supply to other equipment.
 - .2 The manufacturer plates and the seals or labels of the equipment standards and approvals organizations must be visible and legible once the equipment is installed.
 - .3 Provide fasteners and metal accessories of the same texture, colour and finish as the support metal to which they are attached. Use non-corrosive fasteners, anchors, and shims to secure the external and internal work.
 - .4 Ensure that the floors or tiles on which the equipment will be installed are level.
 - .5 Check fittings done at the factory and retighten them if necessary to ensure the integrity of the installation.
 - .6 Provide a means to lubricate the equipment, including Lifetime lubricated shaft housings.
 - .7 Connect the equipment's drainage piping to the drains.



- .8 Align the edges of the pieces of equipment, as well as those of the rectangular identification plaques, and other similar parts with the building walls.
- .5 Future provisions:
 - .1 In any place where a space was left free for future use, ensure that this space remains free and install materials and equipment related to the work so that future connections of the added equipment can be done without needing to redo the floor, walls or ceiling, or even, a portion of the mechanical or electrical facilities.

1.26 PAINTING

- .1 Apply a base coat of sealant on any non-galvanized metal equipment or equipment supports. Before leaving the premises, touch up the base coat of all the damaged areas after removing any rust.
- .2 The base coat is a sandable grey coloured water based acrylic, this product can be used as a base layer and to paint cut or perforated sections of galvanized apparatus, equipment or equipment supports, Sierra Performance S30 Griptec from Rust-Oleum or Sierra Performance S71 as an aerosol.
- .3 Apply one coat of metal mordant and one additional coat of black paint to the soldered joints of uninsulated black steel pipes.
- .4 On insulated black steel pipes, apply one layer of metal mordant on the soldered joints.
- .5 Ensure that access doors of all kinds, including the opening convector panels, electrical panels, etc., are painted in the open position to ensure freedom of movement.
- .6 See section 23 05 53.01 – Identification of systems and mechanical equipment.

1.27 FRAMES, SUPPORTS, AND BRACKETS

- .1 Each relevant section must provide and erect all frames and brackets required for the equipment it installs: reservoir tanks, panels, motors, starters, key switches, etc.
- .2 Install equipment at the height shown in the drawings, but never less than 75 mm (3") above the floor.
- .3 Build the supports and brackets out of welded and grinded steel. If necessary, install hooks, rails, eyelets, etc., to facilitate installation and removal of equipment.

1.28 NEW OPENINGS, DRILLING IN WALLS, FLOORS, BEAMS, AND COLUMNS

- .1 General:
 - .1 Unless otherwise indicated, all direct and indirect costs associated with tracing, marking, openings required for ductwork, piping and electrical conduits, or sleeves to install, are the responsibility of the General Contractor.
 - .2 The General Contractor is responsible for all damages and repair caused by the openings.



- .3 Openings must be shown and located on the coordination drawings, located and identified on the site in a manner accepted by the Contractor and the structural Engineer before drilling.
 - .4 The openings must be sufficiently large to permit the laying of sleeves and thermal and acoustic insulation.
 - .5 Any drilling in the structure must be approved by the structural Engineer.
 - .6 Piercing holes with pneumatic or electric hammers by vibratory action as well as hand drilling and any other process by mechanical impacts are prohibited.
 - .7 In the concrete, drill the holes using a rotary water drill or any other equipment accepted by the structural Engineer.
 - .8 In the steel bridging, drill and reinforce openings, according to the guidelines of the structural Engineer.
 - .9 It is not allowed to drill in capitals and column projections or strips without special permission from the structural Engineer who will decide how to proceed.
 - .10 The General Contractor is responsible for all formwork required for the installation of rectangular ducts. Instructions related to dimensions, quantity, location, and testing must come from the related section. All additional steel framing and related work are also the responsibility of the General Contractor.
 - .11 The General Contractor must employ a specialised firm to scan and digitize the existing slabs, with Georadar (GPR) or similar technology, in order to determine the location of buried elements and services such as conduits, pipes, and reinforcements, before making openings in the existing concrete.
- .2 Round, square and rectangular openings in concrete:
 - .1 All new openings of 150 mm (6") or less are the responsibility of the concerned section, under the instructions of the structural Engineer.
 - .2 All new round openings of more than 150 mm (6"), as well as the required square or rectangular openings must be made by the Contractor, at the expense of the latter, under the direction of the structural Engineer.
 - .3 Openings in concrete block walls and drywall:
 - .1 Openings to be drilled by the Contractor. Sealing of openings by the Contractor. In the case of openings in piping of temperatures higher than 38°C, the relevant mechanical section must install a 20 gauge galvanized steel sleeve.

1.29 SUPERVISOR

- .1 Each section must retain and pay for the services of a competent and permanent supervisor or superintendent who must remain on site until the works are accepted, and, having full authority to represent the section. All communications, orders, etc. supplied by the Engineer or Contractor are considered as given directly to the company responsible for the work of the section.



- .2 Submit for approval the name, qualifications, and experience of the supervisor or superintendent. Following revisions made at the request by the Owner's representative, a lack of experience and qualifications relevant to the project will result in the mandatory replacement of the Superintendent by one meeting the requirements.
- .3 This supervisor cannot be removed from the work site without a valid reason and prior written approval.
- .4 Facilitate site inspections for the Owner and the Engineer at any time. During these visits, the supervisor must be available to them.

1.30 INSPECTIONS

- .1 It is absolutely necessary before any inspection request to the Engineer, that the testing was previously conducted and successful.

1.31 TESTING

- .1 Each section must cooperate with the other sections, so as to enable them to complete their tests within the time period allowed by the Contractor.
- .2 Once the test is finished, readjust all the equipment used for this test, to permit their proper operation.
- .3 General requirements:
 - .1 The Engineer may assist, at any time, in any test they deem necessary.
 - .2 All tests must be performed to the satisfaction of the Engineer.
 - .3 The Engineer may require a test of installations and equipment before accepting them.
 - .4 For temporary trials, obtain written permission to operate and test installations and permanent equipment before being accepted by the Engineer.
 - .5 Give a written 2 weeks notice to the Engineer before the date of the test.
 - .6 Provide equipment, meters, material and staff required to run tests during the project until the acceptance of installations by the Engineer and pay all fees.
 - .7 If a piece of equipment or device does not meet the manufacturer's data or the specified performance during a test, immediately replace the defective unit or part and pay all expenses incurred by the replacement. Make adjustments to the system to achieve the desired performance. Cover all costs, including those of new tests and repair.
 - .8 Prevent dust, dirt, and other foreign matter from entering the openings of installations and equipment during testing.
 - .9 Provide to the Engineer a certificate or letter from the manufacturer confirming that each section of the installation was implemented to their satisfaction.
 - .10 Submit the written test results to the Engineer.
 - .11 The tests must be performed and accepted prior to the installation of the thermal insulation.



- .12 Do not conceal or embedded piping, conduits, or equipment before the tests are completed and accepted.
 - .13 By submitting the pipe or conduits to the test pressures required in each of the respective sections, take the necessary precautions to prevent the deterioration of equipment and accessories that cannot withstand such pressures.
 - .14 If it is impossible to test the entire installation in a single trial, it can be divided into several zones, each of which will be tested individually. The installation must be tested in several stages.
 - .15 Provide hydraulic pumps, air compressors, fans and other equipment necessary to perform all tests and related temporary work.
 - .16 Correct any leak detected. The defective part must be removed, repaired and the test is redone until the results are satisfactory.
 - .17 Whenever tests are conducted with water, place the pressure gauge at the highest point of the installation.
 - .18 Whenever tests are conducted with compressed air, use soap and water on the piping and apparatus to detect air leaks. The air temperature must be the same in the pressure readings. Install a thermometer for this purpose.
 - .19 For joints with caulking, it is not permitted to repair cracks using other materials.
 - .20 Provide two copies of a written report for each of the tests performed.
- .4 Special requirements:
- .1 For details about the tests to perform, see the other sections of this specification.
 - .2 The presence of a section can be required in a test conducted by another section.
- .5 Factory tests:
- .1 The Engineer and the Owner reserve the right to examine the equipment in the factory and attend factory trials described in this specification.
 - .2 Notify the Engineer and the Owner at least one week in advance of the date, time and place where the factory testing will take place.
 - .3 Submit two certified copies of the factory test reports to the Engineer.

1.32 "EARLY ACCEPTANCE", "WITH RESERVATION" AND "WITHOUT RESERVATION"

- .1 Refer to general conditions and additional general conditions of the Architect or Client for the definition of "early acceptance", "with reservation " and "without reservation".

1.33 FINAL TESTING

- .1 Each section must include all costs of final testing to the overall price in its tender. When the work is fully completed and settings, calibrations, and preliminary tests are successfully performed, run the final tests. Notify the Departmental Representative early enough to allow him to attend any of the tests judged necessary.



- .2 In order to demonstrate that the work is complete and executed satisfactorily, each piece of equipment must run for a minimum period of fifteen days and that, prior to acceptance "with reservation". During this period, all equipment must operate simultaneously and not consecutively. The operation must be in automatic mode and set on controls as planned in the operating sequences.
- .3 During this time, until the acceptance "with reservation", each section must perform the normal maintenance, in compliance with the maintenance manual supplied by the Contractor. The maintenance in the period between the acceptance "with reservation" and "without reservation" will be performed by the Owner if all relevant information has been provided and training has been completed. Otherwise the Contractor is to perform the maintenance.

1.34 EQUIPMENT CALIBRATION AND OPERATION

- .1 General:
 - .1 Vibration tests are required to ensure that:
 - .1 The equipment operates within acceptable levels of vibrations.
 - .2 That vibrations or noises is not transmitted to the building structure.
 - .2 The company in charge of the work of each relevant section must use the services of a firm specialized in vibration analysis to conduct verifications and the work required by this article.
 - .3 Before proceeding to any work, have the selection of the specialized firm, which must be retained to perform the analyses, approved. Submit the qualifications of the firm and the methodology to be used to perform the work.
 - .4 The work must be performed by a qualified Engineer or Technician.
 - .5 Provide a list of personnel who will be assigned to the project and a list of equipment and devices that will be used to perform the analyses.
- .2 Analyses:
 - .1 Fans with a 1 HP or stronger motor must be analyzed.
 - .2 Pumps with a 3 HP or stronger motor must be analyzed.
 - .3 All systems modulated by a variable frequency speed controller must be analyzed over the entire range of operating frequencies.
 - .4 ANSI S3.29 and ISO 2631-2 standards must be followed for occupant comfort.
 - .5 If the acceptable values of vibrations are not available from the manufacturer of the equipment, use the RMS values (IRD 1988).
 - .6 Minimum criteria:
 - .1 The amplitude parameter is the velocity (mm/sec.). The frequency range used must cover 600 cycles/min. (CPM) (10 Hz) to 600 000 cycles/min. (10 000 Hz).
 - .1 Overall value (unfiltered) for the entire frequency band of the device: maximum velocity of vibrations of 4 mm/sec.
 - .2 Filtered value (by frequency band): peak maximum velocity of 2 mm/sec.



- .3 General procedure:
 - .1 General:
 - .1 All analyses should be performed only when the system is adjusted, calibrated, and functioning according to design requirements. The analyses can be performed during the running-in period.
 - .2 Provide a coordinated schedule with the Contractor's intervention and the Owner's activities for the testing of each piece of equipment.
 - .3 During the execution of the works, prepare and present to the Contractor and the Engineer preliminary reports for later discussion about the tests.
 - .2 Complete a visual check of all equipment to detect any obvious installation error correctable on-site.
 - .3 Ensure the freedom of movement of vibration isolators and that there are no short circuits caused by any obstruction, whether between the equipment or the anti-vibration equipment base and the structure of the building.
 - .4 Operate the equipment and check by hearing for any apparent malfunction.
 - .5 Check the bearings with a stethoscope. Defective bearings must be replaced immediately to avoid damaging the shaft or any other component.
 - .6 Adjust and calibrate the equipment and the system so that the equipment vibration tests are performed at operating conditions.
 - .7 Perform vibration tests.
- .4 Vibration testing procedure:
 - .1 The following steps must be followed to ensure that the tests are adequate.
 - .2 Determine the operating speed of the equipment. Using a tachometer or stroboscope, measure the rotational velocity of the driven equipment, as well as that of the motor.
 - .3 Determine and report the acceptable criterion in the report.
 - .4 Ensure the freedom of movement of vibration isolators.
 - .5 Operate the equipment and perform a visual and auditory verification to detect any apparent malfunctioning. Check bearings using a stethoscope. Defective, misaligned, and malfunctioning bearings must be corrected before continuing the test. If corrections are not made, the equipment will be considered unacceptable.
 - .6 Measure and record the bearing vibrations from the driven components as well as of the motors in horizontal, vertical and, if possible axial directions. There must be at least one axial measurement for each rotating equipment.
 - .7 Take a "Spike Energy" reading for each engine to determine its condition.
 - .8 Perform an analysis with respect to time on each engine to detect the probability of an electrical fault.
 - .9 Analyze the results and determine probable causes of the vibration.
 - .10 Proceed to the corrections required for operation within acceptable standards.
 - .11 Perform a new analysis to demonstrate that the equipment is operating within acceptable standards.



- .5 Analyses reports:
 - .1 Submit three (3) copies of the final report.
 - .2 The report should contain, among other things, the following information:
 - .1 For each analyzed system, a diagram identifying the measurement points.
 - .2 The vibration curves generated by the analyzer, indicating the date on it, the measuring range, the multiplier, the filter used, the identification of the analyzed equipment, and the measurement point.
 - .3 A table showing the velocity measurements in inches/s, as well as the "Spike Energy" for each of the reading points of the equipment.
 - .4 Conclusions from the data collected in relation to vibration criteria and the likely causes of the vibrations.
 - .5 Description of corrective actions done on each device.

1.35 INSTRUCTIONS TO THE OWNER

- .1 Give to the representative of the Owner all the details on the operation of the equipment specified and installed under this contract. Provide qualified personnel to operate this equipment until the Owner's representative is adequately qualified to take charge of the operation and maintenance of said equipment.
- .2 This training can be combined with the final testing period provided that the Owner's team is available.
- .3 It is understood that such tests are not an automatic acceptance of equipment by the Owner.
- .4 The Owner has the right to do this test as soon as the work is considered sufficiently complete by the relevant Engineer's section, and considered in accordance with the drawings and specifications

1.36 WARRANTY

- .1 Each section guarantees its work for a period of one year after acceptance "with reservation" of the work by the Owner. It is required to repair or replace, at its expense, any defects that would become apparent during this period and that, within 48 h after having been formally notified.
- .2 Manufacturers must offer a one (1) year warranty from the starting operation date or eighteen (18) months from the date of delivery to the site, as appropriate. The warranty must include the cost of materials and labour, and the replacement of defective parts and/or manufacturing defect. In the case of chillers, a five-year warranty applies if the refrigerant charge is contaminated due to the compressor motor burning.
- .3 The warranty is for a period greater than one (1) year (extended/or special warranties), for the areas indicated in the respective specifications.
- .4 General conditions:



- .1 It is expected that several contracts of the same discipline may be executed by different companies, that another company may have adjustments or tests to be executed on its work, that another company may have work to be done which are a subsequent phase of its work, that each company is committed, through this specification, to accept that its work is subject to all conditions listed above without changing the terms of the warranty.
- .5 The use of permanent equipment for temporary purposes does not relieve the relevant section of its responsibilities and obligations with respect to the acceptance and guarantee of its work.

1.37 OBLIGATIONS DURING THE WARRANTY PERIOD

- .1 During the warranty period, in addition to the obligations described in the specifications, the relevant section must provide any technical assistance required by the Engineer and/or Owner with respect to the operation of the installations and their improvements or adjustments as required.
- .2 The temporary use or testing with the goal of adjusting equipment or any other purpose, or permanent use by the Owner of the mechanical and electrical works before the final acceptance of the works should not be interpreted as evidence that such works are accepted by the Owner and does not alter the terms of the warranty. During this time period, the relevant section retains responsibility for the maintenance of installation. No claim for damage or failure of any part of the work put into use will be considered by the Owner.

1.38 MAINTENANCE DURING THE CONSTRUCTION PERIOD

- .1 This article applies only in cases where the equipment is used during the construction period.
- .2 In addition to the responsibilities and obligations of each section, as to the temporary or permanent use of its installations and the use of equipment by the Owner or any other section during construction and before final acceptance of the work, the relevant section still remains as responsible for the operation, preventive maintenance, or other, of its equipment during the same period.
- .3 For these purposes, each relevant section should, in general manner, use its own labour and its own equipment and administer the direct supervision of these tasks.
- .4 However, the relevant section does not have the responsibility to provide the staff required for the equipment's operation during the construction period and before final acceptance of work. However, it remains responsible for the equipment during testing, the adjustment period, calibration, and maintenance of this equipment.
- .5 Supply of spare parts, such as filters, pump belts, fans, compressors and others, as well as providing the energy required for the equipment's operation during the construction period, are the Owner's responsibility.



1.39 TEMPORARY SERVICES

- .1 From a mechanical and electrical point of view, temporary services include: electricity, telephone service, fire alarms, lighting, water supply, sanitation and drainage, heating, ventilation, controls, intercom systems, fire protection, refrigeration, and all the systems necessary for the completion of the works.
- .2 All temporary services, as well as energy costs, are the responsibility of the general Contractor. Refer to general conditions of contract.
- .3 No device that is not part of the permanent installation will be used for temporary services before the building is deemed complete.
- .4 The temporary service period ends upon acceptance "with reservation".

1.40 RENOVATIONS

- .1 Continuous service:
 - .1 The following services are not to be interrupted without prior agreement with the Owner: telephone, electricity, lighting, intercom, fire alarms, sprinklers, fire protection water, aqueduct water, domestic water, sanitary plumbing, storm drainage, external drainage systems, ventilation – air-conditioning, etc.
 - .2 To ensure the continuity of services at during the hours required by the Owner, each relevant section must do all temporary works required, including labour and equipment.
 - .3 All major service cuts must be performed outside the occupancy hours of the building. For example: medical gas, electricity, water, steam, etc.
- .2 Demolition:
 - .1 All demolition work is the responsibility of each concerned mechanical and electrical section.
- .3 Occupied rooms:
 - .1 The work is being done during the occupancy of rooms in the building, therefore, the work must be performed by stages in the rooms designated by the Owner.
 - .2 Perform work after prior agreement with the Owner and establish an acceptable work schedule with the Owner.
 - .3 Before undertaking work in a given area, ensure the availability of all equipment, tools, and labour required to perform the work without interruption.
 - .4 Follow the Owner's instructions as to the delivery to the worksite of its personnel and equipment.
 - .5 The Owner will indicate which staircase can be used and within what limits it is permitted to circulate in the present corridors.
 - .6 Take all necessary precautions to adequately protect existing installations in these areas.
 - .7 At no time must the traffic and the functioning of the building services be impeded. Follow all of the Owner's instructions.



- .4 Noise:
 - .1 Because of the proximity of the occupied premises, take all necessary measures to reduce the noise from construction and demolition.
- .5 Other restrictions:
 - .1 In order not to impair the function of the building that must remain in operation during construction:
 - .1 No vehicles other than trucks used to transport equipment has access to the site for the duration of the works.
 - .2 The use of all elevators is prohibited for construction purposes.
 - .3 The interior circulation outside the boundaries of the services to be renovated must be minimized.
 - .4 The access permitted to the various rooms, for demolition and construction purposes, must be determined by the Owner.
 - .2 Obey the Owner's rules and directives about signs, announcements, advertisements, smoking, etc.
 - .3 Limit equipment/materials to the area delimited set by the Owner for the storage of equipment. They must not congest the area. No part of the construction is to be burdened with a load of equipment that may be hazardous for it.
 - .4 Follow the Owner's sterility standards.
- .6 Dismantling of existing piping, materials, and equipment. Unless otherwise instructed:
 - .1 Any removed pipe, fitting, or valve should not be reused.
 - .2 No device should be reused.
 - .3 The dismantling of pipes, materials and existing equipment is the responsibility of each concerned mechanical and electrical section unless indicated otherwise.
 - .4 All existing equipment and material removed and not re-used or not returned to the Owner, as described below, belong to the respective mechanical or electrical section who are to dispose of them as quickly as possible off site.
 - .5 Every concerned mechanical and electrical section must anticipate the cost of transporting waste off site and bear all related costs to dispose of it.
- .7 Dismantling of refrigeration and cooling equipment:
 - .1 Recover the refrigerant charge and dispose of in a safe manner, compliant with applicable laws and regulations. Submit documentation to the Engineer.

1.41 CERTIFICATION OF COMPLIANCE

- .1 At the end of the work, each section must submit to the Engineer a certification of compliance stating that all work was performed following the drawings and specifications, and all applicable standards and codes. Refer to example form at the end of this section.
- .2 Submit the certificate to the Engineer at the same time as the request for an attestation of successful work completion.



- .3 Have an administrator from the company sign this form and affix their seal to it.

1.42 CLEANLINESS OF THE SYSTEMS

- .1 Take every necessary measure and precaution to keep the inside of all of the ventilation systems' components and ducts clean.
- .2 Duct cleanliness:
 - .1 All ducts and ventilation equipment should be regularly maintained for cleanliness. Along the progression and the work and nearing completion of the work, examinations will be done to ensure that dust levels do not exceed 0.75 mg/100 cm² to respect the NADCA ACR-standard. See section 23 01 31, article "QUALITY CONTROL".

1.43 CLEANING

- .1 Clean the work area as work progresses. At the end of each workday, or more often if the Owner sees fit, remove the trash, carefully arrange the equipment to be used, and do the work site cleanup.
- .2 Once the work is completed, remove the scaffolding, temporary protective equipment, and surplus materials. Repair any defects observed at this stage.
- .3 Clean and polish glass, mirrors, hardware parts, ceramic tiles, chrome or enamel surfaces, laminated surfaces, aluminum, stainless steel or porcelain-enamel parts, floors and sanitary fixtures. Clean manufactured items in accordance with manufacturer's written instructions.
- .4 Clean the areas used for the execution of works and put them in a state at least equivalent to that which existed before the work began, the cleaning must be approved by the Owner.

1.44 SECURITY SCREENING

- .1 All personnel involved in the execution of the work will be subjected to a security screening. Obtain the required authorisations, as per the requirements, for all personnel who are to be present on site.
- .2 Personnel will be screened every day the beginning of the workday, where they will be provided with a security pass they must carry on their person at all times, to be returned to security at the end of the day.

1.45 SECURITY ESCORT

- .1 All personnel involved in the execution of the work will be required to be accompanied by a security officer when performing work in areas prohibited to the public during normal working hours. They must be accompanied in all areas when working during unoccupied times.



- .2 Submit all requests for escorts at least fourteen (14) days in advance. Where requests are made within the prescribed period, the cost of the security escort will be covered by the Departmental Representative. In the case of late requests, the cost will be the responsibility of the Contractor.
- .3 All requests for escorts may be cancelled, without penalty, if notice is give at least four (4) hours before the time. In the case of late requests, the cost will be the responsibility of the Contractor.

1.46 BREAKDOWN OF COSTS

- .1 Before submitting a request for first payment, provide a detailed breakdown of costs relative to the contract, indicating also the overall price of the contract, as per the Engineer’s instructions. Once approved by the Engineer, the breakdown will serve as a reference for payment installment calculations.

Part 2 Product

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.



COMPLIANCE CERTIFICATE

Project: _____

Project address: _____

Discipline: _____

Specification section: _____

We certify that all materials and equipment used, as well as all apparent or concealed work that we have completed or that we have ordered completed, are in all aspects, compliant with the plans, specification, addenda, and changes prepared by the Engineers of Bouthillette Parizeau Inc., and with all applicable codes, laws and regulations in effect.

Company name: _____

Address: _____

Telephone number: _____

Signatory name: _____

Signature: _____

Signatory title: _____

COMPANY SEAL

END OF SECTION



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Part 1 General

1.1 GENERAL REQUIREMENTS

- .1 The use of multiple brands or manufacturers for the same device is prohibited.

1.2 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.
- .2 Section 21 13 13 – Wet pipe sprinkler systems.
- .3 Section 23 05 48 – Vibrations and seismic controls for HVAC piping and equipment.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI) American Water Works Association (AWWA):
 - .1 ANSI/AWWA C110/A21.10 12 – Ductile Iron and Gray Iron Fittings.
 - .2 ANSI/AWWA C151/A21.51 09 – Ductile Iron Pipe, Centrifugally Cast, for Water.
- .2 American National Standards Institute (ANSI):
 - .1 ANSI/ASME B1.20.1-2013 – Pipe Threads, General Purpose (Inch).
 - .2 ANSI/ASME B16.3-2011 – Malleable Iron Threaded Fittings Classes 150 and 300.
 - .3 ANSI/ASME B16.9-2012 – Factory Made Wrought Butt welding Fittings.
- .3 American Society for Testing and Materials International (ASTM):
 - .1 ASTM-A53/A53M-2012 – Standard Specification for Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
 - .2 ASTM-A106/A106M-2015 – Standard Specification for Seamless Carbon Pie for High Temperature Service.
 - .3 ASTM-A126-04 (2014) – Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - .4 ASTM-A135/A135M-09 (2014) – Standard Specification for Electric Resistance Welded Steel Pipe.
 - .5 ASTM-A197/A197M-00 (2015) – Standard Specification for Cupola Malleable Iron.
 - .6 ASTM-A234/A234M-2015 – Standard Specification for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - .7 ASTM-A307-14 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
 - .8 ASTM-A536-84(2014) – Standard Specification for Ductile Iron Castings.



- .9 ASTM-A795/A795M 13 – Standard Specification for Black and Hot Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use.
- .4 National Fire Protection Association (NFPA):
 - .1 NFPA-13 – Standard for the Installation of Sprinkler Systems, 2013 Edition.
 - .2 NFPA-25 – Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. 2014 Edition.

1.4 SCOPE OF WORK

- .1 Work includes:
 - .1 The work generally includes labour, delivery and installation of all materials and equipment necessary for the work of fire protection shown in the drawings and specifications.
 - .2 The work includes, but is not limited to:
 - .1 The supply and installation of new sprinklers heads and piping as identified on the plans.
 - .2 The replacement of existing sprinklers heads by rapid response heads in the zones identified on the drawings.
 - .3 Complete testing of the fire protection systems and test reports.
 - .4 Dismantling as specified in the plans.
 - .5 Payment of all fees, permits, inspection fees and other costs.
 - .6 Supports and structural steel components required to support the piping and equipment.
 - .7 All special connections described in the specifications and/or shown in the drawings.
 - .8 Installation drawings.
 - .9 Identification and labels required for fire protection equipment.
 - .10 Testing of the water system.

1.5 STANDARDS

- .1 Work in accordance with the following standards and regulations:
 - .1 Federal regulations with regards to construction and fire protection.
 - .2 Standards of the National Fire Protection Association, last edition: NFPA-13.

1.6 APPROVAL

- .1 The company in charge of the work of this section must be recognized/specialized for performing this kind of work.
- .2 Inspect the facility before the plaster and ceilings are completed so that the inspection is easy and thorough.



- .3 During final inspection by the Consultant and expensing of this section, make any necessary changes to obtain final acceptance.
- .4 The Consultant must check the coordination and installation drawings, the complete installation, equipment and materials, and inspect and monitor all tests.

1.7 DESIGN CRITERIA

- .1 Density:
 - .1 In general, the density of the areas is low risk. However, the following sectors have particular risks:
 - .1 Mobile shelving rooms (technical service and storage): ordinary risk, group 2.
 - .2 Office spaces: Low risk.

1.8 INSTALLATION DRAWINGS

- .1 See sections "SHOP DRAWINGS" and "ERECTION DRAWINGS" in section 20 00 10 – Mechanical and electrical general instructions.
- .2 Prepare all installation drawings, details required to obtain approvals before starting work.

1.9 REQUIRED DOCUMENTS

- .1 Provide the following documents:
 - .1 A list of identification of piping and valves legends. Refer to section 23 05 53.01 – Mechanical identification.
 - .2 Certificates of materials and tests carried out by the Contractor.
 - .3 Certificates of approval by the authorities concerned.
 - .4 Inspection certificates from the competent authorities.
 - .5 Certificates of guarantee see the article "GUARANTEE", section 20 00 10 – Mechanical and electrical general instructions.
 - .6 Instruction manuals for operation and maintenance of the equipment. See the article "OPERATING INSTRUCTION MANUAL AND MAINTENANCE", section 20 00 10 – Mechanical and electrical general instructions.
 - .7 Maintained drawings, see the article "UPDATED REQUIRED DRAWINGS". section 20 00 10 – Mechanical and electrical general instructions.

Part 2 Product

2.1 GENERAL – PIPING

- .1 Design the system in accordance with NFPA standards, complete with all accessories, excess pressure pumps, alarms and surveillance and fittings of an approved type.



- .2 Pipes and fittings of an approved type, approved by the CFI, conforming to the FM or ULC NFPA identified and designed to withstand an operating pressure of 1210 kPa.

2.2 PIPING ABOVE GROUND AND UNDER 1210 KPA

- .1 Conforms to NFPA.
- .2 Steel pipe:
 - .1 NPS 2 and under:
 - .1 Piping with threaded joints:
 - .1 Piping in black steel or galvanized steel, series 40, ASTM-A53, ASTM-A135 and ASTM-A795.
 - .2 Cast iron fittings ASTM-A126, 860 kPa, approved by UL, threaded, hydrostatic pressure of 1210 kPa operating at 66°C.
 - .2 Piping with rolled mechanical joints:
 - .1 Piping in black steel, series 10, ASTM-A53, ASTM-A135 and ASTM-A795.
 - .2 Cast iron fittings ASTM A126, 860 kPa, approved by UL, threaded, hydrostatic pressure of 1210 kPa operating at 66°C.
 - .3 Piping with grooved mechanical joints:
 - .1 Piping in black steel, series 40, ASTM-A53, ASTM-A135 and ASTM-A795.
 - .2 Cast iron fittings ASTM-A126, 860 kPa, approved by UL, threaded, hydrostatic pressure of 1210 kPa operating at 66°C.
 - .2 NPS 2½ to NPS 8:
 - .1 Piping with flanged or grooved mechanical joints:
 - .1 Piping in black steel or galvanized steel, series 10, ASTM-A53, ASTM-A135 and ASTM-A795.
 - .2 Cast iron fittings ASTM-A536, 860 kPa, approved by UL, hydrostatic pressure of 1210 kPa operating at 66°C or less, Anvil.
 - .3 Clamps/screw-type adapter ("companion flange"), cast iron ASTM-A126, 860 kPa, standards, approved by UL, hydrostatic pressure of 1210 kPa operating at 66°C, Anvil fig. 1016.
 - .4 Bolts for flange square or hex head nut, heavy, ASTM-A307 76b.
 - .5 Linings for rubber flanges, 3.2 mm, Albion 300.
 - .2 Piping with grooved joints:
 - .1 Piping in black steel, series 40, ASTM-A53, ASTM-A135 and ASTM-A795.
 - .2 Cast iron fittings ASTM A126, 860 kPa, approved by UL, threaded, hydrostatic pressure of 1210 kPa operating at 66°C.
 - .3 Mechanical piping seals:



- .1 General:
 - .1 Grooved pipe, series 40, in mechanical seals, free of marks, projections or recesses over the entire surface in contact with the sealing gasket. Cut straight and prepare the ends of the pipe according to manufacturer standards.
- .2 Groove:
 - .1 The groove must have a square or round shape by rolling and dimensions must be given in manufacturer's table catalog.
- .3 Filling:
 - .1 Resilient elastomeric seal, center groove, following the contours of the cavity and forming a pressurized watertight point around the pipe when the ring is tightened.
- .4 Connections:
 - .1 Fittings formed of ductile iron ring segments enclosing the liner and fitting into the grooves of the pipes.
 - .2 Use fittings with or without set, so as to allow for expansion and angular adjustment, as required by the installation.
 - .3 Accepted materials:
 - .1 For steel: such as Victaulic nos. 005, 07, 72, 77, 920N, 922 and 009H or approved equivalent,
 - .1 For cast iron: such as Victaulic nos. 31, 307 and 341 or approved equivalent.
 - .2 For copper: such as Victaulic nos. 606 and 641 or approved equivalent.
 - .4 Prohibited materials:
 - .1 Mechanical T joints must be made using two collars in ductile iron. Assembly using cast iron collars and U-bolts, such as Victaulic nos. 921 and 925 or other similar styles, are not acceptable.
- .5 Bolting:
 - .1 Use thermally treated bolts, oval collar and pulling head, adapting to the same hole shape and for clamping one side.

2.3 COLLARS

- .1 Wherever pipes pass through walls, floors, ceilings, install cast iron flanges on each side, model 207xxx by Lyncar.
- .2 Wherever pipes pass through ceilings, acoustic tiles, install chrome steel flanges with clamping mechanism and concealed hinges, fig. 10 by Anvil.
- .3 For other locations, see the general mechanical and electrical requirements.



2.4 DIELECTRIC SEALS

- .1 Making connections between two pipes of different metals such as copper and steel, by means of dielectric unions or flanges with gaskets between the flanges and insulating sleeves to the bolts, in order to avoid contact between the two metals, UL approved connections, union and Epcoc flange.

2.5 MANUFACTURER LIST

- .1 Comply with article "PRODUCTS USED FOR TENDERS AND EQUIVALENCES" from section 20 00 10.
- .2 List of manufacturers, section 21 05 05:
 - .1 Piping:
 - .1 Allied Tube
 - .2 American Tube and Piping
 - .3 Grinnell
 - .4 Sidbec-Dosco
 - .5 Steel of Canada
 - .6 Stelco
 - .7 Or approved equivalent
 - .2 Welded fittings and flanges:
 - .1 Anvil-Merit
 - .2 Or approved equivalent
 - .3 Fittings for flanges:
 - .1 Garlock
 - .2 Or approved equivalent
 - .4 Flange connections:
 - .1 Central
 - .2 Gruvlok
 - .3 Victaulics
 - .4 Nibco
 - .5 Or approved equivalent
 - .5 Mechanical Joints:
 - .1 Anvil
 - .2 VGS
 - .3 Victaulics
 - .4 Tyco
 - .5 Or approved equivalent
 - .6 Threaded connections:
 - .1 Anvil
 - .2 Central



- .3 Ward
- .4 Or approved equivalent

Part 3 Execution

3.1 GENERAL

- .1 Piping placement, location of equipment and special devices, etc., mentioned in the specifications or in drawings indicating the general layout of equipment.
- .2 Perform installation according to the standards and learn about the architectural layout of the building.
- .3 Install upright piping in a straight line according the required gradients.
- .4 No pipe should come in contact with the concrete or the ground.
- .5 Install all hoses in such a way to avoid tensile stress or compression.
- .6 Do not bend the pipe in any way.
- .7 The identification of the pipe markings must always be legible for easy inspection.

3.2 ABOVE GROUND PIPING

- .1 See the article "LOCATION OF PIPING AND CONDUIT" in section 20 00 10 – Mechanical and electrical general instructions.

3.3 SLOPES

- .1 Install the system in such a way that it empties completely. Install drain taps at the low points.

3.4 SUPPORTS

- .1 Conform to the NFPA.
- .2 Secure all pipes using brackets and anchors approved by NFPA.
- .3 Adjustable supports with steel rod securely fastened to the structure.
- .4 Piping up to NPS 4, the threaded rods will be 9 mm. For piping NPS 5 to NPS 8, the rods will be 13 mm. For piping NPS 10 and NPS 12 in diameter, the rods will be 15.6 mm.

3.5 ANCHORS

- .1 Adequately anchor in such a way to avoid any stress to joints and/or warping. Using anchors made of welded structural steel firmly secured to the structure by means of anchoring bolts, size and capacity proportional to the weight.
- .2 Attach anchors to the main beams and slabs cast, but not to pre-stressed or precast slabs.
- .3 The structure should not be damaged by the anchors. Submit anchor positions for approval to the structural Engineer with proper coordination drawings.



3.6 TESTING

- .1 See sections "TEST", "FINAL TEST" and "TEST BY OWNER" of section 20 00 10 - Mechanical and electrical general instructions.
- .2 Maintain leak-free status for at least two hours in all piping, with hydrostatic pressure of 1400 or 350 kPa over the normal operating pressure.
- .3 Provide a certificate stating the results of the tests for each system.
- .4 The Contractor will provide the hydraulic pump, connections, and temporary labor needed for these tests.
- .5 Set all devices so that they function properly.

3.7 PAINT

- .1 Apply a metal mordant layer on all exposed pipes.
- .2 Ensure that no sprinkler head is painted. Protect the heads with plastic bags or polythene securely held in place by a string or wire prior to painting.
- .3 Once the painting is completed, remove the temporary protection from the heads. All painted or damaged heads will be replaced and expensed.

END OF SECTION



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Partie 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.
- .2 Section 21 05 05 – Common work results for fire suppression.

1.2 REFERENCES

- .1 National Fire Prevention Association (NFPA):
 - .1 NFPA-13 – Standard for the Installation of Sprinkler Systems – 2013 Edition.
 - .2 NFPA-25 – Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems – 2014 Edition.

1.3 DESIGN REQUIREMENTS

- .1 The modifications to the system must be complete and ready for use, and they must include all the materials, elements and interior and exterior accessories necessary for this purpose.
- .2 The installation must take into account all design features and all structures and elements such as hidden spaces, piping, electrical equipment and air ducts, indicated in detail on shop drawings.
- .3 Materials and fire protection equipment must be approved for use in an automatic water sprinkler system.
- .4 Location of sprinkler heads:
 - .1 Determine the exact location of the sprinklers according to the characteristics of the ceiling, the spacing between the heads must not exceed that specified in NFPA-13.

1.4 SUBMITTALS

- .1 Submit documents in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Product data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3 Certificates:
 - .1 Submit certificates signed by the manufacturer certifying that the products and materials comply with the specified performance and physical requirements.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit all document/elements required, in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Operation and maintenance data (O&M): provide instructions with respect to the operation and maintenance, to be incorporated into the O&M manual.



1.6 DELIVERY, STORAGE AND HANDLING

- .1 Shipping and receiving: deliver material to site in the original packaging, which must bear the name and address of the manufacturer.

Partie 2 Product

2.1 PIPING AND VALVE CONNECTIONS

- .1 In accordance with NFPA-13.
- .2 See section 21 05 05 – Common work results for fire suppression.

2.2 SPRINKLERS

- .1 Approved type, misting with fuse, to varying degrees as required.
- .2 Sprinklers shall be as specified or an approved equivalent.
- .3 Sprinklers of the following type:
 - .1 Ordinary straight: Viking: Microfast, with glass fuse, bronze finish.
 - .2 Semi-flush: Viking: Microfast no. E-1, with glass fuse, chrome and ring, chrome, mounted flush with the ceiling.
 - .3 Rapid response heads: every head located in an area with low or normal risk density should be of rapid response type, as outlined by the NFPA-13.

2.3 SPRINKLER REPLACEMENT

- .1 Provide a metal cabinet with shelves, door hinges and hardware, and capacity as indicated in the NFPA-13, and containing:
 - .1 Sprinklers of each type and of each melting temperature used, in accordance with NFPA-13. Quantity:
 - .1 5 replacement heads, ordinary straight, rapid response.
 - .2 5 replacement heads, semi-flush type, rapid response.
 - .2 Two keys to facilitate emergency changes.
- .2 Install the cabinet at the entrance of the water sprinkler room of the Chancery, in the basement.

2.4 PROTECTIVE BASKETS

- .1 Install protective baskets in places where the nozzles are susceptible to mechanical shock and where indicated in drawings. They must be securely fastened.
- .2 Protective baskets are painted red for bronze finished nozzles, and for chrome finished nozzles.
- .3 Install protective screens on the baskets with sprinklers at the locations shown in the drawings.
- .4 These baskets must be approved for the type of head installed.



2.5 MANUFACTURER LIST

- .1 Comply with article "PRODUCTS USED FOR TENDERS AND EQUIVALENCES" from section 20 00 10.
- .2 List of manufacturers, section 21 13 13:
 - .1 Sprinkler heads:
 - .1 Central
 - .2 Globe
 - .3 Grinnell
 - .4 Reliable
 - .5 Victaulic
 - .6 Viking
 - .7 Approved equivalent product.

Partie 3 Execution

3.1 MANUFACTURERS INSTRUCTIONS

- .1 Compliance: comply with requirements, recommendations and manufacturer's written data, including product technical bulletins, instructions for handling, storage and product installation, and information sheet techniques.

3.2 INSTALLATION

- .1 Install automatic sprinkler systems, check and submit them to an acceptance test in accordance with NFPA-13 and NFPA-25.

3.3 PIPING INSTALLATION

- .1 Install level and square the piping so that it rests evenly on its supports and suspensions. Do not attach the suspensions to plaster ceilings.
- .2 Make sure the interior and the ends of the new pipe as well as the existing pipe are free from water debris.
- .3 During the installation and at the end of each work period, seal the open ends of the pipe with caps or other approved methods to prevent the entry of foreign matter.
- .4 Inspect the pipes before setting them into place.

3.4 ON SITE QUALITY CONTROL

- .1 Testing/Site Inspections:
 - .1 Perform the required tests to verify compliance with the prescribed requirements.
 - .2 Perform the required tests and inspections and approve the piping prior to concealing it.
 - .3 Preliminary tests:



- .1 Conduct hydrostatic testing for each system at a pressure of 200 lb/in² for a period of two (2) hours, there must be no leakage or pressure drop during this test.
 - .2 Flush drinking water pipes in accordance with NFPA-13.
 - .3 Perform required tests and inspections and approve the piping installed in empty ceiling spaces before setting the ceilings.
 - .4 Test the alarms and other related devices.
 - .5 Once testing is complete and corrections have been made, submit the certificate of inspection, signed and dated in accordance with NFPA-13.
- .4 Final tests and inspections:
- .1 Do not request to have tests and final inspections performed before the preliminary tests are completed and any corrections made.
 - .2 Application for final inspection must be made at least fifteen (15) days before the desired inspection date.
 - .3 Repeat required testing as directed.
 - .4 Correct any anomalies and conduct additional tests until the systems comply with contractual requirements.
 - .5 Provide the hydraulic pump, temporary connections, and labor necessary for carrying out the tests.
 - .6 Provide a certificate indicating the test results for each system.

END OF THE SECTION



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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.

1.2 PAYMENT FOR TEST LABORATORY SERVICES

- .1 Retain the services of an independent testing laboratory and assume the costs.

1.3 SUBMITTALS

- .1 Submit documents in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Submit the detailed video controlled cleaning plan following a site visit.
 - .1 Ensure that the plan clearly indicates the sequence of operations, the camera and cleaning device insertion points, as well as the work calendar.
- .3 Product data:
 - .1 Submit the required data sheets, as well as the manufacturer documentation relating to antimicrobial agents used in the work. Data sheets must list the product characteristics, performance criteria and limitations.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit all document/elements required, in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Post-cleaning inspection report: submit four (4) copies of the final inspection report, which must include data on collected particles, observations and recommendations, as well the following information and elements:
 - .1 Name and address of installation.
 - .2 Name and address of cleaning Contractor.
 - .3 Description of different HVAC systems, with drawings and sketches marking systems cleaned.
 - .4 Identification scheme for the various parts of the systems that have been inspected, with notes describing the methods of inspection or analyses performed.
 - .5 Identification of sampling points and type of analysis performed for each sample.
 - .6 Identification of every sample collected.
 - .7 Commentary and photographs of each sampling location and all other system characteristic observations made.
 - .8 Identification of systems tested, observations, suggestions for measure to be put in place and recommendations for maintenance activities to be carried out in the future.
- .3 Post-cleaning video survey: submit two (2) copies of video survey on USB key, which must include the following:



- .1 Parts of the systems subjected to particle analysis and an evaluation of microbial growth.
- .2 Parts of the system of particular interest and their location.
- .3 Special internal characteristics.
- .4 Problems such as damaged elements or control/regulation devices.
- .5 Systems subjected to analysis, observations, measure put in place and recommendations made verbally or in writing in English.

1.5 CONTRACTOR QUALIFICATIONS

- .1 The company must have been incorporated for five (5) years, shown that it has five (5) years of experience cleaning ventilation systems at provide proof when submitting its tender.
- .2 That contactor will have in their employment a qualified workforce with at least two (2) years experience in cleaning ventilation systems and in the performance of work required for the completion of projects.

1.6 SITE SURVEY

- .1 Refer to instructions in tender documents to see date and time for the site visit, as well as general instructions.
- .2 The site survey must not disrupt normal operation of the space nor have an environmental impact.

1.7 SCHEDULE OF WORK

- .1 Before starting work, the Contractor must supply a timeline, as the sections where they will start their work, all in coordination with the Owner.
- .2 Consult the general conditions to establish the relation with the other work and prospective times to perform the cleaning,

1.8 SAFETY

- .1 The Contractor is responsible for the development and respect of site (and adjacent) safety measures during the entirety of the work and all measure must be taken to ensure occupant safety.
- .2 The Contractor is responsible for the development of lockout procedures to protect technicians from any accidental start up of the ventilation systems or other equipment during the work.
- .3 The technicians must have completed the course "Health and safety on construction sites (ASP Construction)", including confined space training, as well as WHMIS, and carry their ASP Construction card with them at all times.
- .4 In existing buildings, the Contractor must respect the codes and standards for occupant safety, as well as for the disposal of debris.

1.9 PROTECTION OF THE SITE



- .1 The Contractor must ensure the protection of the building and equipment by using protective tarps and covers. At the end of work in each area all surfaces must be cleaned with HEPA filter equipped vacuum cleaners. Area and goods to be returned to same state of cleanliness as before the execution of work.

1.10 METHODOLOGY AND EQUIPMENT

- .1 The Contractor must provide a list of primary equipment that will be used during the execution of cleaning work (photos, descriptions, specifications). Contractor must prove that they possess the required equipment. The Owner, in coordination with the Contractor, must establish a location for storage of equipment and material required for work.
- .2 The Contractor must submit a procedure they intend to use for each component. It should be noted, for the cleaning of the supply and return ducts, only the “suction with moving brush” will be accepted.
 - .1 Mechanical method.
 - .2 Manual method.
 - .3 Cleaning products for ducts must be VOC-free and biodegradable.

Part 2 Product

2.1 SCOPE OF WORK

- .1 The cleaning work required is:
 - .1 Provide the workforce, materials, equipment and surveillance necessary to perform the air duct and ventilation system component cleaning, as specified below:
 - .2 List of systems to clean: HRU-1, TRU-1, TRU-2, TRU-3.
 - .3 List of components to clean:
 - .1 Clean the inside of the fresh air ducts.
 - .2 Clean the inside of the supply and return ducts from the systems replaced to the motorized dampers at concrete roof exit.
 - .3 Clean all the blades of the air baffles and extractors, and all other internal components of the ducts.

2.2 ACCESS DOORS

- .1 Use existing access doors to perform the cleaning.
- .2 If other access is needed, proceed as follows:
 - .1 For openings of more than 300 mm x 300 mm, a leak-tight door with locks must be installed according to accessibility, while maintain the operating pressure of the system. The Contractor must provide shop drawings for the access doors to be used (acceptable products: Nailor and Duct Mate).
 - .2 For small openings, pre-cut galvanised steel plates of the same gauge or thicker than the existing material, may be used. The plate must overlap the duct by at



least 25mm all around the opening. For an opening of 250 mm x 250 mm, the plate must be at least 300 mm x 300 mm. A neoprene gasket of 3.2 mm x 15 mm must be installed around the opening to ensure leak-tightness. The plate to be fastened using self-drilling screws, installed a maximum interval of 100 mm. No openings will be made on flexible duct. Any insulating material on the outside must be replaced and match with existing.

- .3 For medium and high-pressure ducts, openings will be permanently closed with pre-cut galvanised steel plates of the same gauge or thicker than the existing material. A permanent leak-tight seal for the duct will be made using cotton tape. The plate to be fastened using self-drilling screws, installed a maximum interval of 100 mm.
- .4 During the work, the Contractor must take notes on the plans regarding where openings were made and any mismatch between the plan provided and actual system, and provide these plans to the Owner when work is completed.
- .5 Openings made and their closing should not, under any circumstance, effect or restrict the volume of air traveling through the ducts.

2.3 ANTIMICROBIAL AGENTS

- .1 Antimicrobial agents used must be registered with the US EPA (40 CFR).

2.4 AIR DUCT CLEANING MATERIAL

- .1 Manually operated rotary contact brushes:
 - .1 Ensure that brushes are specifically designed and made for adapting to different ducts, materials and elements in HVAC systems.
 - .1 Ensure that the brushed are an appropriate size for the different diameters of ducts in the HVAC systems.
 - .2 Make sure that the brushes allow scrubbing by direct contact of the interior walls of the ducts and equipment to be cleaned.
- .2 Bushes: rotating, manual operation, with integrated motor, with nylon, polypropylene of other non-metal bristles.
 - .1 Ensure that the motor is strong enough to continue to turn the brush after the bristles are deformed.
 - .2 Replace used or inefficient brushes as needed.

2.5 DEFICIENCIES AND EXISTING DAMAGE

- .1 If modifications need to be made to existing systems, or damage or deficiencies are found, report to Owner and Engineer.

Part 3 Execution

3.1 PROTECTION OF COMPONENTS

- .1 Ensure that all mechanical and electrical devices near the work are protected.



- .2 Do not place objects, equipment, tools and other materials on the duct insulation.
- .3 Note the position of balancing registers before cleaning. Ensure that baffles and registers are not moved. If some are moved by accident, return to their original position.
- .4 Existing systems:
 - .1 Install a media filter or a sealed envelope (polyethylene) to the outside of the grilles and diffusers in order to prevent dust entering the rooms during the work.

3.2 REMOVAL OF MATERIAL AT RISK OF MICROBIAL CONTAMINATION

- .1 All work involving removal of acoustical insulation or other contaminated material inside the ventilation system components must be performed in negative pressure. Negative confinement to be achieved by evacuating the air in the area to be treated using HEPA filters (99.97%, 0.3 micron), and an airlock be constructed at the area entrance using a support frame and plastic film with a minimum thickness of 0.6 mm. In addition, decontamination workers are required to wear protective equipment such as hooded covers, half face masks with HEPA filters, safety boots, gloves, protective glasses, etc. The Contractor must perform the decontamination of the surfaces following a submitted and approved method, as required by article "STANDARDS AND REFERENCES".
- .2 Respect the norms and regulations in force in the locality.

3.3 ANTIMICROBIAL AGENTS

- .1 The use of antimicrobial agents should not be used unless there is significant appearance of mildew growth or if an unacceptable level of contamination is determined through testing.
- .2 Application of anti microbial agents of permitted after the removal of surface deposits and debris.
- .3 Application to be performed following manufacturer instructions. The agent must be sprayed directly onto the surface and not "atomized" through the system.

3.4 QUALITY CONTROL

- .1 Quality:
 - .1 The quality control programme for the work must satisfy NADCA standards.
 - .2 Standards for dust:
 - .1 Ventilation ducts are considered clean if they pass visual inspection under a strong light (100 W) and if they meet NADCA-ACR dust standards of 0.75 mg/100 cm².
 - .3 The dust collection must be performed by the Contractor in the presence of the Engineer.
- .2 Inspection:
 - .1 Provide remote-controlled video equipment (robot) allowing the Engineer to inspect the duct interior at any time.
 - .2 If some of the inspected ducts do not meet standards and requirements listed above (visual and dust test), repeat cleaning of this part. Repetition of cleaning



and inspection/testing fees will be at the Contractor's expense, without cost to the Owner.

- .3 Video report:
 - .1 Provide two (2) copies of the complete video report, showing each component after cleaning for verification by the Engineer.
 - .2 The video must include identification of the systems and components.
- .4 Written report:
 - .1 Provide two (2) copies of the written report for verification by the Engineer, and must include the following information:
 - .1 Name and address of the Contractor.
 - .2 Project name, number (and lot number, if applicable).
 - .3 Identification of installation cleaned and cleaning dates.
 - .4 Description of different HVAC systems, with drawings and sketches marking systems cleaned.
 - .5 Commentary and photographs of each dust collection location.
 - .6 Cleaning and dust collection methodology.
 - .7 Laboratory where analysis was performed and what type of analysis.
 - .8 Laboratory results.
 - .2 List of recommendations following cleaning, if any.
 - .3 Identification of the system must always accompany results, comments and recommendations.
 - .4 Each report must contain a title page and an index, placed inside a 3-ringed binder, and accompanied by a vide report. If any drawing/plan mark ups were made they should be included in the report.
 - .5 Work will be considered complete when all reports are accepted by the Engineer.

END OF SECTION



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- 1.6 ELECTRICAL CONNECTIONS

PART 2 PRODUCT

- 2.1 NOT USED

PART 3 EXECUTION

- 3.1 NOT USED



Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.

1.2 SUBMITTALS

- .1 Product data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment. Data sheets must include product characteristics, performance criteria, dimensions, limits and finish.
- .1 Shop drawings:
 - .1 Shop drawings must include:
 - .1 Assembly and installation details.
 - .2 Required information to permit operation and maintenance (O&M) of the devices.
 - .2 Submit the following documents along with the shop drawings and data sheets:
 - .1 Shop drawings for the bases, stands, supports and anchoring bolts.
 - .2 Data regarding sound level of systems and devices if applicable.
 - .3 Performance curves with operating points indicated.
 - .4 Documentation from the manufacturer certifying that the products provided are the most current model.
 - .5 Certificate of compliance with relevant codes.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit the required documents/elements in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Operation and Maintenance data (O&M): provide instructions with respect to the operation and maintenance, to be incorporated into the O&M manual.
 - .1 The O&M manual must be approved, before the final inspection, by the Consultant. Final copies to be submitted to the Owner.
 - .2 Operational documentation must include the following:
 - .1 Control diagrams for each system, including local interface controls.
 - .2 A description of each system and related control devices.
 - .3 A description of the operating sequences for each system under different loads, including programmed set points and seasonal changes.
 - .4 Instructions for the operation of each device and its components.
 - .5 Instructions of measures to be taken in case of equipment/material failure or malfunction.
 - .6 Table of flow devices and a flow diagram.
 - .7 A colour code legend.



- .3 Maintenance documentation must include the following:
 - .1 Instructions for the maintenance, repair, operation and troubleshooting of every component,
 - .2 A maintenance schedule specifying the frequency and the length of work as well as tools required to perform the work.
- .4 Performance documentation must include the following:
 - .1 Performance data supplied by the manufacturer of the equipment/material, specifying the performance level of each, measured after the commissioning process has been completed.
 - .2 Results from the performance testing of the equipment/material.
 - .3 All other documentation specified in other sections of the contractual documents.
 - .4 TAB (testing, adjusting and balancing) reports in accordance with requirements from section 23 05 93 – Testing, adjusting and balancing for HVAC.
- .5 Additional information:
 - .1 Prepare sheets for any additional documentation to add to the appendix of the O&M manual.
- .6 "As-built" drawings:
 - .1 Before performing TAB work, complete the as built drawings.
 - .2 Mark on every drawing on the lower right side in at least 12 mm font "AS-BUILT' DRAWINGS: THIS DRAWING WAS REVIEWED AND REPRESENTS THE SYSTEMS/MECHANICAL DEVICES AS THEY WERE INSTALLED" (Contractor signature) (Date).
 - .3 Submit the as-built drawings to the Consultant for approval and make any required corrections as instructed.
 - .4 Perform TAB work with as built drawings at hand.
 - .5 Submit reproducible as built drawings along with O&M manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Transport, store and handle hazardous materials in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Shipping and receiving: deliver material to site in the original packaging, which must bear the name and address of the manufacturer.

1.5 SPECIFIC CONDITIONS – VENTILATION

- .1 The specific requirements of the mechanical and electrical works, Division 20, apply to this section.
- .2 The following sections are included in the scope of the ventilation work and complement each other to form a whole.
 - .1 Section 23 01 31 – Air duct cleaning for HVAC systems.
 - .2 Section 23 05 00 – Common work results for HVAC.



- .3 Section 23 05 48 – Vibration and seismic controls for HVAC piping and equipment.
 - .4 Section 23 05 53.01 – Mechanical identification.
 - .5 Section 23 05 93 – Testing, adjusting and balancing for HVAC.
 - .6 Section 23 07 13 – Duct insulation.
 - .7 Section 23 31 13.01 – Metal Ducts – Low pressure to 500 Pa.
 - .8 Section 23 33 00 – Air duct accessories.
 - .9 Section 23 34 00 – HVAC fans.
 - .10 Section 23 44 00 – HVAC air filtration.
 - .11 Section 23 73 10 – Air handling units.
- .3 Scope of work
- .1 Work included:
 - .1 The work includes, in general, labor, supply, and installation of all materials and equipment necessary for ventilation – air-conditioning work indicated on the drawings and in the specification.
 - .2 This work includes, but is not limited to:
 - .1 Replacement of ventilation systems nos.:
 - .1 HRU-1 / TRU-1 / TRU-2 / TRU-3
 - .2 All special connections and ducts replacements and new transitions to allow for the installation and the connection of the new units.
 - .3 All supports and structural steel components required to support the ducts and the equipment.
 - .4 The modification or replacement of existing steel bases to support the new systems, including the priming and painting of the bases.
 - .5 If required by the new systems, the addition of concrete bases similar to the existing ones to support the new systems.
 - .6 All access doors.
 - .7 The supply and the installation of springs, anti-vibration bases, and other equipment required for this section.
 - .8 Sealing sleeves and openings.
 - .9 All demolition, relocation, and recalibration work for ducts, as shown in the drawings.
 - .10 The cleaning of supply, return and fresh air ducts from the replaced ventilation units to the motorized dampers at the concrete roof exits, shown on drawings.
 - .11 The coordination of coordination drawings from sections from Divisions 21, 23, 25, and 26, in accordance with the requirements of the section 20 00 10 – Mechanical and electrical general instructions, as well as the coordination of acoustic and vibration work.



- .12 Identification of the systems' ventilation ducts, the devices, and the other accessories, in accordance with section 23 05 53.01 – Mechanical identification.
- .13 All tests.
- .14 All work for the balancing and the adjustments of the air quantities. The following balancing works should be done:
 - .1 Measurement of all systems total airflow before the replacement, including the amount of fresh air directed to TRU-1/TRU-2 and TRU-3. Measurement results must be provided to the engineer before demolition.
 - .2 Balancing of the new systems after the installation to supply the same total airflow as before the replacement.
- .15 Paraseismic measures for ventilation – air conditioning work, according to section 23 05 48 – Vibration and seismic controls for HVAC piping and equipment.
- .16 Duct cleanliness:
 - .1 All ventilation ducts and equipment should be regularly maintained to a state of cleanliness. As the work progresses and near the completion of the work, examinations will be done to ensure that dust levels do not exceed 0.75 mg/100 cm² to comply with the NADCA-ACR standard. See Section 23 01 31 – Air duct cleaning and HVAC systems.
- .17 All thermal insulation work.
- .18 The installation of the equipment used for acoustic and vibration treatments.
- .2 Work excluded:
 - .1 In general, the following work is excluded:
 - .1 The controls: the supply and the installation.
- .4 Samples:
 - .1 See section 20 00 10 – Mechanical and electrical general instructions.
 - .2 Submit all samples requested by the different sections of Division 23.
- .5 Special connections and related work:
 - .1 See Division 20.
 - .2 Part of this section's work:
 - .1 The complete ventilation connections of the various devices indicated on the drawings and/or specifications, whether these devices are part of this section or not. The dimensions of the ventilation ducts to the devices shown in the drawings are approximate and should be verified with the other involved sections before the pipes are manufactured.



- .2 The directives, the supervision, and the responsibility for the installation of the various devices provided by this section, but installed by another section.
 - .3 The welded or screwed connections for the ventilation devices and ducts prepared to receive the drain pipes.
 - .4 The openings and the access doors required for the control devices and the other instruments. The sealing of the pipes passing through the ventilation units.
- .6 Documents to provide:
- .1 Provide the following documents:
 - .1 The certificates of approval from the concerned authorities.
 - .2 Shop drawings, device drawings, and coordination drawings.
 - .3 A list of duct identification legends.
 - .4 Copies of the instruction manuals for the equipment operation and maintenance.
 - .5 Up to date drawings.
 - .6 A list indicating for each electric motor: the current in amperes at zero load and at normal load, the capacity of the heater installed in the starter, and the value of the maximum current in amperes inscribed on the motor plate.
 - .2 A full report of the results requested in the article "VENTILATION SYSTEMS' TAB REPORT" from the section 23 05 93 – Testing, adjusting and balancing for HVAC
- .7 Submissions – Prices to provide:
- .1 Global price:
 - .1 Provide with the submission, a global inclusive price covering all the "VENTILATION – AIR-CONDITIONING" work.
 - .2 Declared price:
 - .1 Also, provide the prices declared as included in the overall price for the following work:
 - .1 Controls
 - .2 Acoustics and vibrations
 - .3 Thermal insulation
- .8 Submissions – Other information:
- .1 All work described in section 23 05 93 – Testing, Adjusting and Balancing for HVAC should be performed by a specialized company. Indicate the name of the selected company.
 - .2 All work described in section 23 05 48 – Vibration for HVAC equipment. Indicate the name of the selected company.

1.6 ELECTRICAL CONNECTIONS



- .1 Each relevant mechanical section must provide and install the motors, the thermostats, the controllers, and the other devices specific to their own specialty shown on the drawings and/or requested in the specification.
- .2 Unless otherwise indicated, each relevant mechanical section must provide the starters and the transformers relating to their specialty. These starters and transformers are installed and connected by Division 26.
- .3 According to the indications on the diagrams and the drawings, Division 25 or 26 must provide and install the ducts, the cables, and the boxes with complete connections for all mechanical devices, under the supervision of the Division that provided the device.
- .4 However, each relevant mechanical section is solely responsible for the operation of their own equipment. They must check all the electrical control sequences and the protection of each device by checking all the overload relays.
- .5 Each relevant mechanical section is solely responsible for the selection of the overload relays.
- .6 All electrical connections must comply with the electrical specification requirements.

Part 2 Product

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION



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Part 1 General

1.1 RELATED SECTIONS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.

1.2 SUBMITTALS

- .1 Submit the documents and samples required in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Submit shop drawings required in accordance with section 20 00 10 – Mechanical and electrical general instructions.
 - .1 Submit a distinct shop drawing for each independent system, the complete installation drawings, and the technical and performance documentation.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Packaging, shipping, handling and receiving:
 - .1 Transport, store and handle materials in accordance with section 20 00 10 – Mechanical and electrical general instructions.
 - .2 Transport, store and handle materials in accordance with the manufacturer's written instructions.

1.4 SCOPE OF THE WORK

- .1 Work included:
 - .1 In general, the work includes the calculation, the supply, the supervision, and the responsibility for all materials and equipment necessary for the mechanical and electrical work on seismic restraint systems:
 - .1 The calculations, the assumptions, the factors, and the installation details for the seismic restraint systems needed to meet the required standards. A signed and sealed Engineering report is required by a seismic Engineer for any new construction. This report also testifies the compliance with the various codes. This report is also required for retrofitting (renovation) projects, whose works include the installation of new equipment and distribution networks. A report must also be produced by the same Engineer for the purpose of work acceptance.
 - .2 Supplying seismic restraint systems and delivering this equipment to the site are this section's responsibility.
 - .3 The supervision of the installation of all mechanisms used for seismic control and the presentation of a compliance report issued by the seismic Engineer attesting the installations' compliance with the requirements stated in this report .A certificate of compliance will be issued prior to the work acceptance.
 - .4 Seismic control mechanisms include, for each discipline, but are not limited to:



- .1 Braces and stiffeners at the supports (if required) for ventilation ducts, and electrical conduits.
 - .2 Properly anchoring all devices not fitted with vibration isolators to the framework (anchored directly to the framework), whether they be mechanical or electrical.
 - .3 Seismic mechanisms of all pipes and devices or equipment fitted with vibration isolators.
 - .4 Properly anchoring all pipes and devices with vibration isolators to the framework.
- .2 Work excluded:
- .1 In general, the following work is excluded:
 - .1 The storage of equipment provided by this section (at the expense of the relevant section).
 - .2 The installation of equipment provided by this section (at the expense of the relevant section).

1.5 RESPONSIBILITIES

- .1 Each section (fire protection, ventilation – air-conditioning, controls, and electrical) remains responsible for its discipline’s seismic restraints systems.
- .2 It is to be noted that only each relevant section knows the details, the dimensions, and the run of the mechanical pipes, the ventilation ducts, and the electrical conduits, and the names of the manufacturers that provide the devices (ventilation units, MCC, etc.).
- .3 Each section retains the services of an experienced professional to design, supply, and supervise the installation of all the seismic restraint systems. This professional must have recognized expertise in the field of seismic protection for similar electromechanical installations.
- .4 The consultant specialized in seismic control is responsible towards the section of the discipline concerned with the design, the supply, and the supervision of the installation of their seismic restraint systems of the concerned discipline. He remains the supervisor of the seismic measurements’ structural integrity of the concerned discipline. This design report will be transmitted to the Engineering consultant for information.
- .5 Each relevant section hires a consultant specializing in seismic design, whose specialized Engineer performs the calculations and elaborates the installation details for the seismic restraint systems. Before the end of the work, he must produce a compliance report for the installed seismic restraint systems. This report must be signed by the same Engineer who signed the design report.



1.6 CALCULATIONS

- .1 The consultant specializing in seismic restraint systems must obtain from the relevant mechanical or electrical section all information relating to devices, pipes, ventilation ducts, and electrical conduits required for the seismic restraint calculations (weight, type of fluid number, thermal insulation, run, spacing between supports, groups on trapeze supports).
- .2 The consultant specializing in seismic restraint systems must obtain from the manufacturers of each device and equipment of the concerned discipline, the characteristics required in article "SHOP DRAWINGS AND DEVICES" in section 20 00 10 – Mechanical and electrical general instructions (weight, location of the center of gravity, number of attachment points, location of the center of gravity of the mounting points, rotational speed, seismic fragility of the internal components, etc.).
- .3 The calculation parameters, the calculations, and the installation details for the anchor bolts and the seismic restraint systems should be checked by an Engineer specializing in seismic control design.
- .4 For vertical loads or equipment overturning risks, use the equations detailed in the standard FEMA 450-1.
- .5 Provide for information: the seismic Engineer's design report, the parameters or the values used in compliance with the national Building Code, the bases of calculations, the data of the analyzed equipment or networks, the calculations for seismic bracing, the overturning calculations, the overturning moments, the anchor calculations, the recommended restraint systems, and the installation details, and this for each installed network and equipment. Provide the plans locating the restraints and the drawings for each device along with product specifications.
- .6 Confirm with calculations that if rigid braces are installed, no undue force will be applied to the supports.
- .7 Also, see the article "SEISMIC STANDARDS".

1.7 DOCUMENTS TO PROVIDE

- .1 Provide the shop drawings of the seismic restraint systems, the calculations, and the calculation coefficients.
 - .1 The calculation coefficients represent the categories for location, risk, seismic zone, building height, height of installation, and all required parameters listed in the national Construction Code
 - .2 For each electromechanical device, provide:
 - .1 The identification.
 - .2 The manufacturer's name and the model.
 - .3 The physical dimensions.
 - .4 The weight.
 - .5 The location of the center of gravity (indicate whether the location was obtained from the manufacturer of the device or supposed).



- .6 The location and the number of attachment points.
- .7 The location of the attachment points' centers of gravity (when the center of gravity is different from the unit's center of gravity).
- .8 The rotational speed (if applicable).
- .9 The seismic fragility of the internal components of the device.
- .10 The horizontal and vertical force considered in the calculations.
- .3 Anchor bolt calculations indicating:
 - .1 The type of bolts, the manufacturer, and the model.
 - .2 The diameter.
 - .3 The embedment depth in the concrete.
 - .4 The concrete's compressive strength.
 - .5 The minimum spacing between the bolts and the concrete bases' edges.
 - .6 The applied and allowable stresses in shear and in tension.
 - .7 The overturning moments.
 - .8 The component's opposing (righting) moment.
- .4 The types of mechanical seismic restraint systems for each device and indicate the characteristics of the cables and the rigid structural members, as well as the various elements of the seismic restraint system.
- .2 The consultant specializing in seismic control must provide a written document countersigned by the relevant section certifying that the plans, the specifications, the shop drawings, the products supplied, and the installation have been checked by an Engineer specializing in seismic design, and are adequate and compatible with the entire building, while respecting the seismic design standards, and must provide a compliance report.
- .3 Provide the following documents:
 - .1 The operation and maintenance instruction manuals.
 - .2 The plans maintained up to date.

1.8 INSPECTIONS

- .1 After having installed all rigid and flexible restraints and ensured proper operation under standard operating conditions, proceed to the seismic restraint system inspection and repairs.
- .2 The specialized consultant will inspect all seismic restraint system installations it has calculated and provided. Submit a written report signed by the same Engineer who produced the design report including, among other things:
 - .1 The installation errors with the corrective actions to be implemented.
 - .2 The improperly (inappropriately) selected seismic dampers.
 - .3 The other deficiencies that could affect the proper operation of seismic restraint systems with the corrective actions to be implemented.
 - .4 The steps to correct the installations.



- .5 The electromechanical installation's signed certification of compliance with the standards previously listed, to be issued once all defects or errors have been corrected. This report must be delivered to the Consulting Engineer prior to the work acceptance.

Part 2 Product

2.1 VIBRATION ISOLATORS

- .1 General:
 - .1 Characteristics:
 - .1 Types of vibration isolators:
 - .1 Nested
 - .2 Fitted with motion limiter
 - .3 Hangers
 - .4 Stabilizer
 - .2 The model selection is the isolator supplier's responsibility. Choose them for lower frequencies that are susceptible of causing problems.
 - .3 A maximal compression must not damage the spring. Calculate them and select for a compression not exceeding 2/3 of their maximum compression.
 - .4 They must be able to control the oscillations and the lateral forces from all direction, and be stable for a lateral displacement of 10 to 20% of the spring's height.
 - .5 The ratio of the horizontal spring constant to the vertical spring constant must be $1.0 \pm 10\%$ (k_H/k_V).
 - .6 The static deflection in mm is equal to the load divided by the isolator's stiffness constant ($f = F/K$). This deflection must never be less than the one shown in the vibration bases and isolators tables.
 - .7 When the required deflection is less than 5 mm, anti-vibration pads can be used to replace the steel springs.
 - .8 When used to support devices containing a large volume of fluid, they must have motion limiters.
 - .9 In order to control the lateral movement, install stabilizers when required.
 - .10 Location and specifications:
 - .1 See the vibration bases and isolators tables at the end of this section.
 - .2 Construction:
 - .1 Protect the spring with a layer of neoprene or PVC based paint.
 - .2 Housing made of aluminum or plated with zinc chromate.



- .3 Cadmium plated screw fasteners, bolts, nuts, and washers.
 - .4 Leveling device.
 - .5 Weld the springs to a steel base at the lower end and to a steel compression plate at the top.
 - .6 Calculate and choose the dimensions of the plate so that the load does not exceed 690 kN/m². Completely cover the base with a sound-absorbing pad made of 50 durometers embossed neoprene, of a 6.4 mm thickness.
- .3 Nested isolators:
- .1 Comprising one or more springs placed inside an aluminum casing (heat treated aluminum alloy or 345 MPa cast iron), resistant to corrosion.
 - .2 Isolate the upper and lower parts of the housing using neoprene linings designed to minimize the vertical friction.
 - .3 Use this type isolator as little as possible and always after having received the approval.
- .4 Nested isolators with motion limiters:
- .1 Comprising one or more helical springs placed inside a casing made of welded steel parts. The lower part of the rigid casing and the top plate serving as mounting surfaces.
 - .2 Upper and lower parts connected together with locking mechanisms to prevent the device from rising when emptied.
- .5 Anti-vibration pads:
- .1 Made of 30 or 50 durometer neoprene, embossed, 16 mm thick. Stick a 6.4 mm thick galvanized steel plate on both faces.
 - .2 Calculate the dimensions of each pad for an optimal load of 275 kN/m² which corresponds to a 5 mm static deflection.

2.2 BASES

- .1 General:
- .1 This section must provide the directives and the supervision for the installation of all bases.
 - .2 See the details of the different types of bases.
 - .3 Also see the article "VIBRATION ISOLATORS".
 - .4 Locations: see the vibration bases and isolators tables.
- .2 Calculations:
- .1 These calculations comprise for each rotary machine:
 - .1 The machine identification.
 - .2 The manufacturer.
 - .3 The model.
 - .4 The speed.



- .5 The engine power.
 - .6 The rotor's diameter.
 - .7 The weight.
 - .8 The physical dimensions.
 - .9 The type of base.
 - .10 The dimensions of the concrete base.
 - .11 The weight of the concrete base.
 - .12 The base's frame.
 - .13 The type of spring.
 - .14 The positioning of the springs.
 - .15 The positioning of the anchors.
 - .16 The springs' kH/kV ratio.
 - .17 The attenuation percentage of the base in function of the anticipated load.
- .3 Type V – Device installed on springs:
- .1 Install the vibration isolators directly under the device and fix them to the supports of the latter, with stabilizers if required. See the drawings.

2.3 DEVICES WITH VIBRATION ISOLATORS

- .1 The supports must withstand all transitory conditions (in case of seismic event), including:
 - .1 The weight of the devices, the accessories, the thermal insulation, and the internal fluids.
 - .2 The forces imposed by the thermal expansion and contraction effects.
 - .3 The reactions during start-ups and stops.
 - .4 The vibration.
 - .5 In general, other occasional expenses, such as ice, wind and seismic forces.
- .2 These devices must be securely anchored to the building structure to prevent them from slipping or tipping.
- .3 Apply one or more methods, according to the site conditions:
 - .1 Use anti-vibration devices with integrated damping systems.
 - .2 Use separate dampers additionally to anti-vibration devices.
 - .3 Use a damping system constructed from a combination of structural elements and an elastomeric material, with the approval of the Engineer.
- .4 The damping effect achieved by an elastomeric material or other means must be soft and regular so as to prevent high impact loads.
- .5 Seismic restraint systems should not interfere with the vibration isolators. They must only operate in the event of an earthquake and not cause any overturning moment.



- .6 Each device must have at least four flexible seismic dampers in no tension, installed as near as possible to device's corners so as to avoid preventing the vibratory movement of the equipment during operation.
- .7 Each type of seismic damper must have the following characteristics:
 - .1 The non-cemented impact surface must have a high quality elastomeric in place for resetting.
 - .2 The resilient material must be easily accessible for damage inspection and replacement.
 - .3 The assembly must be able to reduce movements in all directions.
 - .4 The dampers must be tested by independent laboratories and be certified by an Engineer registered in this discipline.
 - .5 In general, a maximum spacing of 6 mm between the device and the seismic damper.
- .8 Ventilation systems supported with the vibration isolators:
 - .1 To avoid transmitting the vibrations through the rigid bracing during normal operation, these suspended components will have slack cables made of galvanized steel or stainless steel, see F type seismic dampers.
 - .2 The seismic restraint equipment must have the characteristics described for pipes and ventilation ducts without vibration isolators.

2.4 MANUFACTURER LIST

- .1 Comply with article "PRODUCTS USED FOR TENDERS AND EQUIVALENCES" from section 20 00 10 – mechanical and electrical general instructions.
- .2 Manufacturer list, section 23 05 48:
 - .1 Stiffeners on hanger rods:
 - .1 Mason Industries Inc. and Vibro-Acoustics (Distributions P.G.A.L. Inc.)
 - .2 Power-Strut (Mueller Flow Control)
 - .3 Unistrut (Routleco Inc.)
 - .4 Vibro-Racan, Vibration Mountings & Controls Inc. and Korfund Dynamics Co. Inc. (Racan Carrier).
 - .5 Vibron Ltd, Kinetics Noise Control (The Master Gtoup ltd).
 - .6 Equivalent product approved.
 - .2 Seismic dampers:
 - .1 Mason Industries Inc. and Vibro-Acoustics (Distributions P.G.A.L. Inc.)
 - .2 Vibro-Racan, Vibration Mountings & Controls Inc. and Korfund Dynamics Co. Inc. (Racan Carrier).
 - .3 Vibron Ltd, Kinetics Noise Control (The Master Gtoup ltd).
 - .4 Equivalent product approved.
 - .3 Vibration isolators:
 - .1 Korfund Sampson Ltd



- .2 Mason Industries
- .3 Vibro-Racan (Racan Carrier)
- .4 Vibron Ltd
- .5 Equivalent product approved.
- .4 Bases:
 - .1 Mason Industries
 - .2 Vibro Racan (Racan Carrier)
 - .3 Vibron Ltd
 - .4 Equivalent product approved.

Part 3 Execution

3.1 LOCATIONS

- .1 At locations described in Part 2.

3.2 VIBRATION ISOLATORS

- .1 In general, anchor the vibration isolators onto leveling bases and fix them to the supported devices. Adjust the leveling nuts.

3.3 SEISMIC RESTRAINT SYSTEM INSTALLATION

- .1 All anchoring and fixation points must be able to withstand the same maximum loads as the seismic protection devices.
- .2 Do not weld the seismic braces directly to the supports and the reinforcements that transport the mechanical pipes, ventilation ducts, or electrical conduits.
- .3 For equipment not fitted with attachment points, provide an attachment device or install fixing belts, all approved by an Engineer specialized in seismic design.
- .4 The structural bases of the equipment must be stabilized to prevent the seismic devices from overturning. The installation of equipment on two simple beams, for example, is prohibited.

3.4 SEISMIC ANCHORING

- .1 Check on site that the anchor bolts, the diameters of the inserts (pins), the embedment depth in the concrete, and the length of the welds are in conformance with the drawings submitted and follow the instructions.
- .2 Bolted to the frame all the various equipment that is not isolated against vibration. Check with the division "STRUCTURE" for imposing equipment.
- .3 The holes around the bolts must be a maximum of 1.6 mm larger than bolt's diameter.
- .4 Oblong holes for bolt adjustment is prohibited.



- .5 The anchors in the concrete slabs will have to be distanced from the concrete edges, follow the anchor manufacturer's recommendations, according to the standard ASTM-E488.

3.5 CLEARANCES

- .1 All seismic restraint systems must be checked after the mechanical and electrical systems have been started to ensure that the recommended clearances are obtained. No more than recommended, since the fragility of the unit may be affected. Make adjustments where required. Ensure that the seismic dampers do not cause short circuits at the vibration isolators.
- .2 A clearance of at least 25 mm must be provided between the seismic protection devices and all other service equipment and elements.



VIBRATION BASES AND ISOLATORS CHARACTERISTICS						
Identification		HRU-1	RTU-1	RTU-2	RTU-3	
Localization		See drawings	See drawings	See drawings	See drawings	
Leveling bases						
Bases	Type	V	V	V	V	
	Thickness					
Vibrations isolators	Type spring	X	X	X	X	
	Cushions					
	Flexion (in.)					
Flexibles fittings	Suction					
	Discharge					
Comments		ELM	ELM	ELM	ELM	
<p>Notes :</p> <p>O : open isolator</p> <p>E : nested isolator</p> <p>ELM : nested isolator with a motion limiter</p> <p>S : vibration isolation hangers</p> <p>N : Neoprene pad</p> <p>NSN : Neoprene-steel-neoprene pad</p> <p>SNS : steel -neoprene-steel pad</p> <p>RP : seismic spring</p> <p>ST : with stabilizer</p> <p>VD : see the description in the specifications</p>						

END OF SECTION



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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 000 10 – Mechanical and electrical general instructions.

1.2 REFERENCES

- .1 National Fire Protection Association (NFPA):
 - .1 NFPA-13-2002 – Standard for the Installation of Sprinkler Systems.

1.3 SUBMITTALS

- .1 Data sheets:
 - .1 Submit required data sheets in accordance with section 20 00 10 – Mechanical and electrical general instructions.
 - .2 Submit data sheets for the products specified in this section, including colour code.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packaging, shipping, handling and receiving:
 - .1 Transport, store and handle materials in accordance with section 20 00 10 – Mechanical and electrical general instructions.
 - .2 Transport, store and handle materials in accordance with the manufacturer’s written instructions.

Part 2 Product

2.1 IDENTIFICATION AND REGISTRATION PLATES

- .1 The devices must be fitted with identification plates showing the dimensions, the equipment designation, and all the information normally provided: serial number, voltage, serial number, number of cycles, number of phases, motor power in HP, capacity, manufacturer name, etc.
- .2 The lettering stamped, printed, or engraved on the plates must be perfectly legible. Do not paint the identification plates. When units are insulated, provide openings in the insulation for these plates to be legible. The plates supplied by the manufacturer must not be modified in any way.
- .3 Each unit or device, pump, fan, compressor, breaker, contactor, starter, transformer, and other control point must be clearly identified, according to the application or the specification’s appellations, by a white ebonite plate with black engraved lettering, firmly fixed on or near the device. These plates are supplied and installed by the section providing the device.
- .4 Place the identification plates visibly.
- .5 The plates must have the following minimum dimensions: 90 mm x 40 mm x 2.5 mm minimum thickness.



- .6 The characters must be 25 mm high on important devices.
- .7 Have the list of plates checked before engraving them.

2.2 IDENTIFICATION OF ACCESSES

- .1 The identification of accesses applies to valves, manual dampers, motorized dampers, pressure reducing boxes, control points, electrical boxes, and any other device, instrument, or accessory.
- .2 Each concerned section must identify the access doors on their visible side with self-adhesive labels of 20 mm in diameter, from Avery, and in the colour shown below:
 - .1 Ventilation: black
 - .2 Sprinklers and fire protection: red
 - .3 Controls: brown
 - .4 Electricity: pink
- .3 Provide samples of each colour for verification.
- .4 In ceilings with acoustic panels, each relevant mechanical and electrical section is required to identify the panels serving as accesses with coloured labels on the underside of the reversed tee according to the table above.
- .5 Include the legend in the operations and maintenance manuals.

2.3 IDENTIFICATION OF CONTROLS EQUIPMENT

- .1 By Division 25.
- .2 Devices located outside of a local control panel:
 - .1 Identify the devices with a white ebonite plate and black lettering, glued and screwed to the device or attached to the device such as described in section "VALVE IDENTIFICATION". The numbering must be alphanumeric with 12 mm lettering and must correspond with the numbering from the controls diagrams.
- .3 Devices and accessories installed in the panels:
 - .1 Identify the devices with "P-Touch" adhesive tape, white lettering on black background. The numbering must correspond with the numbering from the controls diagrams.
- .4 Compressed air piping:
 - .1 Piping NPS 1 and larger:
 - .1 Identify the pipe, according to the article "IDENTIFICATION OF PIPING, DUCTS, AND VENTILATION UNITS".
 - .2 Piping NPS ¾ and smaller:
 - .1 Identify the piping such as valves with tags, steel wire, and lead. The tag must indicate the controls, the compressed air, and the operating pressure in kPa.
- .5 Provide samples, as well as the identification list for verification.



2.4 IDENTIFICATION OF STARTERS OTHER THAN THOSE PROVIDED BY DIVISION 26

- .1 Each mechanical section providing their starters must identify them as described in the article "DIVISION 26 ELECTRICAL EQUIPMENT IDENTIFICATION".

2.5 IDENTIFICATION OF PIPING, DUCTS, AND VENTILATION UNITS

- .1 Perform the identification of ventilation ducts after the insulation work is completed.
- .2 Each relevant mechanical section must identify the pipes, the ventilation ducts, and the devices that are part of its installation.
- .3 Identify all apparent ventilation ducts, insulated or not, on the roof. Identify all ventilation units.
- .4 Identify the ducts at all fire dampers.
- .5 For identification purposes, the terms "exposed pipes and exposed ventilation ducts" apply to those located in mechanical rooms and those that are visible.
- .6 In trenches and/or in non-removable suspended ceilings, pipes and ventilation ducts are considered concealed.
- .7 Perform the identification using letters, numbers, and arrows indicating the direction of the flow of liquids, steam, gas, or air.
- .8 Print the numbers, letters, and arrows using rubber stamps and black ink.
- .9 Characters:
 - .1 For piping NPS 2 or smaller, including the insulation, letters and numbers are 25 mm x 6 mm, arrows are 25 mm in height by 150 mm in length.
 - .2 For ducts and piping NPS 2 ½ or larger, including the insulation, letters and numbers are 50 mm x 10 mm, arrows are 25 mm in height by 150 mm in length.
- .10 Ventilation ducts:
 - .1 On the exposed galvanized surfaces of the ventilation units and the ventilation ducts, apply a special primer on a surface forming a perfect rectangle allowing the adhesion of the finishing paint to the galvanized surface. Apply two coats of white paint, then proceed to the identification.
 - .2 Alternatively, stick a 0.22 kg canvas, 300 mm x 300 mm, with fire retardant adhesive and apply the identification.
 - .3 On ventilation ducts thermally insulated on the outside, before applying the two coats of white paint at the point of identification, install a rosin-sized paper, a glued 0.17 kg canvas, and a chemical adhesive ready to receive paint.
- .11 Approval and identification legend:
 - .1 Have the numbers, letters, and arrow characters and the stamps approved. Provide lettering specimens before proceeding to the identification work. It is understood that the characters for the numbers, the letters, and the arrows must be the same for all sections and for the entire project.
 - .2 The identification legend must be in English and French.



.3 Once the legend is established, each section must get approval for the legend of all its identifications before proceeding to its work.

.12 Identification methods:

.1 The identifications are as follows:

- .1 Identify the pipe at each shut-off valve so as to clearly identify its contents.
- .2 At each identification, draw an arrow pointing in the direction of the flow.
- .3 If the flow can be in two directions, draw an arrow with two heads or two parallel arrows with opposite heads.
- .4 Every time a pipe or a duct goes through a wall, floor, or ceiling, identify the pipe or duct on each side with arrows.
- .5 Identify every riser and tee with arrows.
- .6 On a continuous line, identify the pipe and the ducts with arrows every 16 m.

- .1 Safety colour designations: these functional colours attract attention to certain dangers, but cannot substitute adequate accident prevention measures.
- .2 Red: Reserved for fire protection equipment: fire extinguishers and their locations, fire alarms, emergency exits, emergency shut-off switches for dangerous devices.
- .3 Orange: safeguarded for risks of cuts, crushing, or burning, reports the dangerous machine parts, sharp parts, press surfaces, particularly inside the guards.
- .4 Yellow: indicates any danger of collision or falls: sharp or protruding angles, ledges, steps, low beams, hoists, hooks. The visibility of this colour can be accentuated by applying oblique stripes on a black background.
- .5 Green: indicates emergency stations, pharmacies, and first aid stations.
- .6 Blue: draws attention to all equipment that must not be in put into operation because they are defective or under repairs. Also indicates the distribution boxes and the electrical controls.

.7 Reference colours:

Services	Identification legend	Back colours	Secondary identification colours
Water, fire protection	FIRE PROTECTION WATER	Rouge	White
Water, automatic sprinkler	SPRINKLER	Rouge	White
Suction refrigerant (include refrigerant no.)	REFRIG. SUCTION. (NO ...)	Yellow	Black
Ventilation ducts:			
Cold air supply	(NO OF SYST.) COLD SUPPLY	White	None



Services	Identification legend	Back colours	Secondary identification colours
Hot air supply	(NO OF SYST.) HOT AIR SUPPLY	White	None
Return	(NO DU SYST.) RETURN	White	None
Evacuation	((NO OF SYST.) EXHAUST	White	None
New air	(NO OF SYST.) FRESH-AIR	White	None

2.6 OPERATION AND MAINTENANCE MANUALS

- .1 Each section should include in its operation and maintenance manuals:
 - .1 The identification legend for the accesses.
 - .2 The identification legend for the pipes, the ventilation ducts, the ventilation units, and fans must be separate.
 - .3 The identification legend for the valves.
 - .4 The identification legend for the devices.
- .2 Each relevant mechanical section must provide the identification tables of all valves, including: the valve number, the service, liquid, gas, or steam, the sector, the floor, the diameter, the model, the make, and the number of the valve located upstream.
- .3 Each mechanical section should provide a table showing the main valves of each service and for each sector and floor serviced.
- .4 Photocopied table with black characters on a white background, glass framed. The table must be handed to the Owner. Provide ten additional copies of this table.
- .5 The tables mentioned above must be included in the operation and maintenance manuals and be printed in a sufficient number of copies.
- .6 All tables mentioned in previous articles must have the same format.

Part 3 Execution

3.1 IDENTIFICATION PLATES

- .1 Location
 - .1 The plates must clearly identify the devices and/or piping networks and they must be installed in locations where they are highly visible and easy to read from the work floor.
- .2 Spacers
 - .1 On hot and/or heat-insulated surfaces, provide spacers under the identification plates.
- .3 Protection
 - .1 Do not apply paint, insulation, or any covering on the identification plates.



3.2 PLACEMENT OF THE PIPING AND AIR DUCT IDENTIFICATION ELEMENTS

- .1 On long piping in the open areas of the boiler rooms, equipment rooms, and service galleries: at intervals not exceeding 16 m, so that at least one is visible from any point of operating areas or walkways.
- .2 At changes in direction.
- .3 In each small room through which pipes or air ducts pass (at least one element).
- .4 On each side of visual obstacles or where it is difficult to follow the path of the networks.
- .5 On each side of separations, such as walls, floors, or partitions.
- .6 In places where the piping or air ducts are concealed in a shaft, a ceiling space, a sleeve, a service gallery, or any other confined space, at entry and exit points, and near access openings.
- .7 At the starting and ending points of each conduit or duct, and near all pieces of equipment.
- .8 Immediately upstream of the main automatic or manual control valves, otherwise, as close as possible, preferably upstream.
- .9 Such that the identification can be easily read from the normal operating areas and from all easily accessible points.
 - .1 Perpendicularly to the best line of vision possible, taking into consideration the area where the operating personnel usually are, the lighting conditions, the reduced visibility of the colours or legends caused by the accumulation of dust and dirt, and the risk of damage.

END OF SECTION



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Part 1 General

1.1 QUALIFICATION OF TAB PERSONNEL

- .1 Submit names of personnel to perform TAB to the Engineer within ninety (30) days of award of contract.
- .2 Submit documentation confirming staff's qualifications and experience.
- .3 The testing, adjusting, and balancing operations must be performed in accordance with the requirements of standard governing the qualifications of the company and the staff responsible for the work.
- .4 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

1.2 PURPOSE OF TAB

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.
- .2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.3 COORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.4 START-UP

- .1 Notify the Engineer two (2) weeks prior to TAB.
- .2 Only undertake TAB when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows, and other components that may affect results are complete.
 - .2 Installation of sealants, caulking, and weather-stripping is complete.



- .3 Pressure tests, seal tests, and other tests defined in other sections of Division 23 are completed.
- .4 Equipment required for TAB are installed and in good working condition.
- .5 Start-up and verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Clean filters in place.
 - .2 Duct systems clean.
 - .3 Ducts, duct shafts, and plenums including ceilings are airtight, within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Balancing, fire, and smoke dampers are installed and open.
 - .6 Coil fins are combed and clean.
 - .7 Access doors and hatches, installed and closed.
 - .8 Outlets installed, volume control dampers open.

1.5 INSTRUMENTS

- .1 Prior to starting TAB, submit to the Engineer a list of instruments to be used, with their serial numbers.
- .2 Calibrate in accordance with requirements of the most stringent of referenced Standard for applicable system or HVAC system.

Part 2 Product

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 VENTILATION SYSTEMS

- .1 General:
 - .1 Perform tests, measurements and adjustments to:
 - .1 Demonstrate the ventilation systems are airtight.
 - .2 Adjust fans to obtain the specified airflows.
 - .3 Establish quantitative performance of all equipment installed under this section.
 - .4 Adjust quantity of air to terminal equipment.



- .5 Check the adjustment of certain control components.
 - .2 Check installations for compliance with this section's requirements.
 - .3 For each system, establish, measure, and adjust the airflow required to meet the specified quantities.
 - .4 Record and present the results in the form of a report.
 - .5 Before starting TAB, TAB firm must be approved.
 - .6 Before starting TAB, submit an outline of the proposed procedures required to comply with this article and a list of equipment and instruments to be used.
 - .7 The selected firm must, for the duration of the installation work, carry out regular site visits and submit a report indicating corrective measures required in order to adequately proceed with TAB (minimum one visit per month or more often depending on site conditions).
 - .8 Take corrective actions submitted by the retained specialized firm.
 - .9 Supply the equipment and work force required for leak tests.
 - .10 Once ducts are installed, but before ceilings, walls, and insulation are installed, check the airtightness of all seals and the condition of all ducts.
 - .11 Hermetically seal each section undergoing a test and temporarily seal all openings. Run the tests, section by section, on each system, according to the convenience of the location and the established procedure.
- .2 Leak tests:
- .1 Water tests:
 - .1 Fill every horizontal duct susceptible of receiving water during standard operation with 25 mm of water and spray the inside vertical ducts subject to the same conditions, sufficiently to check the seals.
 - .2 This test applies to all sealed ducts requested in this specification, such as fresh air intakes and exhaust air outlets and their plenums, chilled water coil drain pans, heat recovery coils, kitchens hood exhaust, and dishwashers.
 - .3 Provide connections to drains and screwed drain caps at the low points of these ducts.
 - .2 Low pressure ducts:
 - .1 Conduct 500 Pa static pressure test on the ducts.
 - .2 Maximum allowable loss:
 - .1 For all ducts, as per "Leakage Class 6" from HVAC Air Duct Leakage Test Manual, second edition, 2012, for each section tested, maximum leakage of 0.48 L/s/m² of duct wall.
 - .2 For overall system, the sum of the leakage must not exceed 3% of the fan(s) airflow.
 - .3 Portable test equipment to include, among other things, a radial blade fan, ventilation duct with calibrated orifice and a U-tube manometer.
 - .4 The orifice curve must have been calibrated by an independent laboratory.



- .5 Plenums made of acoustic panels:
 - .1 Subject the ventilation plenums constructed of acoustic panels to a static pressure of 2500 Pa. All seals must be airtight.
- .3 Adjustment precision:
 - .1 Do TAB to the following tolerances of the design values:
 - .1 Airflow adjustment:
 - .1 At terminal equipment: 10% ±
 - .2 In main ducts: 5% ±
 - .2 Differential pressure:
 - .1 Positive pressure zones:
 - .1 Supply: 0 to +10%
 - .2 Exhaust and return: 0 to -10%
 - .2 Negative pressure zones:
 - .1 Supply: 0 to -10%
 - .2 Exhaust and return: 0 to +10%
- .4 General procedure:
 - .1 Equipment and system verification:
 - .1 Once leak tests are performed and results are satisfactory, proceed with TAB of the equipment and systems as follows:
 - .1 Start up fans (supply, return, exhaust).
 - .2 Verify:
 - .1 Voltage and amperage of motors to avoid overload.
 - .2 Motor and fan rotation.
 - .3 Differential pressure switch (DPD) operation.
 - .4 Position of motorized dampers.
 - .5 Temperature control of chilled water, hot water or glycol with controls Contractor.
 - .6 Any obvious air leaks.
 - .2 Develop a ventilation system diagram which identifies all devices and equipment that will be used for testing, adjusting and/or balancing flow. Also, identify all locations where measurements will be taken to ensure that sufficient connections are provided on the ductwork. Use this identification as a reference in the balancing report. Ensure that there is no short-circuiting in the ductwork system.
 - .2 Airflow at main branches:
 - .1 Using a Pitot tube, measure flow rate in the main branches.
 - .2 If required, adjust fan speed to obtain design airflow.
 - .3 Check motor power and fan speed to ensure that operation is within critical limits.



- .4 Adjust balancing dampers at main branches until design airflow has been reached.
- .5 Refer to each type of system described in this section.
- .3 Minimum outside air:
 - .1 Adjust static pressure in unit's mixing plenum to zero or slightly negative, following the requirements of the site conditions, when the return damper is open to its maximum position. Balancing dampers installed before the mixing plenum is used to set the static pressure in the plenum.
 - .2 Adjust dampers to set the outside air to a maximum of 105% of design requirement.
- .4 System adjustment for balancing work:
 - .1 Adjust dampers for minimum outside air.
 - .2 Dual-duct system and constant volume multizone, ensure the proper airflow through the cooling coils and maintain it throughout the adjustments.
- .5 Ventilation TAB report:
 - .1 For each balanced system, the balancing report shall include, as a minimum, the following information:
 - .1 Dated reports:
 - .1 On the report cover page, and on all pages of the report, clearly indicate dates when measurements and adjustments, at all stages (preliminary, corrections, and revisions) were taken.
 - .2 Design data:
 - .1 Airflows:
 - .1 Supply
 - .2 Return
 - .3 Exhaust
 - .2 Fan static pressure.
 - .3 Motor power (HP).
 - .4 Brake horsepower (BHP).
 - .5 Fan speed (rpm).
 - .6 Minimum percentage of outside air.
 - .3 Characteristics of installed equipment:
 - .1 Manufacturer (model and serial no.)
 - .2 Unit size and dimensions.
 - .3 Arrangement.
 - .4 Construction class.
 - .5 Motor nameplate:
 - .1 Power



- .2 Voltage
- .3 Number of phases
- .4 Frequency
- .5 FLA
- .6 Rotation speed
- .4 Tests at main:
 - .1 Fan speed.
 - .2 Power readings at the motor terminals (voltage and current on each phase).
 - .3 Differential pressure across each system component (coils, filters, etc.).
 - .4 Pressures at suction and discharge of the fan.
 - .5 Measured airflow.
 - .6 Fan curve indicating the operating point, based on measurements.
 - .7 Pressures measured with pressure sensors supplied and installed by the Division 25.
- .5 Test at the terminal devices:
 - .1 Identification of the terminal device by ID number and location.
 - .2 Type of terminal device:
 - .1 Manufacturer
 - .2 Model
 - .3 Dimensions
 - .4 Output factor
 - .3 Design airflow and air speed.
 - .4 Airflow and air speed results.
 - .5 Adjustment, where applicable, of airflow pattern diffuser.
- .6 Additional information:
 - .1 Fans:
 - .1 Dimensions and number of belts.
 - .2 Dimensions of pulleys.
 - .3 Position of adjustable pulleys.
 - .4 Full load motor speed.
 - .5 Overload protection adjustment.
 - .6 Filter type, initial pressure loss at full flow, final pressure loss for filter replacement.
 - .7 Air speed readings at coil faces, where possible.
 - .8 Airflow control device type.
 - .2 Air distribution system:



- .1 Pressure reading at main branches.
 - .2 Pressure reading in ceiling spaces.
 - .3 Pressure difference between building interior and exterior when building is operating at minimum and maximum outside air.
 - .4 List of Pitot tube tests with their results.
 - .5 List of airflows measured at each grille and diffuser. Indicate the required airflows.
- .6 Acceptable Contractors:
- .1 Comply with article "MANUFACTURER LIST" from Section 20 00 10 - Mechanical and electrical general instructions.

END OF SECTION



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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.
- .2 Section 23 31 13.01 – Metal air ducts – Low pressure to 500 Pa.

1.2 REFERENCES

- .1 Definitions:
 - .1 For the purposes of this section, the following definitions apply:
 - .1 In this section, the term "insulation" and "thermal insulation" will be considered synonymous.
 - .2 "Concealed" elements: insulated mechanical services and equipment located above suspended ceilings or in inaccessible chases and furred-in spaces.
 - .3 "Exposed" elements: elements that are not concealed (as previously defined).
 - .4 Insulation system: systems consisting in particular of the insulation itself, the fasteners, jackets and other accessories.
 - .2 TIAC acronyms:
 - .1 CRD: Code Round Ductwork.
 - .2 CRF: Code Rectangular Finish.

1.3 SUBMITTALS

- .1 Submit the documents required in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Data sheets:
 - .1 Submit required data sheets, including the manufacturer's documentation for the insulation. Data sheets must include product characteristics, performance criteria, dimensions, limits and finish.
 - .1 A description of the devices and materials, including the manufacturer name, type, model, year of fabrication, the strength or the flow.
 - .2 Details relevant to the operation, usage, and maintenance of the devices and materials.
 - .3 A list of recommend spare parts.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Transport, store and handle materials in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.



1.5 MANUFACTURER'S INSTRUCTIONS

- .1 Submit the manufacturers' instructions for the installation of the insulating materials.
- .2 The instructions must specify the methods to be used, as well as the required execution quality, particularly in regards to the joints and the overlaps.

1.6 QUALIFICATIONS OF THE WORKFORCE

- .1 The installer must be an expert in the field, with at least three years of proven and successful experience in the installation of work in this size, type and scope of work, and possess the qualifications required.

1.7 SCOPE OF THE WORK

- .1 The work generally includes, but is not limited to: labor, supply and installation of all materials and equipment necessary for the insulation work shown on the drawings and in the specification for ventilation, and air conditioning.
- .2 Consult the drawings and the specification of all mechanical work.

1.8 INCLUSIVE PRICE

- .1 Provide an overall fixed price with the tender, covering all the work in section 23 07 13.

Part 2 Product

2.1 FIRE AND SMOKE RATING

- .1 To ASTM E84, ASTM E136 and UL 723.
 - .1 Maximum flame spread rating: 25
 - .2 Maximum smoke developed rating: 50

2.2 TYPE B INSULATION

- .1 Elastomeric cellular thermal insulation flexible sheet, or roll form, according to the application.
- .2 Maximum thermal conductivity "k": 0.039 W/m.°C at 32°C.

2.3 TYPE D INSULATION

- .1 Rigid mineral fiberboard bonded by a thermosetting resin with integrated FSK vapor barrier, with a density of 36 kg/m³, maximum service temperature of 232°C.
- .2 Maximum thermal conductivity "k": 0.035 W/m.°C at 24°C.

2.4 ADHESIVES

- .1 Compliant with the standards ASTM-E-84-76.
- .2 Use to secure the canvas, the tabs and all-service jackets, seal the joints, and secure the insulation to the metal surfaces.



2.5 JACKETS

- .1 Aluminum jackets:
 - .1 Aluminum jacketing compliant with the standards ASTM-B209, to be used on exposed elements located outdoors and in mechanical rooms, when specified.
 - .2 Corrugated or embossed aluminum alloy jacketing, 0.4 mm thick, with longitudinal S joints with 50 mm wide overlapping ends, factory installed internal protective covering and also featuring an aluminum alloy joint cover with mechanical fasteners. Vapor barrier membrane.
 - .3 Jackets for connecting to matrix elements made of 0.4 mm thick aluminum alloy with factory installed internal protective covering.

2.6 RIGID SUPPORT MATERIAL

- .1 Characteristics:
 - .1 Permeability: 0.00 perm/cm.
 - .2 Non-combustible.
 - .3 Compressive strength: 7.0 kg/cm²
 - .4 Average density: 128 kg/m³
 - .5 Coefficient of linear thermal expansion: $8.6 \times 10^{-8}/^{\circ}\text{C}$
 - .6 Maximum operating temperature: 482°C
 - .7 Thermal conductivity: 0.48 W/m.°C.
 - .8 Foamglas from Pittsburg Corning.

2.7 MANUFACTURER LIST

- .1 Comply with "MANUFACTURER LIST" from section 20 00 10.
- .2 List of manufacturers, section 23 07 13:
 - .1 Type B thermal insulation:
 - .1 Armacell AP from Armaflex with adhesive 520 and WB finish.
 - .2 Rubatex Insul-Tube 180 with adhesive R-373 from Nomaco RBX.
 - .3 Equivalent approved product.
 - .2 Type D thermal insulation:
 - .1 Johns Manville: Spin-Glas 814, type II with a FSK vapor barrier.
 - .2 Knauf: panel for air ducts with FSK.
 - .3 Owens-Corning Fiberglas: AF530 with FRK.
 - .4 Equivalent approved product.
 - .3 Adhesives:
 - .1 To secure canvas: Bakor No. 120-18, Foster No. 120-09, POL-R from Nadeau, Childers no. CP-52 or 81-42W.
 - .2 For sealing joints, tabs, and multi-purpose jackets, vapor barrier, flame retardant, and colorless adhesive: Bakor No. 230-06, Foster no. 85-15, or Childers no. CP85.



- .3 To stick the insulation to the metal surfaces: Bakor No 230-38, Foster No. 85-23, Childers no. CP89, or Mulco no. 89.
- .4 Equivalent approved product.
- .4 Mechanical Fasteners:
 - .1 Welding pins, pin fasteners, Duro-Dyne.
 - .2 Equivalent approved product.
- .5 Aluminum jackets:
 - .1 Thermoclad Plus jacketing with anti-corrosion protection, Polysurlin type, Stucco finish.
 - .2 Equivalent approved product.
- .6 Thermal insulation protection support:
 - .1 Insulgard (Master Group)
 - .2 Steel support (Dispro Inc.)
 - .3 Equivalent approved product.

Part 3 Execution

3.1 PREPARATORY WORK

- .1 Only install the insulation once the system has been tested and the results have been certified by the responsible authority who has witnessed the test.
- .2 Ensure surfaces to be covered with insulation or with a finish coating are clean, dry, and free of foreign matter.

3.2 INSTALLATION METHOD

- .1 The insulation work is considered as:
 - .1 Concealed: pipes and ducts are installed in suspended ceilings, walls, shafts, and floors.
 - .2 Exposed: exposed pipes and ducts must be insulated on all sides, even on non-visible sides against walls or ceilings.
 - .3 Ducts and pipes in mechanical rooms, tunnels, and service spaces are considered exposed.
- .2 Install insulation once all tests are complete and accepted, and air inside the building is dry enough and in conditions conforming to the manufacturers standards. Install insulation continuously, without interruption.
- .3 All equipment, piping, and ducts must be clean and dry before installing the insulation.
- .4 Consult the other mechanical sections to determine the type of ducts, piping, fittings, valves, and other accessories installed by other Contractors.
- .5 This section is responsible for the proper installation of insulation in the locations specified.
- .6 When insulation is likely to be damaged by impact or crushing near the access doors, doors, access panels, corridors, etc., protect with a 1.3 mm galvanized steel sleeve (18 gauge).



3.3 APPLICATION

- .1 See section "DUCTWORK INSULATION SCHEDULE" for thicknesses.
 - .1 Outside air ducts and plenums (-40°C to ambient):
 - .1 As in "rigid insulation" above, but first applying a layer of rigid insulation without vapor barrier before applying the layer of rigid insulation with vapor barrier. All joints must be staggered.
 - .2 Exceptions:
 - .1 Unless otherwise stated, when an internal duct liner is specified, external insulation is not required.
 - .2 For external applications of rigid insulation, where mechanical fasteners are not suitable because of a lack of space, it is possible to substitute them for string or wire, insulation adhesive, or other suitable fastening methods.
 - .2 Finishes:
 - .1 Outdoor:
 - .1 Rectangular and round ducts:
 - .1 Apply vapor barrier tape on all vapor barrier joints and breaks and all corners of mixed temperature and cold ducts.
 - .2 Over insulated surface, apply an embossed aluminum jacket fixed with rivets. All joints to be sealed.
 - .3 On insulation surfaces, apply a coat (minimum 1 liter/1.5 m²) of weatherproof coating. While it is still wet, impregnate the reinforcing membrane with a final coat (minimum 1 liter/1.5 m²) of weatherproof coating.

3.4 DUCTWORK INSULATION SCHEDULE

- .1 General:
 - .1 No insulation is required for:
 - .1 Ducts fitted with acoustic insulation serving as thermal insulation, unless otherwise indicated.
 - .2 Acoustic plenums (boxes).
- .2 Rooftop systems nos. HRU-1 / RTU-1 / RTU-2 / RTU-3 are included in the scope of work.
- .3 Ducts outside the building:
 - .1 Insulation: type D
 - .2 Thickness: 100 mm, in two 50 mm layers and with overlapping joints.
 - .3 Finishes: cover insulation with a weatherproofing protection described in the article "APPLICATIONS", section "Finishes", and sub-paragraph "Exterior".

END OF SECTION



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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.
- .2 Section 23 33 00 – Air duct accessories.

1.2 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).
- .2 ASTM International:
 - .1 ASTM A635/A635M-09b – Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements.
 - .2 ASTM A653/A653M-11 – Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 National Fire Protection Agency Association (NFPA):
 - .1 NFPA 90A-12 – Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-12 – Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
 - .1 SMACNA HVAC – Duct Construction Standards - Metal and Flexible, 2005.
 - .2 SMACNA HVAC – Air Duct Leakage Test Manual, 2012.
 - .3 IAQ – Guideline for Occupied Buildings Under Construction 2007.

1.3 SUBMITTALS

- .1 Submit documents in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Product data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3 Certificates:
 - .1 Submit certificates signed by the manufacturer certifying that the products and materials comply with the specified performance and physical requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit all document/elements required, in accordance with section 20 00 10 – Mechanical and electrical general instructions.



- .2 Operation and maintenance data (O&M): provide instructions with respect to the operation and maintenance, to be incorporated into the O&M manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Transport, store and handle hazardous materials in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Shipping and receiving: deliver material to site in the original packaging, which must bear the name and address of the manufacturer.

Part 2 Product

2.1 GENERAL

- .1 Unless otherwise specified, manufacture the ducts in galvanized steel. If the ducts are made of aluminum, use aluminum sheets with a thickness corresponding to the following table:

Galvanized steel:						
– CAL US	26	24	22	20	18	16
– mm	0.551	0.701	0.853	1.006	1.311	1.613
Aluminum:						
– CAL B & S	24	22	20	18	16	14
– mm	0.508	0.635	0.813	1.016	1.295	1.626

- .2 For all cases, the faces of each duct section will have the same thickness. The thickness of the sheet and the dimensions of the transverse seals and the reinforcements are determined by the dimensions of the largest side. Visibly mark the caliber of the sheet on the outer face of the duct for inspection purposes.
- .3 To ensure the rigidity to the ducts, the sheet will be marked with transverse ribs (stop beads) when manufacturing the pipes. The spacing between the ribs is 300 mm at most. The method of marking two diagonal plies (cross breaking) on all flat surfaces 200 mm and more in width is also acceptable. For either method, the sheet gauge required will be the same.
- .4 In the ducts with dimensions having a greater ratio than 4 to 1, install a sheet division in the center of the longest dimension.
- .5 For energy saving needs, seal the joints of ducts conveying treated air.
- .6 At the locations shown in the drawings, block the ends of the ducts for future connections. Use galvanized steel sheet metal of the same gauge as the duct. These caps must be airtight and withstand the static pressures of the relevant systems.
- .7 Ducts exiting service shafts: installed inside the shaft with a collar securely fastened to the duct and to the shaft wall. Seal the joints.
- .8 Definitions:



- .1 Low pressure ducts:
 - .1 Ducts with a static pressure less than 500 Pa and an air velocity below 610 m/min.
 - .2 Treated air ducts:
 - .1 Ducts supplying heated or conditioned air.
- .9 For each of the types of joint described in this section, provide samples and drawings showing the construction details, as well as the materials used.
- .10 Before starting the installation of any ducts, demonstrate with tested samples that the specification requirements are met.

2.2 LOW PRESSURE DUCTS

- .1 Ducts:
 - .1 For the sheet thickness, the types of joints, and the reinforcements for rectangular, round, and oval ducts, see the details in the drawings.
 - .2 Connections:
 - .1 All branch connections must have 45° angle lateral outlets, 150 mm in length.
 - .2 For any branch connections serving a supply grille placed within 600 mm of the main duct and any other branch connected at right angles without adaptors, install "extractor" type guide blades with adjustment rod and lock screw inside or outside the duct, depending on the ceiling type. The extractor must be able to completely close off the branch. If the air speeds are greater than 365 m/min., it must be manufactured to withstand these speeds.
 - .3 For the air supply terminal units and the diffusers, when connected by a flexible duct with adjustable damper, as well as for connecting a duct to a plenum, see the details in the drawings.
 - .3 Joints:
 - .1 Rectangular ducts:
 - .1 All corners of tee joints will be sealed using butyl tape placed over the joint and held in place by the cover flap of the two metal strips. See details in the drawings.
 - .4 Access doors:
 - .1 See details on the drawings.

2.3 PROTECTIVE PAINT

- .1 When a steel sheet's galvanization is damaged by electric welding or some other act, apply two layers of cold galvanizing compound containing a maximum of 221 g/L of VOCs and leaving a dry film of 92% zinc. This compound will also be applied to protect any metal surface (galvanized steel, carbon steel, cast iron, and aluminum, when required). Similar to the compound ZRC-221, matte gray finish.



- .2 Use two coats of paint (such as epoxy-based) for the protection of galvanized steel sheet for certain special systems described in paragraph "Locations" above. Apply these paint layers after degreasing.

2.4 MANUFACTURER LIST

- .1 Comply with the article "MANUFACTURER LIST" in section 20 00 10 – Mechanical and electrical general instructions.
- .2 List of manufacturers, section 23 31 13.01:
 - .1 Rigid ducts:
 - .1 Alcan (aluminum)
 - .2 Algoma Steel Inc.
 - .3 Dofasco
 - .4 Stelco
 - .5 Or approved equivalent
 - .2 Sealant (less than 250 g/l of VOCs):
 - .1 Duro-Dyne (DDS-181)
 - .2 Hardcast Carlisle (Duct-Seal 321)
 - .3 Trans-Continental Equipment Ltd (Multipurpose MP)
 - .4 Or approved equivalent
 - .3 Tape:
 - .1 Duro-Dyne (fibre glass weave FT-2)
 - .2 Trans-Continental Equipment Ltd (Simple Seal and Simple Tape)
 - .3 Flexmaster (Duct Bond)
 - .4 Hardcast Carlisle (Foil Grip)
 - .5 Or approved equivalent
 - .4 Gaskets:
 - .1 Hardcast Carlisle (Flange Gasket 1902)
 - .2 3M Ltd (LC-105 Gaskets)
 - .3 Or approved equivalent
 - .5 Resilient sealant:
 - .1 Minnesota Mining Mfg. from Canada (3M)
 - .2 Tremco
 - .3 Or approved equivalent
 - .6 Protective paint:
 - .1 Sico (Corostop, Crown Diamond)
 - .2 ZRC Products Co. (Kerry Industries Ltd)
 - .3 Or approved equivalent
 - .7 Bolts and anchors:
 - .1 Hilti



- .2 Phillips Red-Head
- .3 Ucan
- .4 Or approved equivalent

Part 3 Execution

3.1 SUPPORTS AND ANCHORS

- .1 General:
 - .1 Adequately support all ducts, equipment, and devices to the structure. These supports include the entire steel structure, the steel beams, the structural irons, the angle irons, the steel rods, the steel plates, the supports from specialized manufacturers and other accessories necessary for the work, and all drilling, anchoring, and welding work required.
 - .2 Prior to the manufacturing and the installation, provide shop drawings of all types of supports.
- .2 Support rods:
 - .1 Mild steel rods, diameter according to the table on drawings.
- .3 Horizontal ducts:
 - .1 General:
 - .1 Securely support the ducts to the structural frame by means of rods and angles.
 - .2 Firmly affix the steel rods used to secure the supports to the concrete slabs or the steel frame.
 - .3 Coat all support elements with a layer of aluminium-based paint.
 - .4 Install additional hangers at every bend, every change of direction, the connections fittings, and any additional steel required to support the pipes in the shafts.

3.2 ELBOWS

- .1 Rectangular ducts:
 - .1 Wherever pipes change direction with an average radius smaller than 1.5 times the dimension of the pipe, install directional vents arranged proportionately to ensure a pressure loss that is not greater than that caused by a change in direction respecting the ratio $R/D = 1.5$. For square elbows, install double-walled vents, with low-loss blades. Submit manufacturing details, performance details, and samples.

3.3 SECTION CHANGE

- .1 The section changes must have a maximum angle of 15°.
- .2 Install ducts as straight as possible.



- .3 When there is an obstruction caused by piping and it is impossible to relocate the conduit or the pipe, install a contoured envelope around the pipe passing through the ventilation duct. Install an access door for visual inspection.
- .4 If the obstruction is greater than 10% of the duct's section, proportionally increase the dimensions of the duct in order to maintain the effective area.
- .5 For circular ducts, use prefabricated transformer sections in medium and high-pressure systems, to allow maximum static regain.

3.4 LEAK TIGHTNESS OF OPENINGS

- .1 Perform the sealing work for the openings required through the slabs and the walls for the passage of ducts and pipes supplying the diffusers or others.

3.5 ACCESS AND INSPECTION DOORS

- .1 Provide access doors at the locations indicated on the drawings and where required.
- .2 Provide inspection doors of 450 mm x 450 mm or of equivalent dimensions, depending on the dimensions of the duct (unless otherwise indicated), close to each motorized or manual damper, control instrument, fire damper, combustion product analyzer, humidifier, intake or exhaust motor, upstream and downstream of each coil and other equipment.
- .3 Place the doors for easy access.
- .4 Reinforce the opening and align the doors. Seal the doors using a permanently installed flexible rubber seal (foam rubber not accepted).
- .5 In insulated walls construct doors out of a double panel with mineral fibre filler between the two panels of a thickness equivalent to the wall insulation.

3.6 GROUNDING

- .1 Ensure the complete grounding of all ventilation systems, units, ducts, etc., by a braid-shaped conductor made of stranded tinned copper and end each extremity with flat fixing rings electrically connecting the ducts and the units on each side of the jacketing joints. Conductors similar to the cables manufactured by Continental Cordage Corporation (Anixter Canada Inc.).

END OF SECTION



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- 1.4 CLOSEOUT SUBMITTALS
- 1.5 DELIVERY, STORAGE AND HANDLING

PART 2 PRODUCT

- 2.1 GENERAL
- 2.2 OPENINGS FOR AIR VELOCITY AND AIR TEMPERATURE READINGS
- 2.3 ACCESS DOORS
- 2.4 MANUFACTURER LIST



Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general requirements.
- .2 Section 23 31 13.01 – Metal ducts – Low pressure to 500 Pa.

1.2 REFERENCES

- .1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
 - .1 SMACNA – HVAC Duct Construction Standards – Metal and Flexible, 2005.

1.3 SUBMITTALS

- .1 Submit documents in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Product data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3 Shop drawings:
 - .1 Shop drawings must include the seal and signature of a professional Engineer.
- .4 Certificates:
 - .1 Submit certificates signed by the manufacturer certifying that the products and materials comply with the specified performance and physical requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit all document/elements required, in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Operation and maintenance data (O&M): provide instructions with respect to the operation and maintenance, to be incorporated into the O&M manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Transport, store and handle hazardous materials in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Shipping and receiving: deliver material to site in the original packaging, which must bear the name and address of the manufacturer.

Part 2 Product

2.1 GENERAL

- .1 The accessories must be manufactured according to the SMACNA HVAC Duct Construction Standard.



2.2 OPENINGS FOR AIR VELOCITY AND AIR TEMPERATURE READINGS

- .1 On the insulated ducts, provide openings for instrument ports, with neoprene handles and caps held by chains, for air velocity readings. Install the accesses downstream from a long straight duct with constant section, Duro-Dyne no. IP-1 or IP-2.
- .2 On the ducts without insulation and at low velocity, we can use the model IP-4 with screw cap, Duro-Dyne no. IP-4.
- .3 Coordination:
 - .1 To avoid any misunderstanding or error, the location of the openings should be carefully coordinated with the firm responsible for balancing the systems.

2.3 ACCESS DOORS

- .1 Non-insulated ducts: double-walled doors (sandwich panels), the same material as used for the ducts, but of the next largest thickness (not be thinner than 0.6 mm), with angle iron frame.
- .2 Insulated ducts: double-walled doors (sandwich panels), the same material as used for the ducts, but of the next largest thickness (not be thinner than 0.6 mm), with angle iron frame and rigid insulation, fiberglass, 25 mm thick.
- .3 Seals: neoprene.
- .4 Hardware parts:
 - .1 Doors measuring up to 300 mm wide: two (2) latches for the frame.
 - .2 Doors measuring between 301 mm and 450 mm wide: four (4) latches for the frame.
 - .3 Doors measuring between 451 mm and 1000 mm wide: a piano hinge and at least two (2) latches for the frame.
 - .4 Doors measuring over 1000 mm side: a piano hinge and two (2) handles operable from the inside and from the outside.
 - .5 Device to hold the open position.

2.4 MANUFACTURER LIST

- .1 Comply with article "PRODUCTS USED FOR TENDERS AND EQUIVALENCES" from section 20 00 10.
- .2 List of manufacturers, section 23 33 00:
 - .1 Openings for air velocity and air temperature readings:
 - .1 Duro-Dyne
 - .2 Lawson Taylor Ltd
 - .3 Or approved equivalent

END OF SECTION



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PART 2 PRODUCT

- 2.1 GENERAL
- 2.2 CENTRIFUGAL FANS
- 2.3 COUPLINGS
- 2.4 LUBRICATORS
- 2.5 MANUFACTURER LIST

PART 3 EXECUTION

- 3.1 GENERAL
- 3.2 OIL AND GREASE



Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.

1.2 REFERENCES

- .1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA):
 - .1 ANSI/AMCA – Standard 99-2010, Standards Handbook.
 - .2 ANSI/AMCA – Standard 210-2007/(ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
 - .3 ANSI/AMCA – Standard 300-2008, Reverberant Room Method for Sound Testing of Fans.
 - .4 ANSI/AMCA – Standard 301-1990, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .2 The Master Painters Institute (MPI):
 - .1 Architectural Painting Specification Manual – latest edition.
 - .1 MPI no. 18 – Primer, Zinc Rich, Organic.

1.3 SUBMITTALS

- .1 Submit documents in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Product data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3 Certificates:
 - .1 Submit certificates signed by the manufacturer certifying that the products and materials comply with the specified performance and physical requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit all document/elements required, in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Operation and maintenance data (O&M): provide instructions with respect to the operation and maintenance, to be incorporated into the O&M manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Transport, store and handle hazardous materials in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Shipping and receiving: deliver material to site in the original packaging, which must bear the name and address of the manufacturer.



Part 2 Product

2.1 GENERAL

- .1 For specifications, see the fan tables.
- .2 The construction of the fans, the diameter of the shaft, the base dimensions, the angle irons, the gauge of the sheet metal, etc., must meet the requirements of the Air Moving & Conditioning Association (AMCA).
- .3 Self-aligning precision ball bearings, submerged in the grease reservoir of a pillow block bearing, securely supported. Resistant to the suction of the lubricant by the air located in the air intake. Install them at the ends of the shaft even if there are several wheels on the same shaft in order to be able to easily replace them without removing the drive shaft. Designed for heavy duty service and must have an average life of 200,000 h at maximum rotational speed of the fan class, according to ANSI L-50 from AFMBA.
- .4 Statically and dynamically balance the wheels of all fans. Particular attention should be paid to balancing the variable speed fans.
- .5 Paint the fans with a coat of primer.
- .6 For each fan:
 - .1 Provide the performance curves certified by the manufacturer for the specified operating conditions.
 - .2 Provide a curve indicating the air flow variations, in function of the air flow control system.
 - .3 Provide shop drawings including a description of the operating conditions.
 - .4 Provide the noise data, in accordance with the standard AMCA 300.
- .7 If the fans installed are not compliant with the requirements, submit them to tests, in accordance with the AMCA requirements, and if necessary, replace them. The replacement, if necessary, will be considered part of this section's work, at no additional charge.
- .8 Parallel operation:
 - .1 For fans installed in a common plenum and operating in parallel, supply and install a backdraft damper at the output of each of the fans.
- .9 See section 23 05 13 – Common motor requirements for HVAC equipment.

2.2 CENTRIFUGAL FANS

- .1 Cold-rolled steel housing, reinforced to eliminate all vibration, can be disassembled into two or more parts when the fan wheel is larger than 1016 mm in diameter, flanges suitable for connecting and fastening the ducts, air inlets with profiled cones.
- .2 Steel wheel with airfoil blades curved backwards or forwards, as indicated. Provide an identification plate indicating the diameter and the width of the wheel.
- .3 V-belt drive.



- .4 For drive force and base, see section 23 05 13 – Common motor requirements for HVAC equipment. Mount the motors on the adjustment rails permitting movement in both directions. Install the rails on a common metal base for the fan and the motor. When installed on the centrifugal fan, support the motor with the aid of a reinforced housing part of the fan.

2.3 COUPLINGS

- .1 Direct:
 - .1 General:
 - .1 Fan wheel with width and diameter adjusted when required to meet specified characteristics.
 - .2 When the fan speed listed in the tables is less than the speed of the motor, this means that the fan can operate at a higher air flow rate and static pressure when the latter is at the speed of the motor.
 - .2 The fan's maximum characteristics can be determined as follows:
$$cfm_{\max} = \left[\frac{rpm_{\text{mot}}}{rpm_{\text{vent}}} \right] \times cfm_{\text{vent}} \qquad PS_{\max} = \left[\frac{rpm_{\text{mot}}}{rpm_{\text{vent}}} \right]^2 \times PS_{\text{vent}}$$
 - .1 Fan power at maximum characteristics must not exceed motor's power.
 - .2 The maximum speed of the fan class must be at least 10% above the motor's rated speed.
 - .3 Provide with the shop drawings, the operating characteristics and the performance curves for specified and maximum conditions.
 - .3 Directly to the motor:
 - .1 Aluminum wheel with steel hub, TEFC motor type with cast iron housing.
 - .4 Direct with flexible fittings:
 - .1 Coupling type with cord or rough flexible membrane. Do not use the type of couplings with dowel pins or rubber sleeves.
- .2 With belts:
 - .1 Unless otherwise indicated, connect the fans to the motors with V-belts, with a minimum force of 150% of the motor's starting torque. Pay special attention to the type of motor connected.
 - .2 Multigroove V-belt pulleys. Fan pulley with fixed diameter. For motors of 7.5 kW (10 HP) or more, fixed diameter drive pulley. In these cases, provide an additional set of pulleys for the adjustment of each system.
 - .3 The variable diameter pulleys must allow a variation of 10% more or less than the rated speed.
 - .4 Statically and dynamically balance all pulleys. Use at least two belts to drive units having motors exceeding 0.38 kW (½ HP) or for units having fan wheels with a diameter of 406 mm or larger.
 - .5 Use adjustable engine supports so as to maintain a proper tension in the belts.



2.4 LUBRICATORS

- .1 For motors and fans with ball bearings, fit the equipment with pressure lubricators. Choose lubricators of the same type and from the same manufacturer.
- .2 For bearings located within a plenum, a duct, or poorly accessible areas, extend the grease cups outside the plenum or the duct, drive side, by means of copper tubes with seals and grease fitting (Zerk fitting).

2.5 MANUFACTURER LIST

- .1 Comply with article "PRODUCTS USED FOR TENDERS AND EQUIVALENCES" from section 20 00 10.
- .2 List of manufacturers, section 23 34 00:
 - .1 Centrifugal fans:
 - .1 Barry Blowers
 - .2 Chicago Blower (Q.A.T.)
 - .3 New-York Blower
 - .4 Northern Blower
 - .5 Approved equivalent product
 - .2 Bearings:
 - .1 Link Belts
 - .2 Seal Master
 - .3 SKF
 - .4 Approved equivalent product

Part 3 Execution

3.1 GENERAL

- .1 Install the fans as shown in the drawings.
- .2 Take the required precautions to get air movement evenly distributed at the entrance and the exit.
- .3 The installation equipment for range hood exhaust must comply with the standard NFPA-96.

3.2 OIL AND GREASE

- .1 For each device requiring oiling or greasing, provide and attach to the device a metal plate bearing an engraved inscription indicating the manufacturer's recommendations:
 - .1 The quality of oil or grease required.
 - .2 The frequency of oiling or greasing.
- .2 Lubricate the bearings of fans and the motors, as recommended by the manufacturer and the AMCA.



FAN CHARACTERISTICS																										
Identification	VA-01	VE-01																								
Location	HRU-1	HRU-1																								
Manufacturer																										
Model																										
Arrangement																										
Build Class																										
Rotation																										
Suppression																										
Airflow (cfm)	2 400	2 400																								
Static pressure (in wg)																										
rpm	-	-																								
O.S. (ft/s)	2062	2597																								
Motor	HP	3	2																							
	rpm	1750	1750																							
	Volt/Phase	415/3	415/3																							
	Position																									
Notes – Accessories	VP or TC	VP or TC																								
<p><u>Notes:</u></p> <table> <tr> <td>SD: see drawing</td> <td>PL: protective layer</td> </tr> <tr> <td>DD: direct drive</td> <td>TI: thermal insulation</td> </tr> <tr> <td>FP: fixed diameter pulley</td> <td>OS: outlet speed</td> </tr> <tr> <td>VP: variable diameter pulley</td> <td>TC: transistorized control</td> </tr> <tr> <td>FCI: flexible connection type I</td> <td>N: not variable</td> </tr> <tr> <td>FCII: flexible connection type II</td> <td>AF: airfoil blades</td> </tr> <tr> <td>GD: gravity damper</td> <td>BI: backwards blades</td> </tr> <tr> <td>SP: static pressure</td> <td>FC: forwards blades</td> </tr> <tr> <td>D: drain</td> <td>VFC: inverter (variable frequency speed controller)</td> </tr> <tr> <td>GF: gravity flap</td> <td></td> </tr> </table>							SD: see drawing	PL: protective layer	DD: direct drive	TI: thermal insulation	FP: fixed diameter pulley	OS: outlet speed	VP: variable diameter pulley	TC: transistorized control	FCI: flexible connection type I	N: not variable	FCII: flexible connection type II	AF: airfoil blades	GD: gravity damper	BI: backwards blades	SP: static pressure	FC: forwards blades	D: drain	VFC: inverter (variable frequency speed controller)	GF: gravity flap	
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PART 2 PRODUCT

- 2.1 GENERAL
- 2.2 PLEATED FILTERS OR PREFILTERS, MEDIUM EFFICIENCY (FPME)
- 2.3 BOX TYPE FILTERS
- 2.4 ELECTROSTATIC FILTERS (FE)
- 2.5 FRAMES FOR FILTERS AND PREFILTERS
- 2.6 PRESSURE GAUGES FOR FILTERS
- 2.7 MANUFACTURER LIST

PART 3 EXECUTION

- 3.1 GENERAL
- 3.2 PRESSURE GAUGES FOR FILTERS



Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.

1.2 REFERENCES

- .1 American National Standard Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
 - .1 ANSI/ASHRAE 52.2-12 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particulate Size (ANSI approved).

1.3 SUBMITTALS

- .1 Submit documents in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Product data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for the products. Data sheets must include product characteristics, performance criteria, dimensions, limits and finish.
- .3 Certificates:
 - .1 Submit certificates signed by the manufacturer certifying that the products and materials comply with the specified performance and physical requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit all document/elements required, in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Operation and maintenance data (O&M): provide instructions with respect to the operation and maintenance, to be incorporated into the O&M manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Transport, store and handle hazardous materials in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Shipping and receiving: deliver material to site in the original packaging, which must bear the name and address of the manufacturer.

Part 2 Product

2.1 GENERAL

- .1 The efficiency of filter media is given in MERV and MERV-A units. These values must be established according to the standard ASHRAE 52.2-2007. The efficiency established in MERV-A units means that tests were conducted according to the method of the annex (appendix) J of this same standard. This characteristic is accepted, but not mandatory.



- .2 All media must be approved by the Canadian Insurers Association. They must be certified and labeled class no. 2, according to the standard UL900. Class no. 1 may be required in specified cases.
- .3 Systems must never operate without filters.
- .4 For the purposes of run-in and adjustments, use 50 mm temporary fiberglass filters at this section's expense.
- .5 Upon work acceptance, on each system without exception, replace all filters with new filters of the thickness, the dimensions, and the type shown in the drawings and the specification.
- .6 Supply and install all housings required to support the pre-filters and the filters.
- .7 For specifications, see the filter tables.

2.2 PLEATED FILTERS OR PREFILTERS, MEDIUM EFFICIENCY (FPME)

- .1 Type FPME:
 - .1 Renewable type filters with pleated media made of synthetic fibers and of uniform thickness. Media supported by a galvanized steel lattice, assembly glued together in a resistant and waterproof frame.
 - .2 Minimum efficiency of MERV-8.
 - .3 Initial static pressure loss depending on the thickness and the velocity:

Thickness	Velocity	Loss
25 mm	107 m/min.	57 Pa
50 mm	152 m/min.	77 Pa
100 mm	152 m/min.	67 Pa

- .4 Recommended maximum loss of 250 Pa.
- .5 Filter considered dirty at 150 Pa.
- .6 List of equivalents:
 - .1 30/30 from Camfil Farr.
 - .2 Aerostar, series 400 from Dafco Filtration Group.
 - .3 Pre Pleat 40 from Flanders (JAS Filtration).

2.3 BOX TYPE FILTERS

- .1 Type FC:
 - .1 High efficiency filter with media consisting of glass microfibers laminated on a reinforcement fabric, ensuring a uniformly thick and sufficiently rigid mat. Media glued along the perimeter of the frame to prevent air leaks. Stabilizers and supports are corrosion resistant. The frame must also be constructed with foresight for the installation of 50 or 100 mm FPME type pre-filters, as indicated.
 - .2 600 mm x 600 mm x 300 mm filter, filtration area of about 4.9 m².
 - .3 Minimum efficiencies MERV-A 14, according to the choice specified.
 - .4 Initial pressure loss at 152 m/min:



- .1 MERV or MERV-A 14: 115 Pa
- .5 Recommended maximum pressure loss of 373 Pa.
- .6 Filter considered dirty at 250 Pa.
- .7 List or equivalents:
 - .1 Aerostar Synthetic Rigid Cell from Dafco Filtration Group
 - .2 Rigid-Air Synthetic from Flanders (JAS Filtration)
 - .3 Or approved equivalent

2.4 ELECTROSTATIC FILTERS (FE)

- .1 Commercial electronic air cleaner supplied including cabinet, solid state power supply, two electronic cells, prefilters and building management system interface. Mounted directly in the ventilation unit. Model F58H1006 and F58G1016 de Honeywell.
- .2 The electrostatic filters must be supplied the carbon activated filter option.
- .3 The electrostatic filters must be powered electrically directly from the ventilation units and not by an independent source. This coordination must be achieved prior to the order of the ventilation unit HRU-1.

2.5 FRAMES FOR FILTERS AND PREFILTERS

- .1 Universal frame:
 - .1 Universal mounting frame in 16 gauge galvanized steel, 19 mm inner edge for a fixed installation of the filter and to ensure a seal, polyurethane seal on the inner edge between the frame and the filter, as well as raised support points to ensure the adequate installation of type 8 frames.
 - .2 Factory perforated frame for easy installation, assembly either by rivets or bolts to mount bank filters. Multiple perforations for the application of various fasteners, allowing the installation of a wide variety of standard size air filters.
 - .3 The installation of the fasteners must be done without tools or screws.
 - .4 Allowing the installation of all types of standard filters according to type of fasteners retained. Possibility to assemble a flat or V configuration bank filter to add filter surface and reduce the pressure loss in a duct.
 - .5 List equivalents:
 - .1 Type 8 from Camfil Farr.
 - .2 Aerostar Seal Frame from Dafco Filtration Group
 - .3 JAS universal frame (JAS Filtration)
 - .4 Or approved equivalent

2.6 PRESSURE GAUGES FOR FILTERS

- .1 Pressure gauge indicating the resistance to air flow, with scale graduated from 0 to 700 Pa on all systems. The indicator must show a differential pressure in the range of 25 Pa. Dwyer Series 2000.



2.7 MANUFACTURER LIST

- .1 Comply with article "PRODUCTS USED FOR TENDERS AND EQUIVALENCES" from Section 20 00 10 – Mechanical and electrical general instructions.

Part 3 Execution

3.1 GENERAL

- .1 Install the filters according to the indications in the drawings, in the equipment tables, and according to the manufacturer's recommendations.
- .2 Reinforce the filters' frames to prevent buckling and seal around the edges of the filters.
- .3 For back to back installation of filters and pre-filters, use two sets of supports spaced 100 mm apart at minimum. Install and remove the pre-filters on the upstream side of the first support and the filters on the downstream side of the second support. The space provided between the two supports allows the installation of the probes and the pressure gauges.

3.2 PRESSURE GAUGES FOR FILTERS

- .1 Install a pressure gauge for each filter and pre-filter. For two filters in series, two pressure gauges are required.



FILTER SPECIFICATIONS					
Identification	F-1	F-2	F-3		
Location	HRU-1	HRU-1	HRU-1		
MERV rating	8	14	14		
Type	FPME	FC	FE		
Air flow (L/s)	1 132	1 132	472	943	
Velocity (m/min.)	117	117	122		
Final pressure loss (inch water)	0.58	0.94	-		
Quantity	2	2	1	1	
Disposition	Horizontal				
	Vertical	X	X	X	X
Dimensions (mm)	Length	508	508	350	670
	Height	508	508	610	610
	Depth	50	305	171	171
Comments			1	2	

Notes:

- 1 : Model F58H1006 by Honeywell
- 2 : Model F58G1016 by Honeywell

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- 1.5 DELIVERY, STORAGE AND HANDLING

PART 2 PRODUCT

- 2.1 GENERAL
- 2.2 MODULAR AIR HANDLING UNITS (HRU-1)
- 2.3 COMPACT AIR HANDLING UNITS (RTU-1 /-2 /-3)
- 2.4 MANUFACTURER LIST

PART 3 EXECUTION

- 3.1 AIR HANDLING UNITS



Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 10 – Mechanical and electrical general instructions.
- .2 Section 23 05 48 – Vibrations and seismic controls for HVAC piping and equipment.
- .3 Section 23 31 13.01 – Metal ducts – Low pressure to 500 Pa.
- .4 Section 23 44 00 – HVAC air filtration.

1.2 REFERENCES

- .1 Definitions:
 - .1 Certified nominal specifications: technical data published or taken from the manufacturer's documentation, confirmed by tests that have been performed by the manufacturers, or on their behalf by independent laboratories, and certifying the compliance of the elements with the requirements of the codes and the standards in effect.
- .2 References:
 - .1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA):
 - .1 ANSI/NFPA-90A-2009 – Standard for the Installation of Air Conditioning and Ventilating Systems, 2009 Edition.
 - .2 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
 - .1 ANSI/ASHRAE 90.1-2007 (I-P) – Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - .2 ANSI/ASHRAE 52.2-2007 – Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.
 - .3 Air Conditioning and Refrigeration Institute (ARI).
 - .4 Master Painters Institute (MPI):
 - .1 MPI-INT 5.3-2007 – Galvanized Metal.
 - .5 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).

1.3 SUBMITTALS

- .1 Submit documents in accordance with Section 20 00 10 – Mechanical and Electrical General Instructions.
- .2 Product data:
 - .1 Submit manufacturer's printed product literature, instructions, specifications and data sheets for products. Data sheets must include product characteristics, performance criteria, dimensions, limits and finish.
- .3 Certificates:



- .1 Submit certificates signed by the manufacturer certifying that the products and materials comply with the specified performance and physical requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit all document/elements required, in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Operation and maintenance data (O&M): provide instructions with respect to the operation and maintenance, to be incorporated into the O&M manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Transport, store and handle hazardous materials in accordance with section 20 00 10 – Mechanical and electrical general instructions.
- .2 Shipping and receiving: deliver material to site in the original packaging, which must bear the name and address of the manufacturer.

Part 2 Product

2.1 GENERAL

- .1 Panels with polyurethane insulation:
 - .1 This type of panels will have to meet the standard NFPA-90A "Installation of Air-Conditioning and Ventilating Systems".
 - .2 Related sections:
 - .1 For custom and conventional air handling units, and those with utilidor, the following sections apply:
 - .1 Section 23 05 48 – Vibrations and seismic controls for HVAC piping and equipment.
 - .2 Section 23 44 00 – HVAC air filtration.
 - .3 Panel thickness:
 - .1 For custom air handling units and air handling units with utilidor, select the thickness according to the following table's data:

Static pressure	Thickness	
	With polyurethane insulation	With fiberglass insulation
2 000 Pa	50 mm	50 mm
2 500 Pa	63 mm	100 mm
3 750 Pa	75 mm	100 mm

- .2 Deflection:
 - .1 The maximum allowable deflection at 2500 Pa will be 1/240.
- .3 Structural reinforcement:



- .1 If necessary, depending on the pressure and the dimensions of the panels, the manufacturer must provide structural reinforcement to meet the maximum allowable deflection.
- .4 Leakage:
 - .1 The manufacturer must certify that the units have a seal corresponding to class 6 leakage, according to the SMACNA-15D standard.
- .4 Acoustic properties:
 - .1 The acoustic properties of panels used in the construction of power plants must be certified by an independent laboratory.
 - .2 The methods used to establish the insertion loss of the panels must conform to the standards ASTM, E90, and C413.

2.2 MODULAR AIR HANDLING UNITS (HRU-1)

- .1 Module manufacture:
 - .1 Manufactured in accordance with the ARI standard 430.
 - .2 All modules delivered separately include all the components shown on the plans.
 - .3 All modules will be double-walled, solid surface on both sides, nominal thickness of 50 mm, 18 gauge galvanized steel, and 16 gauge profile structure. Thermally insulated walls with a minimum R factor of 7.5.
 - .4 All seals will be installed at the factory and the on-site assembly will be done using mechanical fasteners or another approved method, ensuring a perfect seal.
 - .5 The access panels and doors must allow modules to withstand a static pressure of 1250 kPa, with a maximum leakage rate of 2.3 L/s/m².
 - .6 The unit must have a single point electrical connection.
- .2 Access doors:
 - .1 Doors or access panels must be provided so as to remove each of the internal mechanical components without compromising the structural integrity of the central module.
 - .2 In general, the required access doors must be provided on one side only of the unit, on the same side as the piping connections.
 - .3 All doors must be made using plates identical to those described above.
 - .4 Each door must be fitted with at least two stainless steel hinges and two cane shaped handles. Doors can be opened from the outside or from the inside.
 - .5 The seal between the door panel and the frame must be secured by a closed cell neoprene double gasket. These seals must be fixed to the door panel and not on the door frame.
 - .6 All doors must be on hinges with lockable handles.
 - .7 All doors must open to the side having the higher static pressure.
- .3 Fan modules:



- .1 Centrifugal type fans, double width and double inlet. The specifications are certified in accordance with the ARI standard 430. See section 23 34 00 – HVAC fans for fan specifications and data tables.
- .4 Filter modules:
 - .1 See section 23 44 00 – HVAC air filtration.
 - .2 Provide a dedicated section for the field installation, or factory installation, of electrostatic filter modules, see section 23 44 00 – HVAC air filtration. The contractor must supply and install the filters, provide the necessary supports for the filters and ensure that the added frames for the filter modules are properly sealed.
- .5 Acoustics and vibrations:
 - .1 Consider section 23 05 48 – Vibrations and seismic controls for HVAC piping and equipment.
- .6 Enthalpy wheel :
 - .1 The unit must have an enthalpy wheel that is factory installed and tested. The wheel must be mounted on a rigid frame encasing the motor, the belts, the gaskets and the bearings. The frame must slide out of the unit for maintenance.
 - .2 The enthalpy wheel's performance must be certified AHRI-1060-2005 and have all the certified product seals required.
 - .3 The enthalpy wheel and its motor must be certified UL for fire safety.
 - .4 The wheel must transfer sensible and latent energy between two counter-flow air streams.
 - .5 Both air streams must have filters with a minimal efficiency of MERV-8 before the wheel according to ASHRAE 52.2.
 - .6 The wheel must be constructed from a light polymer, supplied with desiccant, and must not degrade. The different parts must be washable with a detergent or an alkaline cleaner and water.
 - .7 The wheel must have a frost control option.
- .7 Controls:
 - .1 Control panel with the following block terminals for remote controls:
 - .1 Unit start/stop (BI)
 - .2 Recovery wheel start/stop (BI)
 - .2 Motorized dampers:
 - .1 The unit shall be delivered with a normally-closed spring-loaded outside air and exhaust damper actuators pre-installed.
 - .2 Pre-installed damper actuators shall be equipped with a built-in limit switch pre-wired to the unit starter. Fan starts upon damper opening proof from the limit switch.



.8 Characteristics :

Identification	HRU-1
Model	CAH004
Manufacturer	Daikin
Quantity	1
Minimum nominal air flow	2 400 cfm
External static pressure	1 in W.G.
Electrical specifications	415V/3/50
Over current protection	30A
Dimensions	3 251 mm x 1 118 mm
Approximative weight	691 kg

2.3 COMPACT AIR HANDLING UNITS (RTU-1 /-2 /-3)

- .1 Horizontal type with belt drive. The specifications are indicated in the table in annex.
- .2 18 gauge galvanized steel enclosure, reinforced for the required rigidity.
 - .1 Access panels on either side.
 - .2 Internal surfaces acoustically insulated and thermally insulated with 25 mm thick fiberglass, according to the article "ACOUSTIC INSULATION" from section 23 33 00 – Air duct accessories.
 - .3 Air inlet with collar for connection to an air duct.
 - .4 Air outlet with collar for connecting an air duct.
 - .5 Side duct connections.
 - .6 Motor/fan assembly fully isolated from the fan housing.
 - .7 The interior and the exterior of the enclosure is degreased, chemically treated, and covered with a coat of primer.
- .3 Coils:
 - .1 Copper tubes, 16 mm outer diameter.
 - .2 Corrugated aluminum fins, fixed to the copper tubes by the mechanical expansion of the tubes.
 - .3 Number of fins per inch and rows, as indicated in the table.
 - .4 Test pressure of 1380 kPa.
 - .5 Easy to drain and self-venting.
- .4 Heat pump :
 - .1 Copper tubes, 10 mm of outer diameter.
 - .2 Corrugated aluminium fins, fixed to the copper tubes by the mechanical expansion of the tubes.
 - .3 Two scroll compressors with dual refrigerant circuit.
 - .4 Direct drive axial fan, statically and dynamically balanced with variable pitch pulley.
 - .5 Test pressure of 4 135 kPa.



- .6 Refrigerant type R-410A.
- .5 Condensate pan:
 - .1 Galvanized steel, corrosion resistant, and thermally insulated.
 - .2 Drain connection with brazed joint.
- .6 Fans:
 - .1 Centrifugal, double-entry, forward curved blades, statically and dynamically balanced with variable pitch pulleys.
- .7 Motors:
 - .1 Open type, start capacitor, 1 725 rpm, single or three phases, according to the indications and the specified voltage.
 - .2 Installed on a sliding rail for easy belt adjustment.
 - .3 Variable diameter pulley on the motor (fixed diameter on the fan).
- .8 Filters:
 - .1 Replaceable, 50 mm thick MERV-8 filter.
 - .2 Replaceable 100 mm thick MERV-14 final filter.
- .9 Controls:
 - .1 Control panel with the following block terminals for remote controls:
 - .1 Unit start/stop (BI)
 - .2 Heat pump compressor start/stop (BI)
 - .3 Heat pump mode inverter (BI)
 - .4 Electric heater SCR modulation (AO)
 - .5 Unit general alarm dry contact (BO)
 - .2 Motorized dampers:
 - .1 The unit shall be delivered with a normally-closed spring-loaded return damper actuator pre-installed and pre-wired.
 - .2 Pre-installed damper actuators shall be equipped with a built-in limit switch pre-wired to the unit starter. Fan starts upon damper opening proof from the limit switch.
- .10 Characteristics :

Identification	RTU-1, RTU-2, RTU-3
Model	UATYQ600 (heat pump)
Manufacturer	Daikin
Quantity	3
Minimum nominal air flow	7 000 cfm
External static pressure	0.8 in W.G.
Minimum cooling capacity	210 000 Btu/h
Number of compressors	2
Refrigerant	R-410A
Minimum heating capacity	195 000 Btu/h



Prefilter	MERV 8
Filter	MERV 14
Electrical specifications	415V/3/50
Over current protection	63A
Dimensions	2 739 mm x 2 231 mm
Approximative weight	830 kg

2.4 MANUFACTURER LIST

- .1 Modular heat recovery air handling units:
 - .1 Daikin
 - .2 Trane
 - .3 Carrier
 - .4 York
 - .5 Stulz
- .2 Compact air handling units:
 - .1 Daikin
 - .2 Trane
 - .3 York
 - .4 Carrier

Part 3 Execution

3.1 AIR HANDLING UNITS

- .1 Installation:
 - .1 When the units are delivered in separate modules, the supplier/manufacturer will have to supervise the assembly work.
 - .2 Refer to the manufacturer's installation manual for on-site handling instructions.
 - .3 Ensure that each unit is installed level and square.
 - .4 When the units are delivered in modules, ensure proper seals between the modules.
 - .5 Check and correct, if necessary, the alignment of doors and the dampers to ensure proper operation.
- .2 Anti-vibration pads under the air handling units:
 - .1 Made of neoprene, 30 or 50 durometer, checker plate face, 16 mm thick. A 6.4 mm thick galvanized steel plate is glued on each of the two (2) faces,
 - .2 Calculate the dimensions of each pad for an optimum load of 275 kN/m² which corresponds to a static deflection of 5 mm.
- .3 Fan/motor assemblies:



- .1 All fan/motor assemblies must be installed on an integral base supported by seismic type anti-vibration isolators, with a nominal static bending of 51 mm.
- .2 Movement limiters must be provided for each fan to ensure stable operation and to protect the flexible connections from tearing.
- .4 Electrical connection provisions:
 - .1 Provide an empty conduit connected to the motor of each fan from a pull box installed on the outer surface of the enclosure.
- .5 Grounding:
 - .1 Also provide a grounding braid between the fan and the enclosure, as specified in the article "GROUNDING" from section 23 31 13.01 – Metal ducts – Low pressure to 500 Pa.
- .6 Raised base:
 - .1 To ensure an adequate height for the site installation of the water seals required for the condensate drains, the unit will be installed on a raised of at least 75 mm with neoprene isolators, as specified further in this specification.
- .7 Roof mounted air handling units:
 - .1 The units installed on the roof will be placed on architectural bases or steel curbs. Seal the edges.
- .8 Suspended devices:
 - .1 Install them using the methods described in section 23 05 48 – Vibrations and seismic controls for HVAC piping and equipment and section 23 05 29 – Hangers and supports for HVAC piping and equipment.
- .9 Seismic controls:
 - .1 Install the equipment with all seismic mechanisms, accessories and anchors required to achieve an installation that complies with code requirements.
- .10 Commissioning units:
 - .1 The manufacturer must collaborate with the company in charge of the work by this section during the commissioning which will be under the supervision of the Engineer.

END OF SECTION



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Part 1 General

1.1 RELATED SECTIONS

- .1 Section 20 00 10 – General mechanical and electrical instructions.
- .2 All Division 23 and 26 sections.

1.2 GENERAL CONDITIONS

- .1 All mechanical and electrical general requirements of Division 20 apply to Division 25.
- .2 All mechanical and electrical drawings apply to Division 25.
- .3 Division 25 must supply the services of a qualified technician possessing the required competences to change and modify the software programs to control systems during commissioning and start-ups periods.

1.3 ACRONYMS AND ABBREVIATIONS

- .1 List of acronyms used in this section:
 - .1 BACnet – Building Automation and Control Network.
 - .2 BTL – BACnet testing laboratories.
 - .3 CDL - Control Description Logic.
 - .4 COSV - Change of State or Value.
 - .5 DDC – direct digital control.
 - .6 EMCS – Energy Management and Control System.
 - .7 HVAC - Heating, Ventilation, Air Conditioning.
 - .8 I/O – Input/Output.
 - .9 IT – Information technologies
 - .10 OT – Operation technologies
 - .11 LAN – Local Area Network.
 - .12 NMU(s) – Network Management Unit(s).
 - .13 MCU(s) – Master Control Unit(s).
 - .14 LCU(s) – Local Control Unit(s).
 - .15 TCU(s) – Terminal Control Unit(s).
 - .16 PID – Proportional, Integral and Derivative.
 - .17 PC – personal computer.
 - .18 OS - Operating System.
 - .19 NC – Normally Closed.
 - .20 NO – Normally Open.
 - .21 USB – Universal Serial Bus.
 - .22 WAN – Wide rea Network.

1.4 DEFINITIONS

- .1 Point: may be logical or physical.



- .1 Logical points: values calculated by the system such as set points, totalizers, totalized impulses, corrections computed from results and/or CDLs.
- .2 Physical points: inputs or outputs which are hardwired to controllers to measure physical properties, to monitor or provide status conditions of contacts or relays or to provide interaction with related equipment (system start/stop, modulation control, etc.)
- .2 Point Object Type: points fall into following object types:
 - .1 AI (analog input).
 - .2 AO (analog output).
 - .3 BI (binary input).
 - .4 BO (binary output).
 - .5 Pulsed input.

1.5 SCOPE OF WORK

- .1 Work included:
 - .1 In general, the work covered includes labour, supply, installation, adjustments, calibrations and connections of electric and electronic equipment of all control systems indicated on drawings and specifications.
 - .2 Unless specified otherwise Division 25 must include all devices, accessories, conduits and wiring for electrical and/or electronic devices pertaining to the control centre and to every system control equipment, all interconnections between the two type of controls, all electrical connection to panels and starters for normal operation of the controlled equipment, the supply and installation of transformers required for all controllers and field devices.
 - .3 The work includes, but is not limited to, the following:
 - .1 All demolition works of control equipment rendered useless by the current scope of work. Hand back all controllers, actuators and thermostats to the Owner. Deletion of all obsolete alarms and dynamic graphics.
 - .2 All electrical and DDC controls required for HVAC systems, unless specified as part of another section.
 - .3 All control panels and local panels.
 - .4 All actuators and end switches for dampers other than those supplied with ventilation units.
 - .5 All duct and room temperature sensors and zone thermostats.
 - .6 All current and tension transducers.
 - .7 Complete electrical installation includes conduits, cables, junction boxes, etc. required for control systems and the EMCS, as shown on drawings and described in these specifications, as well as all electrical connections required to motor control centers and starters, interlocks for fans, pumps or other controls (e.g. device, panels).



- .8 230V/1/50 power sources and 24 V for local panels from transformers installed by Division 25 or from 230V local service panels.
 - .9 Engineering, supervision, adjustments and calibrations for the DDC control system.
 - .10 Provide and configure an NMU to connect all new DDC unit controllers to the owner's IP network.
 - .11 Provide and configure a desktop computer for EMCS software server and operation functions. Coordinate computer's make with the owner's IT service current stock.
 - .12 Provide and configure a new native BACnet EMCS software. Coordinate users' access and privilege with the owner's OT service.
 - .13 DDC programming and complete database, including building all dynamic graphics for controlled and integrated systems.
 - .14 The segregation of information according to every user's access level.
 - .15 Coordination with the Owner to comply with its point description and dynamic graphic standards.
 - .16 All system start-up, initial commissioning, training, operating and maintenance documentation for all systems.
- .2 Work excluded:
- .1 Damper actuators pre-installed and pre-wired in ventilation units.
 - .2 High voltage (415 V) wiring.

1.6 DOCUMENT SUBMITTAL

- .1 Submit required documents as per section 20 00 10.
- .2 In addition, submit the following documentation:
 - .1 For each system integrated to the EMCS, provide control and wiring schematics showing: all controllers involved in local control loops, all field devices, a bill of materials, points labelling, control elements, wiring terminals, narrative sequences, etc.
 - .2 Shop drawings and specification sheets for each item. Documents must include manufacturer's descriptive literature, manufacturer's installation recommendations, specifications, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, other data to establish compliance.
 - .3 All construction drawings showing the exact position of each local control panel and the layout of all electrical sources and distribution dedicated to Division 25.
 - .4 Provide inside each local control panel every drawings of related controlled systems. These drawings must be plasticized on both sides and placed in a file holder installed on the back of the panel door in such a way that it does not conflict with push buttons and lights installation.
 - .5 All documents required in the "TESTS AND CALIBRATION" clause of the current section.



- .6 A list of all points and their identification in an electronic file.
- .7 A copy of all source programs or control loop charts and the documentation required for their use.
- .8 After installation, start-up and fine-tuning are completed, provide a copy of all installed software, including the database, graphics database, all configured parameters, etc.
- .9 A list of all analog limits assigned.
- .10 A list of all point assigned to each scheduled program and events.
- .11 A copy of the database.
- .12 A read-only USB key back-up copy configured of all aforementioned documents.

1.7 QUALITY ASSURANCE

- .1 See the “LAWS, REGLEMENTATIONS AND PERMITS” clause of section 20 00 10 – General instructions for mechanical and electrical.
- .2 All wiring must comply with manufacturers’ recommendations and all local electrical codes for all electrical work.
- .3 The system must include all devices, control and monitoring equipments as well as all devices, accessories and equipment installed remotely, software, interlock wiring and conduits required to obtain a fully functional system, as described in this section. The system must meet all effective local and national codes. If a conflict between the two reference codes appears, the most recent and most severe local codes must be applied.

1.8 WARRANTY

- .1 Regardless of the warranty period stipulated in the “WARRANTY” clause of section 20 00 10 – General instructions for mechanical and electrical, the complete control system must have a two (2) year warranty period from the final acceptance date.

1.9 FIXED PRICE

- .1 Provide in the quote, a global lump sum that includes all the work covered in Division 25.

Part 2 Products

2.1 ELECTRICAL AND ELECTRONICAL CONTROL DEVICES AND INSTRUMENTATION

- .1 R – Electrical relay:
 - .1 4PDT or DPDT, with silver or nickel alloy contacts, LED status indicators, and self-maintained test button.
 - .2 Plug-in type with termination base. In applications where relay is subject to vibration, provide hold-on clip.
 - .3 Complete with enclosure when installed outside panels.
 - .4 When used for switching, use appropriate contact rating.



- .5 As per Omron model MYxIN or approved equivalent approved by the professional.
- .2 CT - Current sensors:
 - .1 Current transducer:
 - .1 Current range: depending on the application
 - .2 Isolation: 600 V AC rms.
 - .3 Accuracy: $\pm 2\%$ on all ranges.
 - .4 Temperature: -15 to 60°C (5 to 140°F)
 - .5 Relative humidity ratio: 10 - 90% without condensation
 - .6 Output signal: 4 to 20 mA
 - .7 Model: Type H721 or H921 Hawkeye from Veris Industries or equivalent approved by the professional.
 - .2 Version with jumper based on selected current ranges only. Models with potentiometer are prohibited.

Models nos	Types	Current range
H721LC	"Solid Core"	Adjustable, 0-10, 0-20 or 0-40 A
H921	"Split Core"	Adjustable, 0-30, 0-60 or 0-120 A
H721HC	"Solid Core"	Adjustable, 0-50, 0-100 or 0-200 A

- .3 TT – Phase tension transducer:
 - .1 DIN rail AC voltage measuring transducer.
 - .2 Range: 0-660 Vca.
 - .3 Power supply: 24 Vca.
 - .4 Output signal: 4-20 mA.
 - .5 Operating ambient temperature conditions: 0-60°C.
 - .6 Casing protection: IP20 (or NEMA 1).
 - .7 As per Phoenix Contact MACX series or approved equivalent.
- .4 TR - Transformer:
 - .1 Single phase transformer, enclosed type complete with fuse holder and fuse. Transformer capacity in VA to be at least 20% greater than the rated connected charge. Use of transformers with integrated thermal protection or with intrinsic limitation as an alternative to fuses is prohibited.
 - .2 As per MC series from Marcus or approved equivalent from Hammond.
- .5 D.C. power supply:
 - .1 Voltage converter A.C./D.C., switch-mode type, input: 24 V A.C to 415 V A.C., output: 0-30 V D.C., capacity of 3 to 20 A., as required. Unit will be selected based on a 75% load capacity. Provide fuses at the input/ output of the power source.
- .6 ES – End switch:



- .1 Heavy duty end switch with position indicator, waterproof metallic box and stainless steel adjustable roller lever switch.
 - .2 IP67 certified.
 - .3 Contacts: SPDT, 600 VAC, 10 A, continuous (NEMA-A600)
 - .4 As per series 9007, type C, from Square D (Schneider Electric) or approved equivalent from Siemens or Allen-Bradley.
- .7 Electric damper actuator:
- .1 General applications:
 - .1 Proportional or on/off type as indicated on drawings, mounting brackets, accessories or adaptors supplied and installed by this section, permanent installation with drilling of the shaft and utilization of the two tightening screws.
 - .2 All actuators provided with a built-in spring return for failsafe action.
 - .3 Size to control dampers against maximum pressure and dynamic closing/opening pressure, whichever is greater. Torque requirements to be 50% greater than theoretical requirements.
 - .4 24 V A.C. power supply.
 - .5 As per Belimo, type NF, AF or EF series, or approved equivalent from Siemens, Johnson Controls or Honeywell.
 - .2 Outdoor applications:
 - .1 All outdoor actuators must be built into a weatherproof IP66/67 (or NEMA-4X) enclosure. Weatherproof field-provided enclosures are not accepted.
- .8 Local monitoring panel – Accessories
- .1 PB - Push-button:
 - .1 Momentary type, normally closed (N.C.) or normally opened (N.O.) as per application, IP65 (or NEMA-4X) enclosure rating, dimension: 22 mm.
 - .2 PL - Pilot Light:
 - .1 LED type light indicator, for 24 V supply, IP65 (or NEMA-4X) enclosure rating, dimension: 22 mm.
 - .3 SS - Selector Switch:
 - .1 2 or 3 position, as indicated on drawings, IP65 (or NEMA-4X) enclosure rating, rated for 24 V, dimension: 22 mm.
 - .4 As per type XB4 from Schneider Electric or approved equivalent from Klockner-Moeller, Siemens or Allen-Bradley.
- .9 T - Temperature sensor/transmitter:
- .1 Generals:
 - .1 Usage of blank room temperature sensor for:
 - .1 Public spaces: halls, corridor, amphitheatres, classrooms and cafeteria.



- .2 Technical rooms: mechanical, electrical and telecommunications rooms.
- .2 Provide electronic thermostats with display and local readjustment for other types of premises.
- .2 Room temperature – blank sensor:
 - .1 Type: NTC 10k ohms, ± 0.2 °C accuracy, standard resistance/temperature coefficient, for a wall recessed installation.
 - .2 Stainless steel plate cover with tamperproof screws.
 - .3 Greystone series no TE-200 or equivalent approved by the professional.
- .3 Room temperature sensor:
 - .1 Applicable in all premises except those listed in the lists of premises with blank sensor.
 - .2 Resistance type detector, NTC or RTD thermistor, measuring range 10 to 37°C (45 to 99°F), accuracy of ± 0.3 °C.
 - .3 Potentiometer set point adjustment with indication \pm .
 - .4 Except for public areas with temperature display, set point and "day/night" override button.
 - .5 Socket for connecting a "Laptop" computer or zone terminal.
 - .6 ABS plastic housing with mounting accessories.
 - .7 Wall installation on an electrical box.
 - .8 Option to connect a laptop for service and troubleshooting.
 - .9 By software programming, it must be possible to activate or deactivate the set point adjustment function. It must be possible to limit the adjustment value by plus or minus the setpoint adjustment knob, when enabled.
- .4 Duct temperature sensor:
 - .1 Insertion : NTC type, 10k ohms, ± 0.2 °C accuracy, standard resistance/temperature coefficient, sensor length: 460 mm (18"), temperature range: de -40 to 121°C (-40 to 244°F), Greystone series no TE-200 or equivalent approved by the professional.
 - .2 For installation in large conduits : NTC resistance type, 10k ohms, accuracy of ± 0.2 °C, standard resistance / temperature coefficient, resistant to humidity and contained in a tube, can take variable forms, length of 6 m (20 '), such than Greystone no TE 200 or equivalent approved by the Professional.

2.2 DDC controllers:

- .1 Network Management Unit (NMU):
 - .2 General:
 - .1 Network Management Unit to include the following:
 - .1 Power supply modules: one for each electronic module.
 - .2 A 32 bits Central Processing Unit (CPU).



- .3 Network control module supervising control execution and access on the primary Ethernet TCP/IP network. Communication protocol on the primary Ethernet TCP/IP network in accordance with the latest ASHRAE – BACnet standard (Annex J) – BACnet IP.
 - .4 Communication interface to supervise and control data communication on its secondary network.
 - .5 Enough internal memory to support the system database, operating system, data trending and archiving, management of local scheduling and alarm programs and permission access control. Memory-resident data to be protected from voltage fluctuations or power loss using Flash type memory or RAM type memory with battery back-up (72 h minimum capacity).
 - .6 Enough internal memory to archive historical data locally of all input/output points supervised by the controller for a minimum of 48 h with a sampling rate of fifteen (15) minutes.
 - .7 The operating system operates in real-time with an internal clock accurate to \pm five (5) seconds/year, with rechargeable batteries for a minimum of 72 h in event of a power failure.
 - .8 Plug-in terminals to facilitate installation, modification and commissioning of the system.
 - .9 Network Management Unit (NMU) to operate on a standalone basis or in network with other network controllers with no additional equipment required.
- .2 All components to be installed in an enclosure of adequate size.
 - .3 Power supply module:
 - .1 Includes a power supply module for each electronic module. Module to distribute power to all interfaces and filter the input signal. Includes the necessary logic to conduct a step-by-step start-up and shutdown to protect data integrity.
 - .4 Network control module:
 - .1 The network control module is the primary processor of the NMU and is fully programmable by the user. The module communicates, through the secondary level bus with DDC control units (LCU) to supervise controller actions.
 - .2 The network controller is microprocessor based and includes a memory bank with battery back-up to store application software, the user database and historical data. Programming in the module is memory-resident.
 - .5 As per model NAE from Johnson Controls, or approved equivalent with BTL listing as a B-BC device.
 - .6 Local control unit (LCU):
 - .1 Description:



- .1 Fully programmable, microprocessor based (32 bits), standalone controller for multi-task operation and real-time digital control.
- .2 Sufficient internal non-volatile memory (Flash) to support the operating system, application programs and subprograms.
- .3 Sufficient internal rewritable memory (RAM) to store operating parameters, control variables and constants, operating data and settings, scheduling objects, alarm limits, etc. Memory-resident data to be protected from voltage fluctuations or power loss using a battery or supercapacitor (72 h minimum capacity).
- .4 Controller consisting of a power supply, base module, plug-in electronic circuit board. Plug-in terminal blocks are used to connect I/O equipment. For each MCU controller, provide a connection point for a portable OWS (operation and maintenance). Connection point to provide access to all LCU controllers, management controllers (UGR) and master controllers (MCU).
- .5 Inputs/outputs (minimum for each LCU):
 - .1 Minimum resolution for analog inputs: 10 bits.
 - .2 Minimum resolution for analog outputs: 8 bits.
- .6 Four analog inputs, type as per following:
 - .1 Thermistor, 10,000 ohms.
 - .2 0-10 V D.C.
 - .3 0/4 – 20 mA.
- .7 Four digital inputs: dry contact.
- .8 Four digital outputs: form C relay, 110/220 VA.C.
- .9 Four analog outputs: 0-10 V D.C., 0/4 - 20 mA.
- .2 As per model FEC from Johnson Controls, or Tracer UC600 from Trane with BTL Listing as a B-AAC device.
- .7 Local control panel:
 - .1 General:
 - .1 Unitized Cabinet type, IP20 (or NEMA-1) enclosure, 610 mm x 815 mm x 205 mm complete with key-lockable front door mounted on concealed hinges, easily removable to provide interior access. Installed on rigid support for mounting on wall, floor, ceiling or ductwork.
 - .2 Provide a minimum of 20% free space at the bottom of the panel, for future addition.
 - .2 Location:
 - .1 Locate to provide a minimum clearance of 1000 mm (40") in front of panel.
 - .2 All component with a display or adjustment must be installed at an accessible height from the ground.
 - .3 Accessories:



- .1 All controls equipment including relays, switches, fuses, terminal blocks, etc., to be installed inside the panel.
- .2 Push buttons, pilot lights, selector switches, filter pressure indicators, etc., to be surface mounted on the panel's front door.
- .3 All wiring shall be inside raceways of adequate size with 50% of free space.
- .4 Identification:
 - .1 On the panel door, identify by white plastic laminate, with black lettering accurately aligned as well as all apparent accessories. Glued and screwed to the panel.
 - .2 Inside the panel, identify all accessories with laminated tape (Dymo).
 - .3 All pneumatic tubing must be colour code in all panels.
 - .4 All wiring to be tagged at both ends.
 - .5 Identify all pneumatic tubing.
- .5 Power source:
 - .1 Panels require 230 V switched power supply, to be done by this section.
 - .2 Switches must be from the same manufacturer as the DIN-rail terminal blocks or industrial type, installed on an electrical box 50 mm x 100 mm (2" x 4").
- .6 Terminal blocks:
 - .1 All joints and connections inside the panel must be done on screw-type terminal blocks. The use of marrettes or shielded wires with electrical tape is prohibited.
 - .2 Industrial grade modular type terminal blocks, DIN-rail mounted with vibration proof screw connections and color-coded labelled terminals and voltage and current separators.
 - .3 Allow 10% (minimum ten (10) terminals) spare capacity per panel.
 - .4 As per SAK series from Weidmüller or approved equivalent from Entrelec.
 - .5 Provide a minimum of 20% free space at the top of the panel, for future addition.
- .7 Schematic:
 - .1 Permanently installed in the door of the panel, a schematic drawing showing the system's arrangement.
 - .2 Schematic drawing to be sealed in a transparent plastic case.

2.3 Energy management and controls system (EMCS):

- .1 General:
 - .1 Supply and install a centralized management system to serve as an interface between system users (operators) and digital control systems located within the facility, which includes building controllers and integrated systems.



- .2 The centralized management system shall have the capability of interfacing with third-party control systems in a transparent manner, provided they comply with open protocols such as ASHRAE-BACnet. Provide the necessary software, drivers and/or interfaces to integrate third-party systems described in these specifications.
 - .3 Program all dynamic graphics, including all graphics required for integrated third-party equipment. Graphics must be programmed for Web operation so that they can be accessed through a standard Web browser.
 - .4 The centralized management system must be designed to support a minimum of five (5) users concurrently. Contractor to submit technical documentation, providing proof of compliance clearly showing this capability.
 - .5 Communication protocol for devices residing on the primary network must comply with the Ethernet standard and the IP protocol suite and must be able to operate under Windows' latest platform.
 - .6 Network addressing and configuration of devices residing on the facility's Ethernet TCP/IP network must be done under the supervision of the client's IT Department and in accordance with their standards and security policies.
 - .7 Using the operator workstation (OWS), the centralized management system allows bidirectional data transfer with EMCS components, data display via dynamic graphics and information management.
 - .8 Via the centralized management system, authorized users are able to view, delete, modify and/or add (create) graphics, modify programming of building controllers on site, create and modify scheduling programs and create, modify or delete historical data (logs).
 - .9 To ensure bidirectional data transfer between the centralized management system and building controllers and other third-party controls, programming to be done in accordance with ASHRAE Standard – BACnet (Annex J).
 - .10 The centralized management system software (and applications) must be from the same manufacturer and product line as the building controllers.
- .2 Operator workstation functions:
- .1 The centralized management system supports the following operator control functions related to building automation, provided that the operator has the proper user privileges:
 - .1 Supervision in real-time of all centralized system control points assigned to alarm functions, monitoring programs and energy management control.
 - .2 View, create, delete and modify all input/output (I/O) points, parameters, schedules and programs residing in building controllers.
 - .3 Create, delete and modify existing dynamic graphics.
 - .4 Modify or program building controllers to add control points (inputs/outputs) and to change or create new operating sequences. Modifications are saved on the controller to avoid data loss in case of a power failure or other system malfunctions.



- .2 The centralized management system and operator workstations (OWS's) to support the following tasks:
 - .1 Display and/or printout of the following:
 - .1 Operating Mode (using text and color).
 - .2 Analog value of each point (using text and engineering unit).
 - .3 All status (using text and color).
 - .4 All alarms (using text and engineering unit).
 - .5 Coloured graphics of systems (complete with animations).
 - .6 System-related data (using text and units).
 - .7 Logs of specific point value/state or list of points.
 - .8 Scheduling programs, holiday schedules and annual calendar.
 - .9 Graphs of independent variables.
 - .2 Command functions:
 - .1 Provide operator control and supervision over electromechanical systems, including performing manual overrides.
 - .2 Perform start/stop commands and generate alarms for unauthorized start/stop commands.
 - .3 Perform systems restart following a power failure (actual start-up by building controllers).
 - .3 Automatic functions:
 - .1 Logging of digital alarms and change of status messages.
 - .2 Logging of analog alarms.
 - .3 Schedule programming.
 - .4 Real-time display on user interface (HMI) on a continual basis.
 - .5 Printout of new alarms to an alarm printer.
 - .6 Printout of "return to normal" to an alarm printer.
 - .7 Event-based commands (alarm, start-up, etc.).
 - .8 Define logical groups (system points, calculated data, etc.).
 - .4 Logging functions:
 - .1 Logging of all points.
 - .2 Logging at regular intervals of a selected number of points ("trend log").
 - .3 Logging of a logical grouping of points defined by the user.
 - .4 Logging of programmed parameters.
 - .5 Other functions:
 - .1 Programs described in the item "Software" below.
 - .2 Create alarm limits.
 - .3 Change setpoints without having to modify controller programming.
 - .4 Adjustable totalizers (0 to 999,999).



- .5 Printing program for change of status, when a control point is associated to a logical start/stop group. Printing program provides a status log of all points associated with this group.
- .6 Automatic and/or manual archiving of system database related to control systems.
- .7 Automatic report printing.
- .8 Archiving (database backup) of building controller programs through manual intervention or automated schedule.
- .9 Automatic or manual restore of a building controller's programs on detection of an invalid or faulty program.

2.4 Operator workstation:

- .1 Primary OWS and server:
 - .1 The primary OWS ensures a link between the users (operators) and the building's DDC control units. The primary OWS consists of: a micro-computer, an optical drive, a hard disk drive configured in RAID1, and an enhanced keyboard.
 - .2 Minimum requirements:
 - .1 Processor: Intel Xeon E5-1620 microprocessor, operating at minimum clock speed of 3.6 Gigahertz, 1600 MHz bus speed.
 - .2 Memory: 8 GB DDR3, 1,600 MHz (2 DIMM X 4 GB).
 - .3 Video card: NVIDIA Quadro 600 (1GB RAM).
 - .4 DVD-RW drive.
 - .5 Two hard disks SATA 500 GB, running at 7,200 rpm, set in RAID1.
 - .6 MS Windows 10 Professional, in English.
 - .7 Enhanced 101 keys keyboard.
 - .8 Optical mouse.
 - .9 Gigabit Ethernet port (on motherboard).
 - .10 Local UPS unit:
 - .1 On-line double-conversion uninterruptible power supply.
 - .2 Support for ten (10) minutes minimum.
 - .11 Three (3) years extended warranty with on-site support.
 - .12 Colour monitor: 24". Flat panel display LED backlit, resolution 1920 x 1200, 16:10 widescreen format.

2.5 Building controller software

- .1 General:
 - .1 Software and application programs reside on each individual controller and cannot be subservient to a computer with higher performance.
 - .2 Software consists of discrete programs, which are combined to satisfy a specific controls sequence, by using input data (sensors, detectors), programming the required operating sequence and executing the adequate commands to output devices.



- .2 Programming:
 - .1 Control loops must be programmable to satisfy operating sequences.
 - .2 Energy management and events programs must have the ability to interrupt operating sequences to optimize operation.
 - .3 Software to provide the ability to program priority levels for individual programs.
 - .4 Logical points (pseudo points) can be created to provide access to calculated points, scaled conversions, setpoint deviations, etc.
- .3 Control logic :
 - .1 Building controllers (NMU, MCU, LCU and TCU) to be able to perform the following control algorithms:
 - .1 Two position control.
 - .2 Proportional constant.
 - .3 Proportional Integral and Derivative (PID) control.
 - .4 Automatic loop constant adjustment.
 - .5 Boolean Logic.
 - .6 Mathematical functions (addition, subtraction, multiplication, division, square root extraction, n-root extraction, etc.).
 - .2 Control software to provide ability to define time between successive starts for each piece of equipment to reduce cycling of motors.
 - .3 Provide protection against excessive electrical-demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.
 - .4 Power fail restart: upon resumption of power, NMC or MCU to analyze status of controlled equipment, compare with normal occupancy scheduling, turn equipment on or off as necessary to resume normal operation.
- .4 Energy management:
 - .1 NMU, MCU to provide for the following energy management routines:
 - .1 Time of day scheduling.
 - .2 Calendar based scheduling.
 - .3 Holiday scheduling.
 - .4 Temporary schedule overrides.
 - .5 Optimal start.
 - .6 Optimal stop.
 - .7 Night setback control ($\pm 1.5^{\circ}\text{C}$, adjustable).
 - .8 Enthalpy (economizer) switchover.
 - .9 Peak demand limiting.
 - .10 Temperature compensated load rolling.
 - .11 Fan speed/flow rate control.
 - .12 Heating/Cooling lockout.
 - .13 Setpoint reset based on a separate variable.



- .14 Equipment sequencing.
- .2 Programs to be executed automatically without need for operator intervention and be flexible enough to allow customization.
- .5 Scheduling and event programs:
 - .1 Provides the ability to generate commands such as "on/off", setpoint reset, based on the following schedules: time of day, day of the week, calendar date, summer/winter.
 - .2 For each equipment, a minimum of four (4) start-up schedules and four (4) shut-down schedules per day can be programmed.
 - .3 Programming of start/stop schedules, holidays, etc. must be simple and user-friendly (calendar and scheduling table format required).
 - .4 An NMU (or master controller MCU) can automatically switch between schedules based on a specific date or an event, for example: outdoor air temperature fluctuations near a seasonal setpoint.
 - .5 Holiday schedules can be programmed to override normal operation schedules (weekday). Thirty (30) holidays can be programmed, up to a year in advance, each with an adjustable period of one (1) to thirty-one (31) days.
 - .6 An exception program can be scheduled up to a year in advance. This program has priority over normal programs for the day that it has been assigned.
- .6 Historian and trending:
 - .1 Historical data collection and trending programs log change in point values over time, with the intent to assist the user in troubleshooting issues that could potentially arise in the system. Network Management controllers (NMU), master control units (MCU) or local control units (LCU) with capabilities to perform the following data logging:
 - .2 Continuous Historical Data:
 - .1 Continuous storing of point historical data for the previous forty-eight (48) hours with a fifteen (15) minutes sampling rate and recording of change of state/value for each digital input and all output points. Historical data can be transferred to an operator workstation for long-term storage. Historical data collection is automatically available for all points.
 - .2 Other types of trend logs allow the user to select specific points and create custom trends to collect data.
 - .3 Performance trending:
 - .1 System to allow high-resolution sampling rates, through master control units (MCU) or network management controllers (NMU) to evaluate performance of control loops. Sampling rates to be operator-selectable between ten (10) to three hundred (300) seconds, with a resolution of one (1) second.
 - .4 Trend data sampling:
 - .1 User-defined trend objects to collect real or calculated point values at an operator selectable rate of ten (10) seconds to sixty (60) minutes. Each



master control unit (MCU), or network management controller (NMU), when applicable, to store collected trend data on a buffer memory with minimum capacity to store forty-eight (48) hours of trend data considering all connected points at a sampling rate of fifteen (15) minutes or five thousand (5,000) sampling values.

- .5 Storing and archiving:
 - .1 Trend data to be stored on network management controller (NMU) or, when applicable, at master control unit (MCU) or local control unit (LCU). Trend data can be downloaded to a different media for archiving purposes.
 - .2 Trend data can be downloaded at regular intervals, as set by the operator, or automatically when buffer memory for trending is at full capacity.
 - .3 Trend data can be exported in file format, which can be used by other programs on a microcomputer.

- .7 Totalization:
 - .1 Run-time:
 - .1 NMU (or MCU and LCU, when applicable) to automatically accumulate and store run-time data for user-selected digital input and digital output points. Totalization to have sampling resolution of one (1) minute or less. Run-time limits can be configured to automatically generate alarm notifications and user-defined messages, when limit is reached.
 - .2 Analog and pulsed values:
 - .1 NMU (or MCU and LCU, when applicable) to automatically collect, calculate and store consumption totals on daily, weekly or monthly basis for user-selected analog or digital pulse input-type points. Totalization to provide calculations and storage of accumulations up to 99,999 units (kWh, litres, KBTU, tonnes, etc.).
 - .2 Totalization routine to have sampling resolution of one (1) minute or less. Warning limits can be configured to automatically generate alarm notifications and user-defined messages, when limit is reached.
 - .3 Events:
 - .1 NMU (or MCU and LCU, when applicable) to store event totalization records (e.g. totalized equipment start/stops) on daily, weekly or monthly basis. Totalization to accumulate and store up twenty thousand (20,000) events before reset.
 - .2 Warning limits can be configured to automatically generate alarm notifications and user-defined messages, when limit is reached.

- .8 Demand response:
 - .1 Demand response programs to supervise meter and forecast energy demand. When forecasted value exceeds the energy target, system to drop non-essential loads to limit demand. A load alternator program also cycles the operation of equipment to reduce energy consumption.



- .2 The two programs are coordinated so that load shedding and equipment cycling functions are distributed equally within the facility. Additionally, space temperatures or other comfort indicators are continuously supervised to ensure equipment shutdowns do not affect the comfort of occupants.
 - .3 Each building controller residing on the network can supervise up to 4 m. However, load shedding can be performed at any building controller linked to the network.
- .9 User-defined programs:
- .1 Allow users to program additional control functions in management controller (NMU) or master controller (MCU), when applicable, such as: optimized start, night setback setpoint reset, economizer mode, etc.
 - .2 These energy management programs are configured from an operator workstation (OWS) and then downloaded into management controls (NMU or MCU) via the primary communication network.
- .10 Access Control:
- .1 The network control module embedded in the network management controller (NMU) or master control unit (MCU), when applicable, provides password access protection. A password (minimum four (4) characters) is assigned to each user, along with an authorization level, which can limit access to certain functions and or group pf points.
 - .2 A minimum of three (3) levels of password protection are supported at the NMU controller, or MCU master controller, when applicable. Authorization levels format as per the following:
 - .1 Operator level: display only.
 - .2 Intermediate level: limited operational commands including automatic override.
 - .3 Supervisory level: full operational commands including automatic override and system administration of authorization levels.
 - .3 Up to fifty (50) user accounts can be programmed.
- .11 Special Processes:
- .1 Network management controller (NMU) or master control unit (MCU), when applicable, to be capable of executing specific special processes, as required by the user, calculations and subprograms.
 - .2 Process inputs and variables:
 - .1 Following items to be available for use in special processes:
 - .1 Any state or value measured in the system.
 - .2 Any calculated value.
 - .3 Any result from another process.
 - .4 User-defined constants.
 - .5 Arithmetical functions (+, -, *, /, exponent).
 - .6 Boolean logic operators.
 - .7 Time functions.



- .8 Coordination or transfer functions between building controllers.
- .3 Program branching:
 - .1 Special processes can be executed based on any of the following branching conditions: time interval, time of day, date, other processes, scheduling programs, events (alarms, etc.).
- .4 Dynamic data:
 - .1 Each process can use measured or calculated values from other NMU or master controllers MCU, when applicable, connected on the network or send commands to control points (physical or logical) resident on any building controller (NMU, MCU, LCU, TCU).
- .5 Messages:
 - .1 Processes to generate user-specific messages at operator interfaces.
- .6 Documentation:
 - .1 All programming performed for special processes to be self-documenting with programming flowcharts.
- .12 Alarm management:
 - .1 Alarm management program to supervise, store and push alarm reports to operator interfaces and memory files.
 - .2 Each NMU or master controller MCU analyzes and filters alarms to limit traffic on the communication network caused by non-critical alarms, while preventing any alarms from being suppressed.
 - .3 Alarm reporting capabilities of NMU or master controllers MCU are not affected by user activity on workstations (OWS) or by inter-communication with other building controllers on the network.
 - .4 Point - change of state:
 - .1 Any alarm report or point change of state to include the point description and the date and time at which the event occurred.
 - .5 Priorities:
 - .1 A system specific action can be defined by the user for each point. A priority alarm table can be set to minimize reporting of non-essential alarms and quicken response time to annunciate critical alarms to operators. System to classify a minimum of three (3) alarm levels.
 - .2 NMU or master controller MCU, to prevent reporting of selected alarms during start-up or shut down of systems. For each point, the operator can manually disable alarm reporting functions.
 - .3 Conditions for which an alarm (of change of state) can be acknowledged and/or filed for follow-up (for future recovery or analysis) can be defined by the operator.
 - .6 Alarm reporting:
 - .1 Alarm reports, messages and notifications must be routed to an alarm storage system for proper archiving. Alarms must be automatically rerouted to a backup system in the event of a communication failure with the primary storage system.



- .7 Alarm messages:
 - .1 System to allow a minimum of two hundred and fifty (250) operator-editable messages, each with sixty-five (65) characters, to provide a description of the alarm condition and a secondary message for any action required in response to the alarm. Each message can be assigned to any number of points in the system.

Part 3 Execution

3.1 GENERAL

- .1 All controls must be installed and set by specialized technicians, regularly employed by the Controls contractor. All costs related to adjustments are part of this contract. All control components must be easily accessible for maintenance and calibration.
- .2 Install all control devices in IP20 (or NEMA 1) unitized cabinets.
- .3 Any control device installed on an insulated ductwork must be install on an appropriate metal support, supplied by Division 25.
- .4 Any piping or tubing going through an obstacle must be protected by a sealed nylon bushing.
- .5 In finished room, enclose the controls in metal boxes with frames covering the joint between the box and the adjacent construction. The box must be of approved construction.
- .6 Thermostats localization on drawings is approximate and is given as a reference only.
- .7 Space thermostats should not be affected in any circumstances by the sun or any other heat source, cold source or air draft. When an installation is required on a hot or cold wall, the thermostat must be installed with an insulated base, supplied by Division 25.
- .8 Install the space thermostat at 1,5 m from the floor covering.
- .9 Thermostats must never be installed above switches, rheostats, dimmers or any other heat generating control equipment.
- .10 The control panel must not have any unprotected openings.
- .11 Protect all cables and tubing from abrasion when passing through openings.
- .12 Identify the position of the control components installed in the ceiling by a "P-Touch" label.
- .13 The expansion boards used to increase the number of inputs and/or outputs of a controller must be installed in the same panel as the associated controller or in a nearby auxiliary panel (less than 1 m distance from the control panel).

3.2 ELECTRICAL WIRING

- .1 Division 25 must supply and install all panels, controls, instrumentation and other specialized control devices. In addition, it must supply and install conduit, wiring and junction boxes required to connect all control devices.



- .2 Conduits, wiring and junction boxes installation must comply with Division 26 requirements.
- .3 Notwithstanding the conductor gage mentioned in Division 26, the wire gage for conductors being used for control only are as follow:
 - .1 230 V: minimum gage 14 AWG.
 - .2 24 V: minimum gage 18 AWG.
 - .3 Sub-network communication: 24 AWG, low capacitance
- .4 Control wire gages must be such that the voltage loss is below 5% of the supplied voltage.
- .5 All cables must be plenum rated. Plenum cable installation must comply to all effective local building codes. Contractor using this practice must install all junction boxes and connections needed for all wire voltage involved that are required by these codes.
- .6 All plenum cables must be installed in existing electrical cable trays, except for cables for room temperature sensors that must be installed without conduits nor trays and must follow straight lines parallel to building's lines and be properly attached at least every 1.5 m with "J hook" fasteners. Using suspended ceiling grid, ventilation supports or any other facilities to attach cables is strictly prohibited.
- .7 As indicated on the drawings, the control and electrical section's owners must provide and install conduits, conductors and junction boxes required for the complete connection of all heating, plumbing, ventilation, refrigeration and of controls.
- .8 However, Division 25 is solely responsible for the proper operation of its equipment. It must verify all electrical control sequences, as well as the protections of each device, by checking the overload relays and all starter designs so as to provide the exact number of auxiliary or other contacts to be in compliance with the drawings (in general, the starters have two NO contacts and two NC contacts).
- .9 Grounding systems required for all systems and devices provided under Division 25, in accordance with manufacturer's instructions and requirements of Division 26.
- .10 All 415 V electrical connections are the responsibility of Division 26.
- .11 Division 25 is solely responsible for providing a complete and fully operational Energy Management and Control System (EMCS) using Direct Digital Control (DDC) technology as shown on drawings and described in these specifications. It must verify all electrical control sequences, all electrical safeties, all overloads and all starter diagrams to provide the right number of auxilliary contacts or other, as require din the control drawings.

3.3 ELECTRICAL INSTALLATION

- .1 Installation includes: electrical diagrams, factory and on-site wiring, workmanship, surveillance, calibration, start-up and verification for a fully operational system.
- .2 Complete electrical installation including conduits, cables, junction boxes, etc. required for control systems, automation and the EMCS, as shown on drawings and described in these specifications, as well as all data transmission "bus", all electrical connections



required to motor control centers and starters, interlocks for fans, pumps or other controls (e.g. device, panels).

- .3 All wiring must comply with the requirements of the local authorities as well as item “ELECTRICAL WIRING”

3.4 TESTS AND CALIBRATION

- .1 Calibration:
 - .1 Calibrate all control devices, sensors and transmitters.
 - .2 The controls of each section or contract must be verified, adjusted and proven to be in working condition.
 - .3 For each system of each section, for each year of the warranty in summer and winter, in order to prove functionality and adequate calibration.
 - .1 A trend log of each points every 3 hours for a 24-hour period.
 - .2 A trend log of each temperature and humidity every 30 minutes for a 24-hour period.
- .2 Simulate all control panel alarms and record results.
- .3 Division 25 must provide great support in the testing and commissioning of the equipment and systems of the other contracts.

3.5 START-UPS

- .1 The control contractor, once installation is completed, must proceed with the start-up of the system. In order to proceed in a safe environment, start-up is divided in the following phases: verification of the control systems and start-up of the control systems with the electromechanical equipment operational.
- .2 During the control system verification, the control contractor must include, but not limited to, the following activities:
 - .1 Verify and calibrate all transmitter’s signals.
 - .2 Verify the operation of all actuators
 - .3 Verify the operation and feedback of all controlled devices.
 - .4 Simulate all alarms.
 - .5 Simulate all control loop and adjust parameters.
 - .6 Simulate a power fail and ensure proper restauration of the control system.
- .3 The final phase of the start-up must be witness by the owner. During this phase, the systems are functional, under the supervision of the owner. The control contractor will make the necessary modifications and adjustments (fine-tuning) in order to have a functional and safe system. The control contractor must perform these changes, at no cost, to optimize the system operation.
- .4 Once the start-up is completed, demonstrate the control system operation.

3.6 TRAINING



- .1 Provide a competent instructor to the owner for a period of four (8) hours for instruction on EMCS's operation and maintenance, including the EMCS software and interface instructions.
- .2 The training must be performed in a classroom environment and the content of the training must be approved prior to the training taking place.
- .3 Provide 3 copies of all training documentation.

3.7 NARRATIVE SEQUENCES OF OPERATION

- .1 See drawings.

END OF SECTION



LEGEND

LIGHTING

- FLUORESCENT LIGHTING FIXTURE 'Y' INDICATES THE TYPE OF FIXTURE 'Y' THE CIRCUIT, 'X' THE ASSOCIATED SWITCH, 'Z' THE PANEL BOARD
FLUORESCENT LIGHTING FIXTURE ON WIREWAY
WALL MOUNTED FLUORESCENT LIGHTING FIXTURE
FLUORESCENT LIGHTING FIXTURE, FROM EMERGENCY SOURCE
FLUORESCENT LIGHTING FIXTURE ON WIRE WAY, FROM EMERGENCY SOURCE
WALL MOUNTED FLUORESCENT LIGHTING FIXTURE, FROM EMERGENCY SOURCE
STREETLIGHT
SINGLE STREET LAMP
DUPLX STREET LAMP
QUADRUPLEX STREET LAMP
INCANDESCENT LIGHTING FIXTURE, METAL HALIDE OR HIGH PRESSURE SODIUM 'W' INDICATES THE TYPE 'W' OF THE CIRCUIT, 'Y' THE ASSOCIATED SWITCH 'Z' THE PANEL BOARD
WALL MOUNTED LIGHTING FIXTURE 'W' INDICATES THE TYPE
CEILING MOUNTED LIGHTING FIXTURE, FROM EMERGENCY SOURCE
WALL MOUNTED LIGHTING FIXTURE, FROM EMERGENCY SOURCE

SWITCH

- SINGLE POLE SWITCH 'X' INDICATES CONTROLLED LIGHTING FIXTURES
THREE-WAY SWITCH
FOUR-WAY SWITCH
KEY SWITCH
KEY SINGLE POLE SWITCH WITH PILOT LIGHT
SINGLE POLE SWITCH WITH PILOT LIGHT
DOOR SWITCH
MANUAL DIMMER
LOW VOLTAGE SELECTOR FOR LIGHTING
LOW VOLTAGE RELAY FOR LIGHTING
LOW VOLTAGE RELAY PANEL

EXIT INDICATOR

- CEILING MOUNTED EXIT LIGHT, THE ARROW SHOW THE DIRECTION
WALL MOUNTED EXIT LIGHT, THE ARROW SHOW THE DIRECTION
BATTERY UNIT NUMBER 1 WITH TWO PROJECTORS FOR EMERGENCY LIGHTING
DOUBLE HEAD PROJECTORS FOR EMERGENCY LIGHTING CONNECTED AT BATTERY UNIT NUMBER 1 ON CIRCUIT NUMBER 2

HEATING

- SHOW HEATING MODEL SEE SPECIFICATION
ELECTRICAL HEATING BASEBOARD CAPACITY OF 1000W
ELECTRICAL HEATING BASEBOARD WITH BUILT-IN THERMOSTAT
ELECTRICAL HEATING BASEBOARD WITH LOW VOLTAGE RELAY
ELECTRICAL HEATING BASEBOARD WITH TRANSFORMER AND LOW VOLTAGE RELAY
ELECTRICAL FORCE FLOW UNIT ON WALL SEMI-RECESSED OR RECESSED
ELECTRICAL FORCE FLOW UNIT ON WALL SURFACE
ELECTRICAL FORCE FLOW UNIT HEATERS OF 50W CAPACITY
RADIANT HEATERS
LOW VOLTAGE ELECTRICAL HEATING THERMOSTAT
THERMOSTAT SUPPLIED BY MECHANICAL CONTRACTOR BUT CONNECTED AND INSTALLED BY ELECTRICAL CONTRACTOR
LINE ELECTRICAL HEATING THERMOSTAT
HEATING COIL

CONDUIT AND CABLE

- EXISTING EQUIPMENT
NEW OR RELOCATED EQUIPMENT
METALLIC CONDUIT IN WALL OR CEILING, TWO NO. 12 CONDUCTORS
METALLIC CONDUIT IN FLOORS, THREE NO. 10 CONDUCTORS
METALLIC CONDUIT IN WALL OR CEILING, TWO NO. 10 CONDUCTORS
METALLIC CONDUIT IN FLOORS, THREE NO. 10 CONDUCTORS
METALLIC CONDUIT IN WALL OR CEILING, TWO NO. 8 CONDUCTORS
METALLIC CONDUIT IN FLOORS, THREE NO. 8 CONDUCTORS

FIRE ALARM

- MANUAL FIRE ALARM STATION
DUAL THERMAL DETECTOR
FIXED TEMPERATURE THERMAL DETECTOR
INDEPENDENT WARNING SMOKE DETECTOR FOR COMBUSTION PRODUCT
CEILING MOUNTED SMOKE DETECTOR
DUCT TYPE SMOKE DETECTOR
STROBE FOR FIRE ALARM SYSTEM
STROBE LAMP FOR FIRE ALARM SYSTEM
CEILING MOUNTED SMOKE DETECTOR WITH PILOT LAMP 4P/4T
DUCT TYPE SMOKE DETECTOR WITH PILOT LAMP 4P/4T
FLAME DETECTOR
SPRINKLER FLOW SWITCH BY DIVISION 15
SPRINKLER SUPERVISORY SWITCH BY DIVISION 15
FIRE-ALARM BELL
FIRE ALARM BELL PROJECTION TYPE
END OF LINE RESISTOR
FIRE ALARM PANEL
FIRE ALARM ANNUNCIATOR
FIREMANS TELEPHONE
CEILING MOUNTED FIRE ALARM SPEAKER WITH HORN
CEILING MOUNTED FIRE ALARM POWER SPEAKER
INTELLIGENT MODULE FOR FIRE ALARM

OUTLET

- 15A, 20V DUPLEX RECEPTACLE FROM NORMAL POWER
15A, 120V, TWIST LOCK DUPLEX RECEPTACLE
15A, 20V DUPLEX RECEPTACLE FROM CLEAN POWER PANEL
15A, 20V OR 240V, 1PH, 3W SINGLE RECEPTACLE
20A, 20V OR 240V, 1PH, 3W SINGLE RECEPTACLE
30A, 20V OR 240V, 1PH, 3W SINGLE RECEPTACLE
15A, 20V OR 240V, 1PH, 3W TWIST LOCK SINGLE RECEPTACLE
15A, 120V DUPLEX RECEPTACLE WITH ISOLATED GROUND
TVSS OUTLET (TRANSIENT VOLTAGE SURGE SUPPRESSOR)
TVSS OUTLET (TRANSIENT VOLTAGE SURGE SUPPRESSOR WITH ISOLATED GROUND)
TVSS OUTLET (TRANSIENT VOLTAGE SURGE SUPPRESSOR WITH LOWERS BEYONDED)
15A, 120V SINGLE RECEPTACLE
20A, 120V SINGLE RECEPTACLE
30A, 120V SINGLE RECEPTACLE
15A, 120V SINGLE RECEPTACLE FROM EMERGENCY SOURCE
15A, 120V DUPLEX RECEPTACLE WITH GROUND FAULT CIRCUIT INTERRUPTER
15A, 120V DUPLEX RECEPTACLE WITH GROUND FAULT CIRCUIT INTERRUPTER, FROM EMERGENCY SOURCE
15A, 120V DUPLEX RECEPTACLE WITH GROUND FAULT CIRCUIT INTERRUPTER FOR SUSCEPTIBLE POWER
15A, 120V DUPLEX WEATHER PROOF RECEPTACLE WITH GROUND FAULT CIRCUIT INTERRUPTER
15A, 120V DUPLEX WEATHER PROOF RECEPTACLE
15A, 120V DUPLEX RECEPTACLE FOR CLEANING
15A, 120V RECEPTACLE FOR WATER COOLER
15A, 120V DUPLEX RECEPTACLE FOR MICROWAVE OVEN
15A, 120V DUPLEX RECEPTACLE IN THE CEILING
15A, 120V DUPLEX RECEPTACLE IN THE CEILING FROM EMERGENCY SOURCE
REFRIGERATOR RECEPTACLE
15A, 120V DUPLEX RECEPTACLE ABOVE THE COUNTER
15A, 120V DUPLEX SERVICE FITTING RECEPTACLE
15A, 120V DUPLEX RECEPTACLE, BOTTOM RECEPTACLE CONTROLLED BY A SWITCH
15A, 120V DUPLEX FLOOR RECEPTACLE
15A, 120V DUPLEX RECEPTACLE IN THE CEILING FOR POLE
30A, 120V/208V OR 120V/240V 1PH, 3W RECEPTACLE FOR STOVE
30A, 120V/208V OR 120V/240V 1PH, 3W RECEPTACLE FOR DRYER

ELECTRICAL DISTRIBUTION

- PULL OR ANCHOR BOX
PULL OR ANCHOR BOX INSTALLED AT 1400mm FROM FLOOR
DIRECT CONNECTION ON THE FLOOR
DIRECT CONNECTION ON THE WALL
DIRECT CONNECTION ON THE CEILING
WALL BOX CONNECTION FOR ELECTRICAL PARTITION CONNECTION
FLOOR BOX CONNECTION FOR ELECTRICAL PARTITION CONNECTION
WALL PULL BOX FOR CABLE PASSAGE OF DATATELEPHONE FOR ELECTRICAL PARTITION
FLOOR PULL BOX FOR CABLE PASSAGE OF DATATELEPHONE FOR ELECTRICAL PARTITION
JUNCTION BOX WITH SWITCH AND BATTERY
120V, 208V OR 240V, 1 PH. MOTOR
208V, 3 PH. OR 600V, 3 PH. MOTOR
120V, 208V OR 240V, 1 PH. MOTOR, FROM EMERGENCY SOURCE
208V, 3 PH. OR 600V, 3 PH. MOTOR, FROM EMERGENCY SOURCE
208V, 3 PH. OR 600V, 3 PH. MOTOR, FROM EMERGENCY SOURCE
FUSED SAFETY SWITCH 24V OR 60V
UNFUSED SAFETY SWITCH 24V OR 60V
WEATHER PROOF SAFETY SWITCH
FUSED SAFETY SWITCH ON EMERGENCY SOURCE
220X115 V - 3 PH 4W SURFACE MOUNTED PANEL
220X115V - 3 PH, 4W RECESSED PANEL
120V/240V - 1 PH, 3P OR 120/208V - 3PH, 4W DISTRIBUTION PANEL
347/600V - 3 PH, 4W SURFACE MOUNTED PANEL
347/600V - 3 PH, 4W RECESSED PANEL
60V - 3 PH, 3W PANEL
DRY TYPE TRANSFORMER 600V - 120V/240V OR 600V - 120V/208V
MAGNETIC STARTER
MAGNETIC CONTACTOR
COMBINATION STARTER DISCONNECT SWITCH TYPE
COMBINATION MAGNETIC CONTACTOR FUSIBLE DISCONNECT SWITCH TYPE
120V, 208V, 240V OR 600V MANUEL STARTER
KEY SWITCH IN STARTER CONTROL UNIT
PUSH-BUTTON CONTROL
VARIABLE SPEED CONTROLLER OUTLET
AQUASTAT, THERMOSTAT, SOLINOID VALVE, MOTORISED DAMPER, etc.
PRESSURE SWITCH
GROUND BAR
SAFETY SWITCH
BREAKER
FUSED SAFETY SWITCH
FUSED BREAKER
ISOLATED GROUND
GENERATOR
GROUNDED TRANSFORMER
AUTOMATIC TRANSFER SWITCH
OUTLET FOR HAND DRYER
PHOTO-CELL
TIMER
DOOR BELL PUSH BUTTON
DOOR BELL
DOOR BELL TRANSFORMER
DOOR BELL WITH INTEGRAL TRANSFORMER
OUTLET FOR DISHWASHER
OUTLET FOR KITCHEN HOOD
SERVICE POLE

- 220X115 V - 3 PH 4W SURFACE MOUNTED PANEL
220X115V - 3 PH, 4W RECESSED PANEL
120V/240V - 1 PH, 3P OR 120/208V - 3PH, 4W DISTRIBUTION PANEL
347/600V - 3 PH, 4W SURFACE MOUNTED PANEL
347/600V - 3 PH, 4W RECESSED PANEL
60V - 3 PH, 3W PANEL
DRY TYPE TRANSFORMER 600V - 120V/240V OR 600V - 120V/208V
MAGNETIC STARTER
MAGNETIC CONTACTOR
COMBINATION STARTER DISCONNECT SWITCH TYPE
COMBINATION MAGNETIC CONTACTOR FUSIBLE DISCONNECT SWITCH TYPE
120V, 208V, 240V OR 600V MANUEL STARTER
KEY SWITCH IN STARTER CONTROL UNIT
PUSH-BUTTON CONTROL
VARIABLE SPEED CONTROLLER OUTLET
AQUASTAT, THERMOSTAT, SOLINOID VALVE, MOTORISED DAMPER, etc.
PRESSURE SWITCH
GROUND BAR
SAFETY SWITCH
BREAKER
FUSED SAFETY SWITCH
FUSED BREAKER
ISOLATED GROUND
GENERATOR
GROUNDED TRANSFORMER
AUTOMATIC TRANSFER SWITCH
OUTLET FOR HAND DRYER
PHOTO-CELL
TIMER
DOOR BELL PUSH BUTTON
DOOR BELL
DOOR BELL TRANSFORMER
DOOR BELL WITH INTEGRAL TRANSFORMER
OUTLET FOR DISHWASHER
OUTLET FOR KITCHEN HOOD
SERVICE POLE

MISCELLANEOUS

- OUTLET FOR HAND DRYER
PHOTO-CELL
TIMER
DOOR BELL PUSH BUTTON
DOOR BELL
DOOR BELL TRANSFORMER
DOOR BELL WITH INTEGRAL TRANSFORMER
OUTLET FOR DISHWASHER
OUTLET FOR KITCHEN HOOD
SERVICE POLE

SECURITY SYSTEM

- SECURITY CONTROL PANEL
MAGNETIC DOOR HOLDER
ELECTROMAGNET
ELECTRICAL LOCK
DOOR SUPERVISORY SENSOR
KEYBOARD
CARD READER
READING HEAD
EXIT PUSH-BUTTON
ULTRASONIC MOTION DETECTOR
INFRARED MOTION DETECTOR
POWER SUPPLY
SECURITY CAMERA
ELECTRIC DOOR CLOSER
ELECTRIC STRIKE
SECURITY BELL
AMPLIFIER
INTERCOMMUNICATION SECONDARY STATION
INTERCOMMUNICATION MASTER STATION
AUDIBLE SIGNAL
MICROPHONE OUTLET
WALL MOUNTED SPEAKER
CONTROL VOLUME OUTLET
CEILING MOUNTED SPEAKER
HORN TYPE SPEAKER
AUDIO RECEPTACLE

INTERCOMMUNICATION

- AMPLIFIER
INTERCOMMUNICATION SECONDARY STATION
INTERCOMMUNICATION MASTER STATION
AUDIBLE SIGNAL
MICROPHONE OUTLET
WALL MOUNTED SPEAKER
CONTROL VOLUME OUTLET
CEILING MOUNTED SPEAKER
HORN TYPE SPEAKER
AUDIO RECEPTACLE

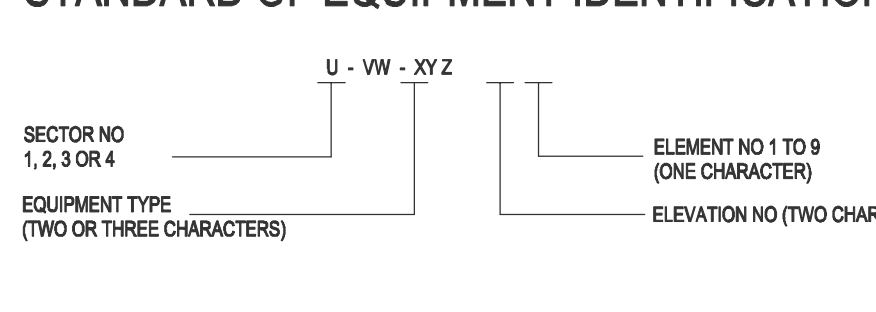
COMMUNICATION

- WALL MOUNTED DATA OUTLET
DATA OUTLET ABOVE THE COUNTER
TELEPHONE DATA OUTLET
TELEPHONE DATA OUTLET ABOVE THE COUNTER
TELEPHONE OUTLET
TELEPHONE OUTLET ABOVE THE COUNTER
PUBLIC TELEPHONE OUTLET
TELEPHONE OUTLET FOR FAX
TELEPHONE OUTLET FOR MOBILE
TELEPHONE RECESSED FLOOR OUTLET
TELEPHONE SURFACE FLOOR OUTLET
TELEPHONE OUTLET INSTALLED AT 1400 FROM FLOOR
TELEPHONE CONDUIT
FLAT CABLE UNDER CARPET FOR TELEPHONE
CABLE DISTRIBUTION OUTLET

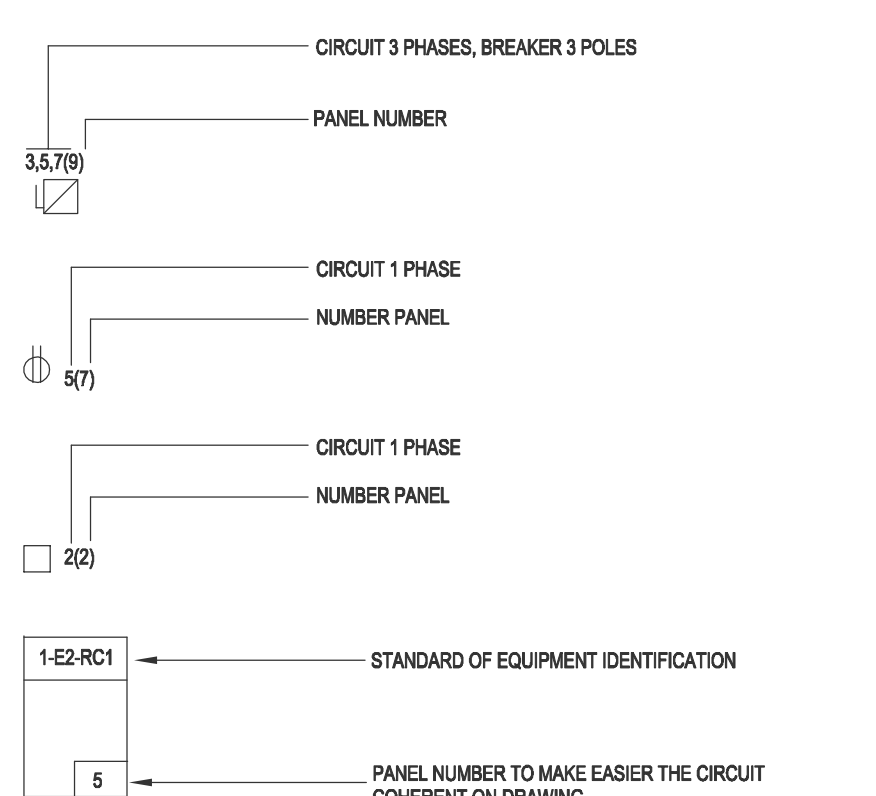
IDENTIFICATION

- PB POWER BAR RECEPTACLE
AE TO REMOVE
AC TO KEEP
AD TO RELOCATE
N NEW
ED EXISTING EQUIPMENT RELOCATED
ER EXISTING EQUIPMENT REPLACED AND CONNECTED ON EXISTING CIRCUIT
EC EXISTING TO KEEP
ETM EXISTING TO MODIFY
EM EXISTING MODIFIED
NM MOUNTING HEIGHT FROM ABOVE FINISH FLOOR
SF UNUSABLE
IB DOWN
EH UP
WP WEATHERPROOF
EXISTING
NEW
DETAIL NUMBER REFERENCE
SHEET NUMBER REFERENCE

STANDARD OF EQUIPMENT IDENTIFICATION



- AF: CABINET FOR FIRE ALARM CONNECTION
AP: PRINCIPAL FEEDERS, NORMAL SOURCE
AU: PRINCIPAL FEEDER, EMERGENCY SOURCE
AD: SPLITTER DISTRIBUTION, NORMAL SOURCE
ADU: SPLITTER DISTRIBUTION, EMERGENCY SOURCE
A2: 120/208V SERVICES PANEL, UPS SOURCE
BN: BUS BAR, NORMAL SOURCE
BU: BUS BAR, EMERGENCY SOURCE
BB: DIRECT CONNECTION BOX
CO: CONTACTOR
COU: CONTACTOR, EMERGENCY SOURCE
CD: DISTRIBUTION CENTER
CDU: DISTRIBUTION CENTER, EMERGENCY SOURCE
C1: 120 V CC ACCUMULATOR CABINET
C2: 24 V CC ACCUMULATOR CABINET
CN: MOTOR COMMAND CENTER, NORMAL SOURCE
CU: MOTOR COMMAND CENTER, EMERGENCY SOURCE
DN: INDIVIDUAL STARTER, NORMAL SOURCE
DU: INDIVIDUAL STARTER, EMERGENCY SOURCE
DI: BREAKER, NORMAL SOURCE
DUJ: BREAKER, EMERGENCY SOURCE
D2: 120/208 V DISTRIBUTION PANEL, NORMAL SOURCE
D3: 347/600 V DISTRIBUTION PANEL, NORMAL SOURCE
E2: 60/600V PANEL, NORMAL SOURCE
E3: 347/600V SERVICES PANEL, NORMAL SOURCE
FP: POWER FACTOR CORRECTION CONDENSER
GR: GENERATOR SET
GD: DRIVERS CABINET, NORMAL SOURCE
GU: DRIVERS CABINET, EMERGENCY SOURCE
G2: 120/208V DISTRIBUTION PANEL, EMERGENCY SOURCE
OR: 347/600 V DISTRIBUTION PANEL, EMERGENCY SOURCE
MD: ENERGY METER
ME: MEASURING CELL
PE: MAIN SWITCH GEAR
PT: TRANSFORMATION STATION
PE: PERIPHERAL CABINET FOR FIRE ALARM SYSTEM
RE: RELAY CABINET
RE: SAFETY SWITCH, NORMAL SOURCE
RU: SAFETY SWITCH, EMERGENCY SOURCE
TS: LOW VOLTAGE BOARD
TR: TRANSFORMER, NORMAL SOURCE
TU: TRANSFORMER, EMERGENCY SOURCE
U2: 120/208V SERVICES PANEL, EMERGENCY SOURCE
U3: 347/600V SERVICES PANEL, EMERGENCY SOURCE



STANDARD OF ZONE IDENTIFICATION

- SECTOR NO. 1, 2, 3 OR 4
SYSTEM OF TYPE (ONE OR TWO CHARACTERS)
ZONE NO (ONE CHARACTER)
ELEVATION NO. (TWO CHARACTERS)
A: FIRST STEP ALARM - FIRE
AS: GENERAL ALARM - FIRE
C: COMMUNICATION - FIRE
T: TELEPHONE - FIRE

DRAWING LIST

Table with 3 columns: Item No., Description, and Status. Includes items E-01 to E-015 such as 'LEGEND AND DRAWING LIST', 'EXISTING ELECTRICAL DIAGRAM', 'NEW ELECTRICAL DIAGRAM', etc.

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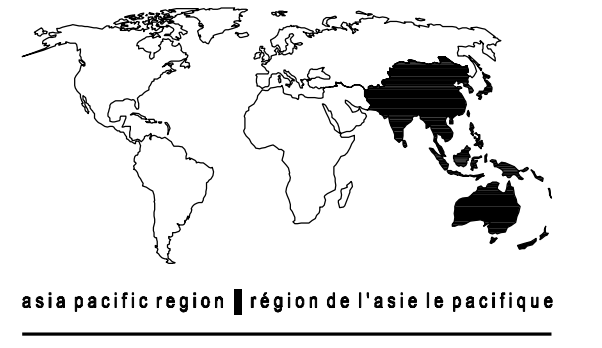
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project north / nord à gauche / true north / nord exact

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revision description date / révisé / révision description date / index



CANADIAN HIGH COMMISSION EMBASSY

CHANCERY PHASE 2 HVAC UPGRADE

718 SHANTIPATH, CHANAKYAPUR

drawing file / titre du dessin

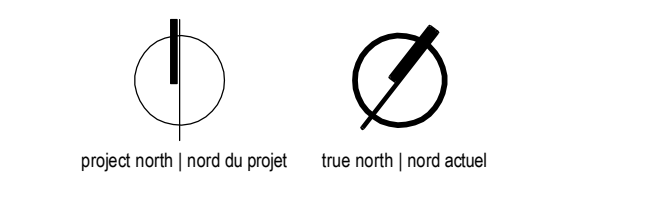
LEGEND AND DRAWING LIST

checked / vérifié
designed by / conçu par G. LABELLE
drawn by / dessiné par C. MATHIEU
approved by / approuvé par P. HANDEU
property number / numéro de programme 522-0-070
scale / échelle NONE
date / date 2020-09-24
sheet number / numéro de la page 1 of 15
drawing number / numéro du dessin

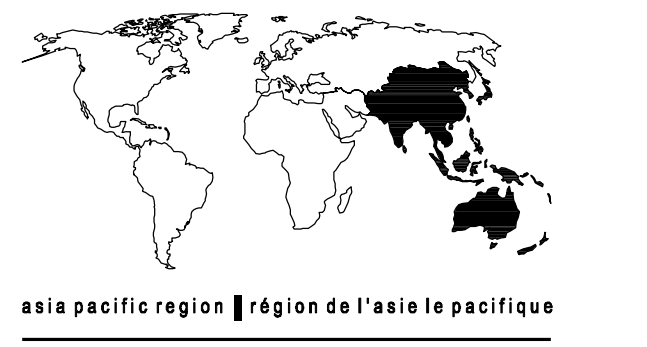
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asia pacific region / région de l'asie du pacifique

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CANADIAN HIGH COMMISSION / EMBASSY

CHANCERY PHASE 2 HVAC UPGRADE

718 SHANTIPATH, CHANAKYAPUR

Drawing file / titre du dessin

EXISTING ELECTRICAL DIAGRAM

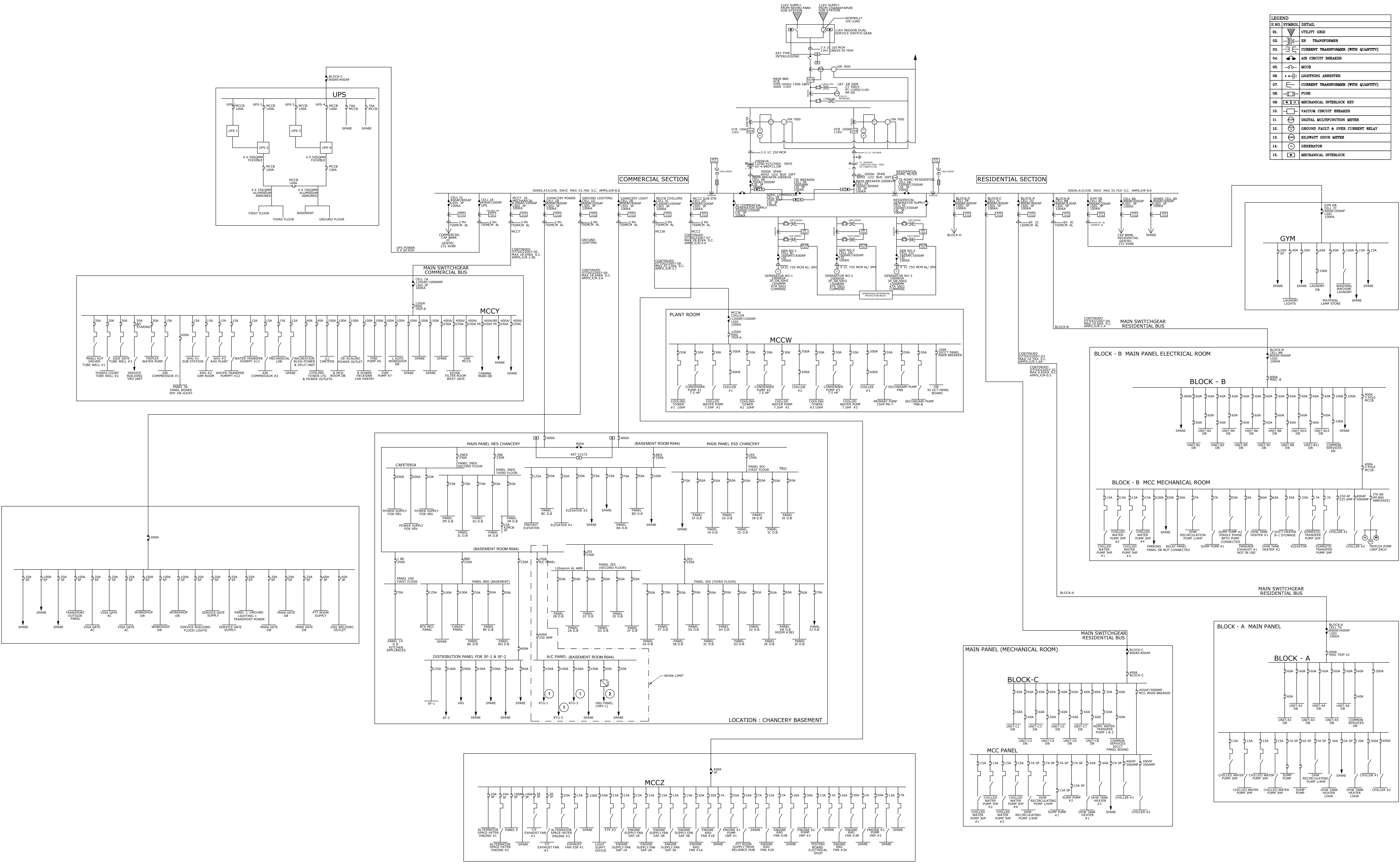
drawing number / numéro du dessin

PBA ARD-533-15-ED-EQ-PRS_1P.0

- GENERAL NOTES:**
(UNLESS OTHERWISE INDICATED)
- A- REMOVE LOADS FROM WORKING FEEDERS FROM EACH EQUIPMENT.
- SPECIFIC NOTES:**
- 1- DISCONNECT THE EQUIPMENT ON THE ROOF AND FEED CABINETS FOR NEW EQUIPMENT CONNECTION.
 - 2- DISCONNECT CABLING AT THE BREAKER PANEL, DISCONNECT CONNECTION CABLING AT THE EQUIPMENT, REMOVE FEEDERS FROM THE ROOF, REMOVE FEEDERS FROM THE FEEDER CABINETS, IN EXISTING PANELS AND ON THE ROOF, DISCONNECT AND REMOVE WORKING FEEDERS.

LEGEND

S.N.O.	SYMBOL	DETAIL
01.	⚡	UTILITY GRID
02.	⚡	3X TRANSFORMER
03.	⚡	CURRENT TRANSFORMER (WITH QUANTITY)
04.	⚡	AIR CIRCUIT BREAKER
05.	⚡	MCCB
06.	⚡	LIGHTNING ARRESTER
07.	⚡	CURRENT TRANSFORMER (WITH QUANTITY)
08.	⚡	FUSE
09.	⚡	MECHANICAL INTERLOCK KEY
10.	⚡	VACUUM CIRCUIT BREAKER
11.	⚡	DIGITAL MULTIFUNCTION METER
12.	⚡	GROUND FAULT & OVER CURRENT RELAY
13.	⚡	KILOWATT HOUR METER
14.	⚡	GENERATOR
15.	⚡	MECHANICAL INTERLOCK



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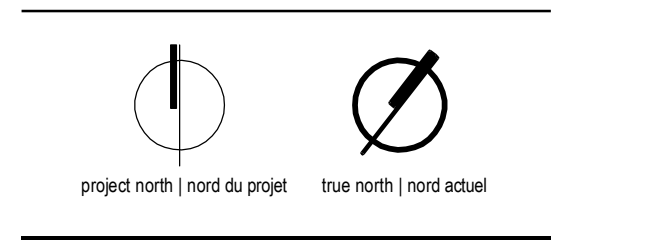
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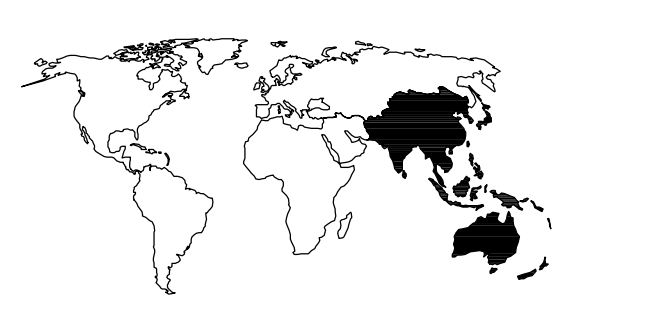
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asia pacific region / région de l'asie le pacifique

PROJECT TITLE / titre du projet

CANADIAN HIGH COMMISSION EMBASSY CHANCERY PHASE 2 HVAC UPGRADE 718 SHANTIRATH CHANKARYAPURI

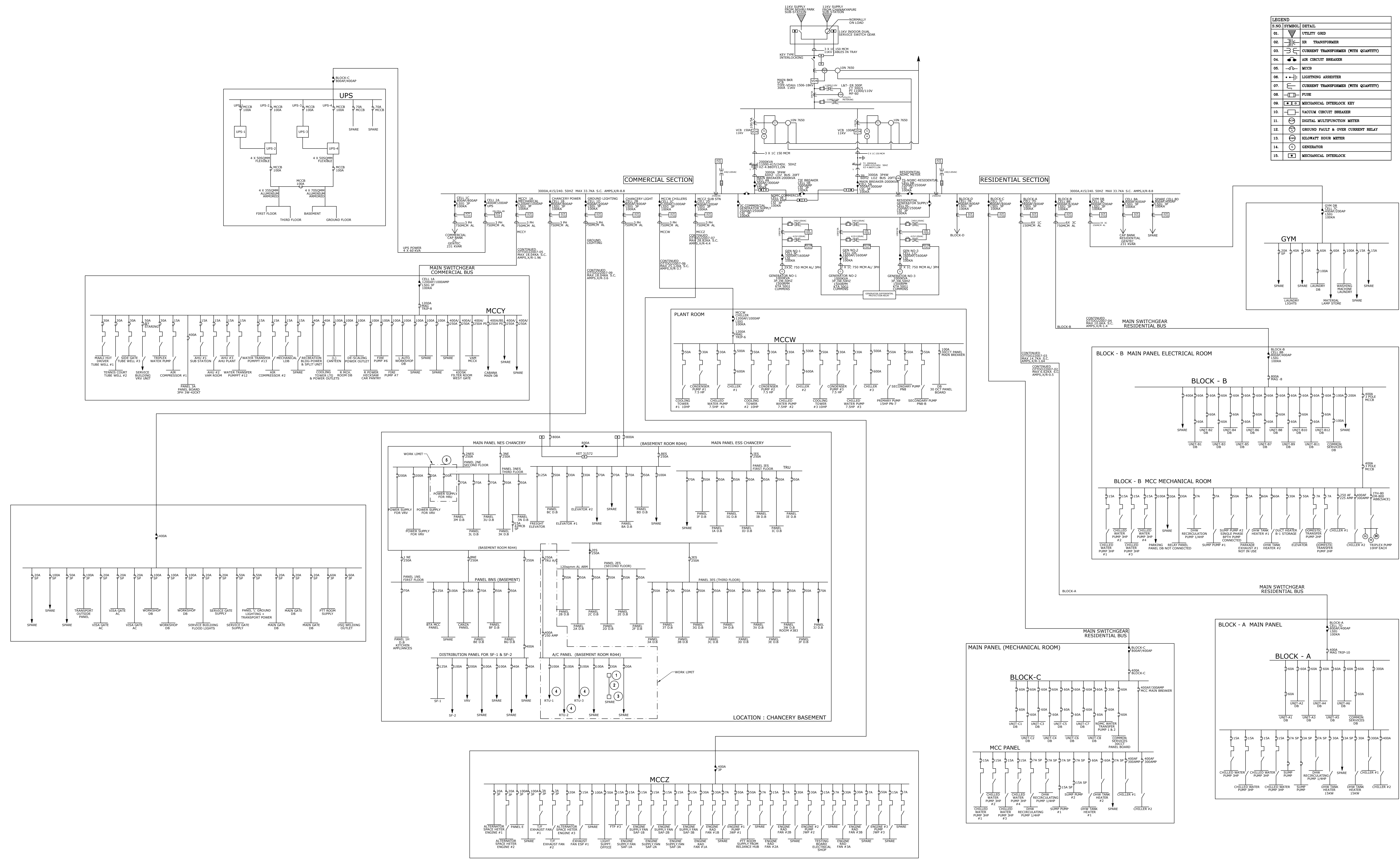
Drawing title / numéro du dessin

NEW ELECTRICAL DIAGRAM

architect / architecte: G. LABELLE; designed by / conçu par: C. NEARNEY; drawn by / dessiné par: P. HASECV; approved by / approuvé par: P. HASECV; property number / numéro de propriété: 522-0-033; scale / échelle: NONE; sheet / date: 2020-02-24; sheet number / numéro de la page: 3 of 10; drawing number / numéro du dessin: PBA-ARD-533-15-EQS-EQ-PRS - 06

- SPECIFIC NOTES: 1. JUNCTION BOX INSTALL IN ELECTRICAL ROOM; 2. EXISTING CABLING TO KEEP IN SHT; 3. JUNCTION BOX INSTALL ON THE ROOF; 4. REUSE EXISTING CABLES FOR NEW EQUIPMENT CONNECTION; 5. PROVIDE INSTALL AND CONNECT NEW BREAKERS, 650A, 3 POLE, 100% PANEL TIGHT TO 25 SEVER FOR NEW FEEDER.

LEGEND table with 15 rows of symbols and descriptions: 01. OVERCUT CABLE, 02. TRANSFORMER, 03. CURRENT TRANSFORMER (WITH QUANTITY), 04. AIR CIRCUIT BREAKER, 05. MCCB, 06. LIGHTNING ARRESTER, 07. CURRENT TRANSFORMER (WITH QUANTITY), 08. PUMP, 09. MECHANICAL INTERLOCK KEY, 10. VACUUM CIRCUIT BREAKER, 11. DIGITAL MULTIFUNCTION METER, 12. GROUND FAULT & OVER CURRENT RELAY, 13. KILOWATT HOUR METER, 14. GENERATOR, 15. MECHANICAL INTERLOCK





GENERAL NOTES:
(UNLESS OTHERWISE INDICATED)

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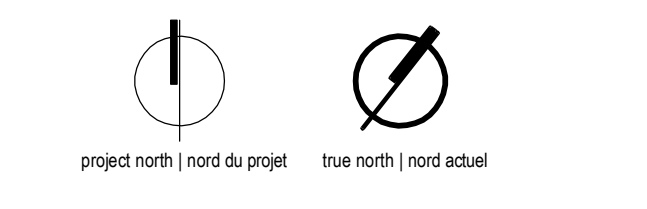
B- THE EXISTING LIGHTING AND SERVICES BASEMENT SHALL BE IDENTIFIED AS SUCH ON THE DRAWINGS AND IDENTIFIED ON THE DRAWINGS AND IDENTIFIED ON THE DRAWINGS.

Foreign Affairs, Trade and
Development Canada / Affaires étrangères, Commerce
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project title / titre du projet

CANADIAN HIGH COMMISSION / EMBASSY

**CHANCERY
PHASE 2 HVAC UPGRADE**

718 SHANTIPATH, CHANAKYAPUR

Drawing title / titre du dessin

**EXISTING
LIGHTING AND SERVICES
BASEMENT**

architect / architecte	
designed by / conçu par	G. LABELLE
drawn by / dessiné par	C. SEMETU
approved by / approuvé par	P. HARVEY
property number / numéro de propriété	523-070
scale / échelle	1:100
date / date	2020-09-24
sheet number / numéro de la page	4 of 13
drawing number / numéro du dessin	

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(UNLESS OTHERWISE INDICATED)

A- BEFORE BEGINNING WORK, CONTRACTOR SHOULD VERIFY ALL EXISTING AND EXPOSED THE EXISTING CONDITIONS. THIS DRAWING IS FOR INFORMATION PURPOSES ONLY.

B- THE EXISTING LIGHTING SHOWN ON THE DRAWING ARE EXISTING. IF ANY REVISIONS ARE REQUIRED, CONTRACTOR SHALL PROVIDE THE APPROPRIATE CIRCULAR BREAKER IDENTIFICATION SHEET.

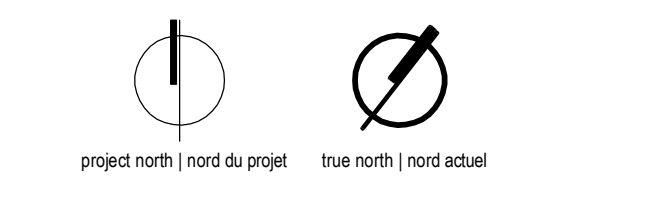
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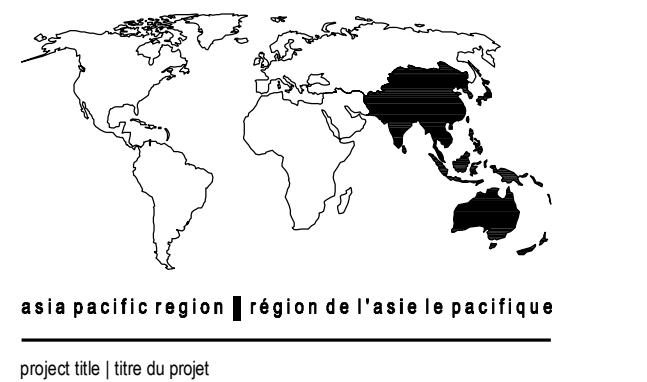
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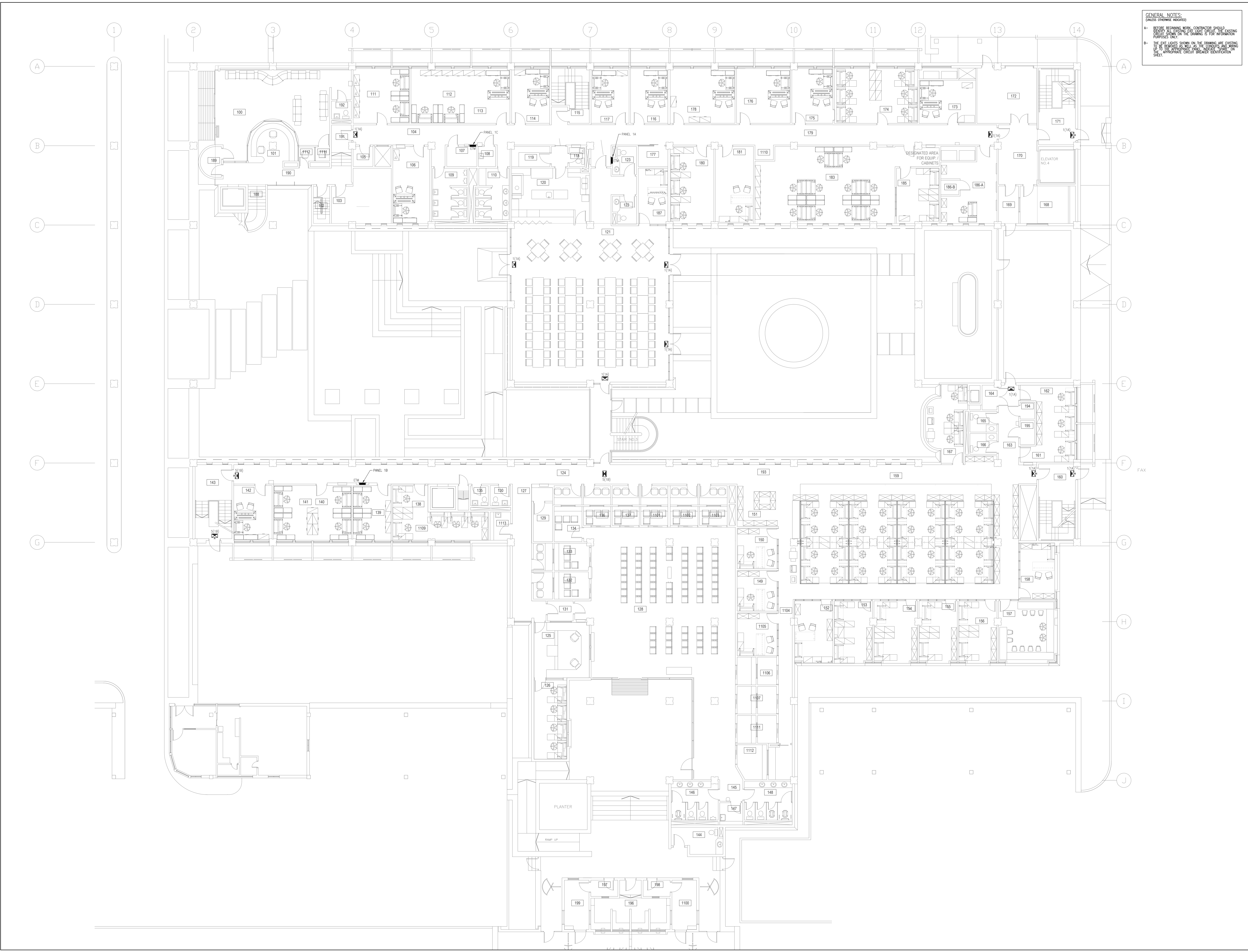
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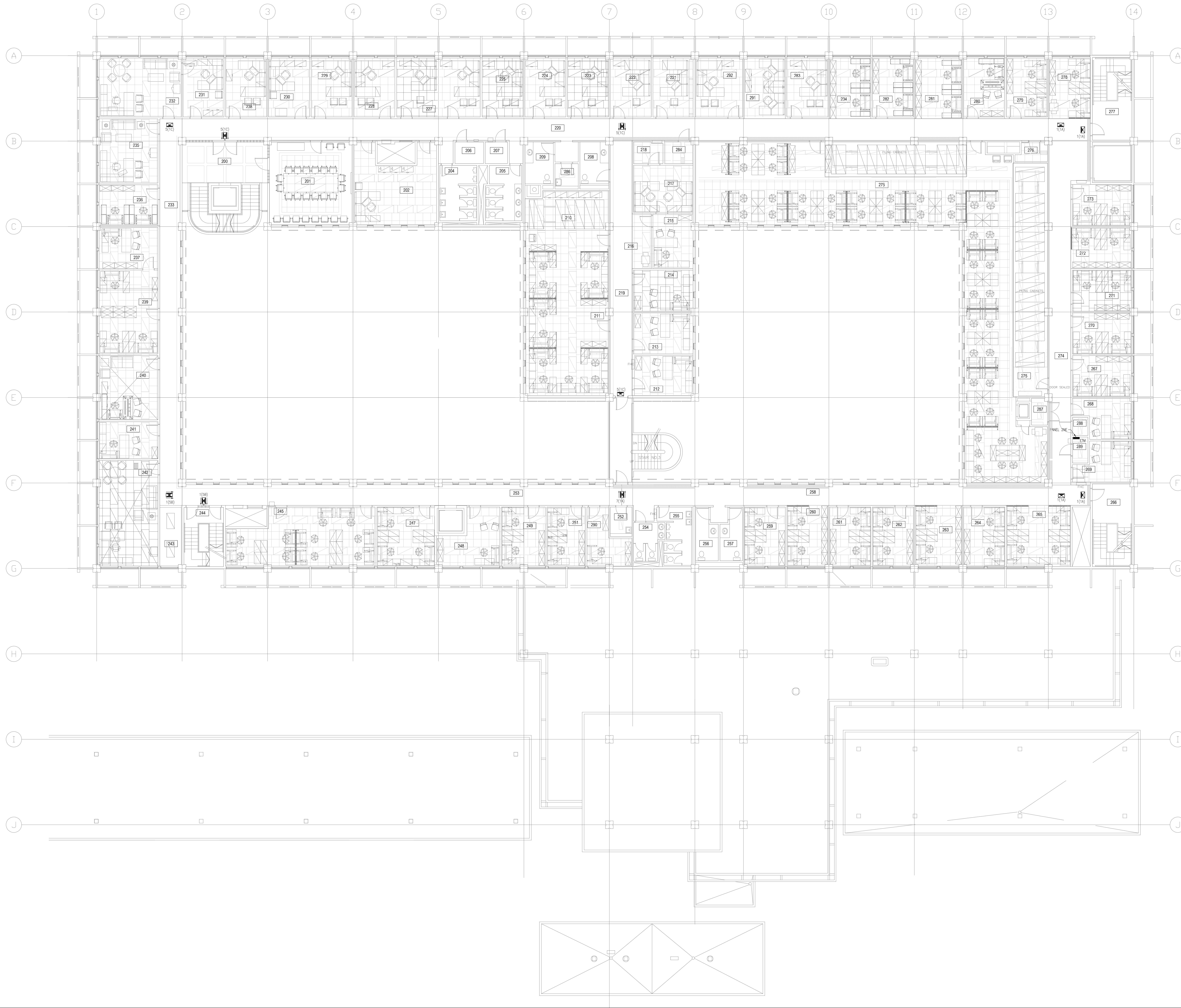


CANADIAN HIGH COMMISSION / EMBASSY
CHANCERY
PHASE 2 HVAC UPGRADE
78 SHANTIPATH, CHANNAYAPUR

EXISTING LIGHTING
GROUND FLOOR

architect / architecte
designed by / conçu par C. LABELLE
drawn by / dessiné par C. SHERATI
approved by / approuvé par M. HANDEE
property number / numéro de propriété 522-0-079
scale / échelle 1:500
date / date 2020-09-24
sheet number / numéro de la page 5 of 15
drawing number / numéro du dessin
PBA ARD-533-15-E06-EQ-PRS_P.01





GENERAL NOTES:
(UNLESS OTHERWISE NOTED)

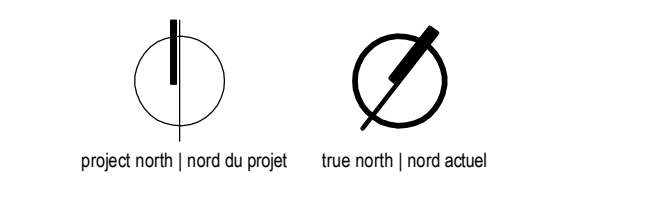
A- BEFORE BEGINNING WORK, CONTRACTOR SHOULD VERIFY ALL EXISTING FLOOR LEVELS, EXISTING FLOOR FINISHES, AND THE QUALITY OF THE WORKMANSHIP.

B- THE EXISTING LIGHTS SHOWN ON THE DRAWING ARE EXISTING TO BE REMOVED AND ALL THE EXISTING LIGHTS AND WIRING TO BE DISCONNECTED AND REMOVED AT THE APPROPRIATE CIRCUIT BREAKER LOCATION ON SHEET.

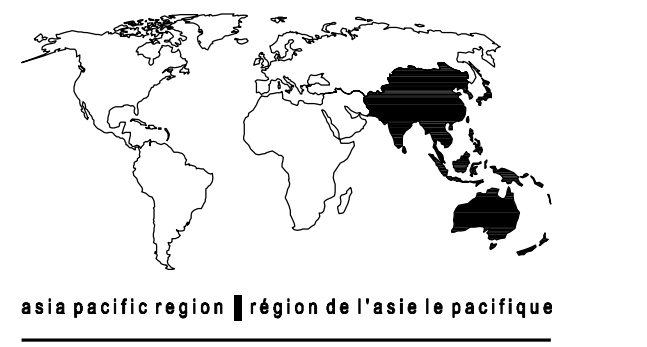
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Version	Description	Date	Initial	Revision	Description	Date	Initial
1							



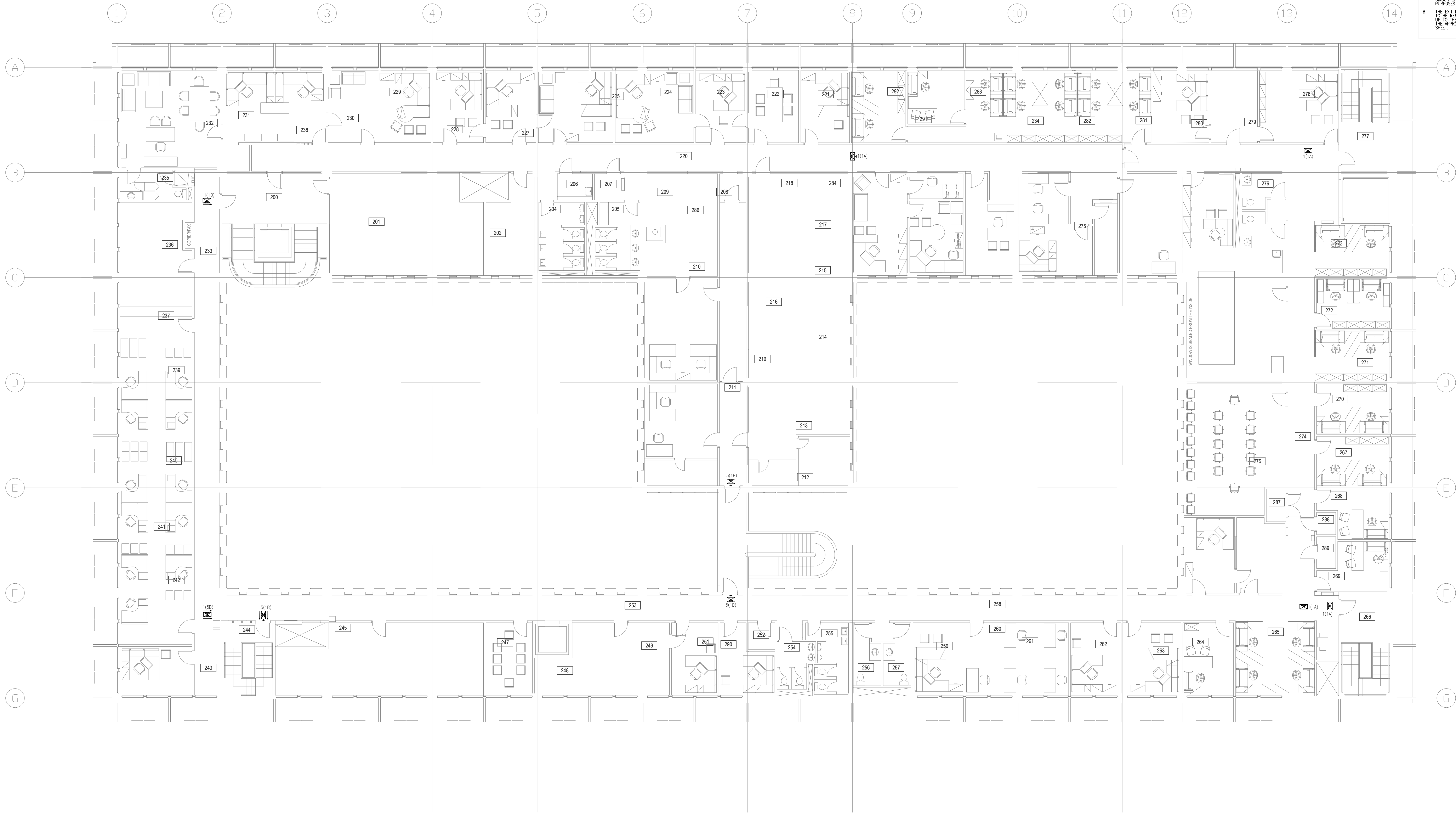
CANADIAN HIGH COMMISSION / EMBASSY
**CHANCERY
PHASE 2 HVAC UPGRADE**
78 SHANTIPATH, CHANNAYAPUR

**EXISTING
LIGHTING AND SERVICES
SECOND FLOOR AND ROOF**

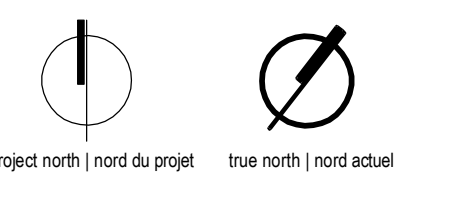
architect / architecte	
designed by / conçu par	G. LABELLE
drawn by / dessiné par	C. NEEMTU
approved by / approuvé par	P. HANDEY
property number / numéro de propriété	522-0-070
scale / échelle	1:100
date / date	2020-09-24
sheet number / numéro de la page	6 of 15
drawing number / numéro du dessin	

GENERAL NOTES:
(UNLESS OTHERWISE INDICATED)

- A- BEFORE BEGINNING WORK, CONTRACTOR SHOULD
VERIFY ALL EXISTING FIELD DIMENSIONS FOR EXISTING
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- B- THE DIMENSIONS SHOWN ON THE DRAWING ARE FINISHED
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revision	description	date	initial	revision	description	date	initial



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project title / titre du projet

CANADIAN HIGH COMMISSION / EMBASSY

CHANCERY
PHASE 2 HVAC UPGRADE

718 SHANEPATH, CHANNAYAPUR

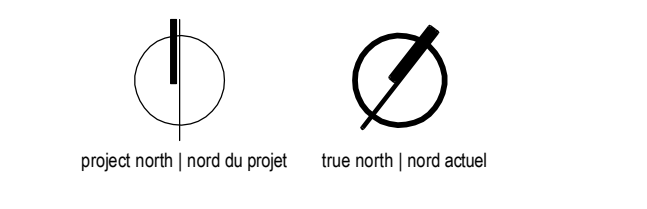
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EXISTING
LIGHTING
THIRD FLOOR

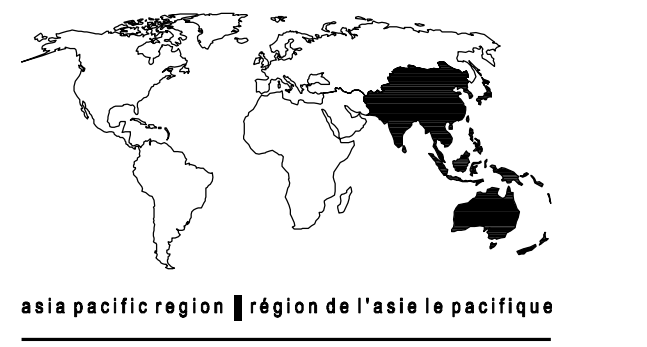
architect / architecte	
designed by / conçu par	G. LABELLE
drawn by / dessiné par	C. NEEMTU
approved by / approuvé par	P. HANDEE
property number / numéro de propriété	522-0-070
scale / échelle	1:100
date / date	2020-09-24
sheet number / numéro de la page	7 of 13
drawing number / numéro du dessin	



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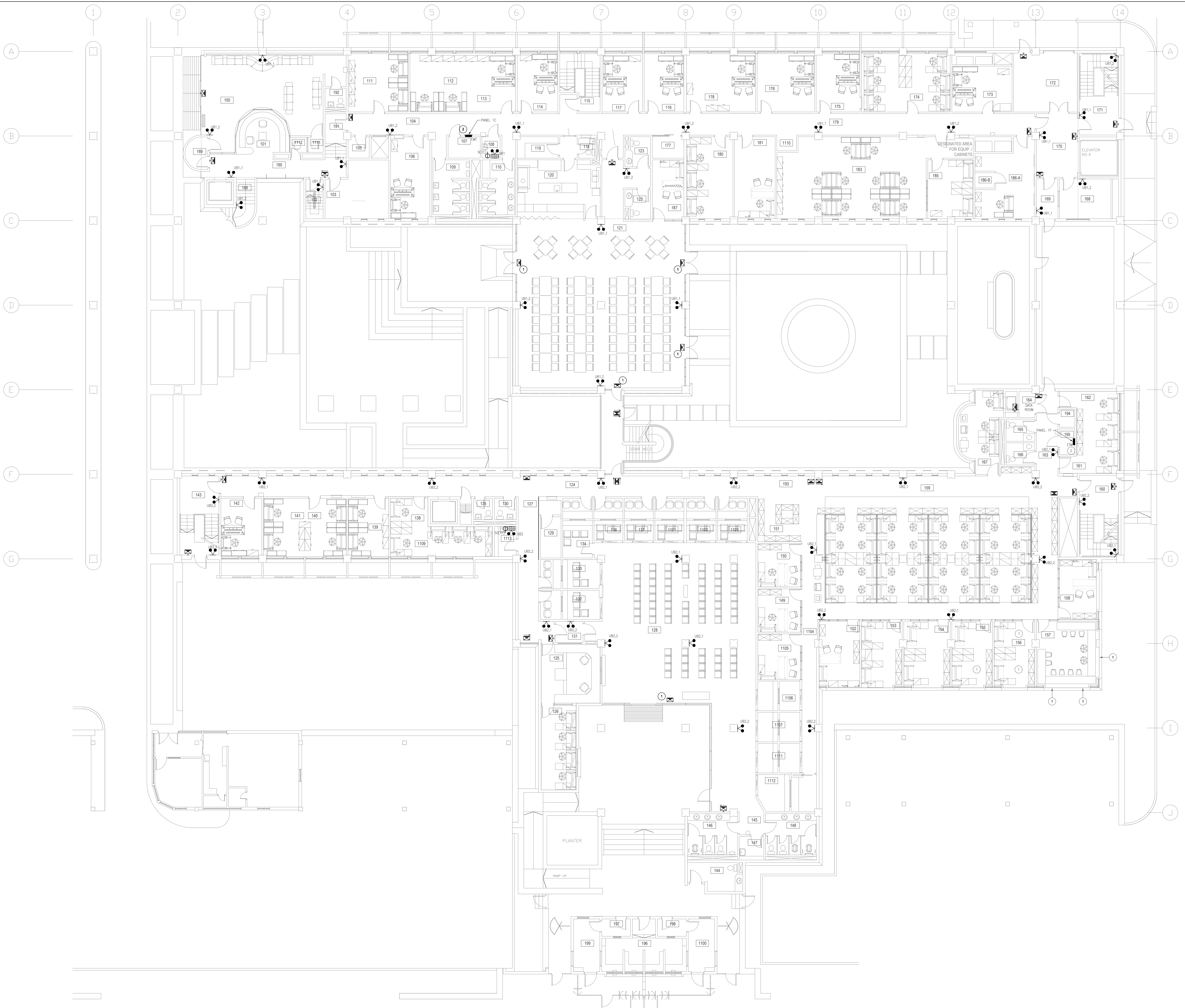
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**CHANCERY
PHASE 2 HVAC UPGRADE**

718 SHANTIPATH, CHANNAYAPUR

**NEW LAYOUT
LIGHTING
BASEMENT**

architect / architecte	
designed by / conçu par	G. LABELLE
drawn by / dessiné par	C. NEAMEL
approved by / approuvé par	P. HANEY
property number / numéro de propriété	522-0-010
scale / échelle	1:100
date / date	2020-02-24
sheet number / numéro de la page	8 of 15
drawing number / numéro du dessin	PBA-ARD-333-15-EQ-EQ-PRJ -r01



SPECIFIC NOTES:

- INSTALL SUSPENDED WITH CONDUIT FROM CEILING
- USE EXISTING 15A BREAKER FOR BATTERY POWER

Foreign Affairs, Trade and Development Canada / Affaires étrangères, Commerce et Développement Canada

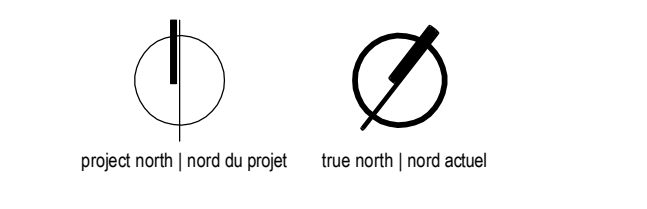
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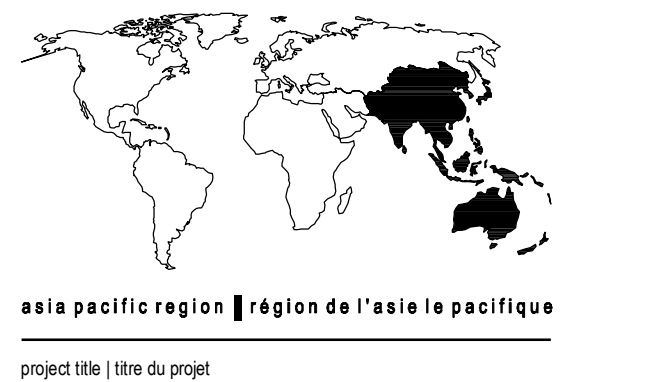
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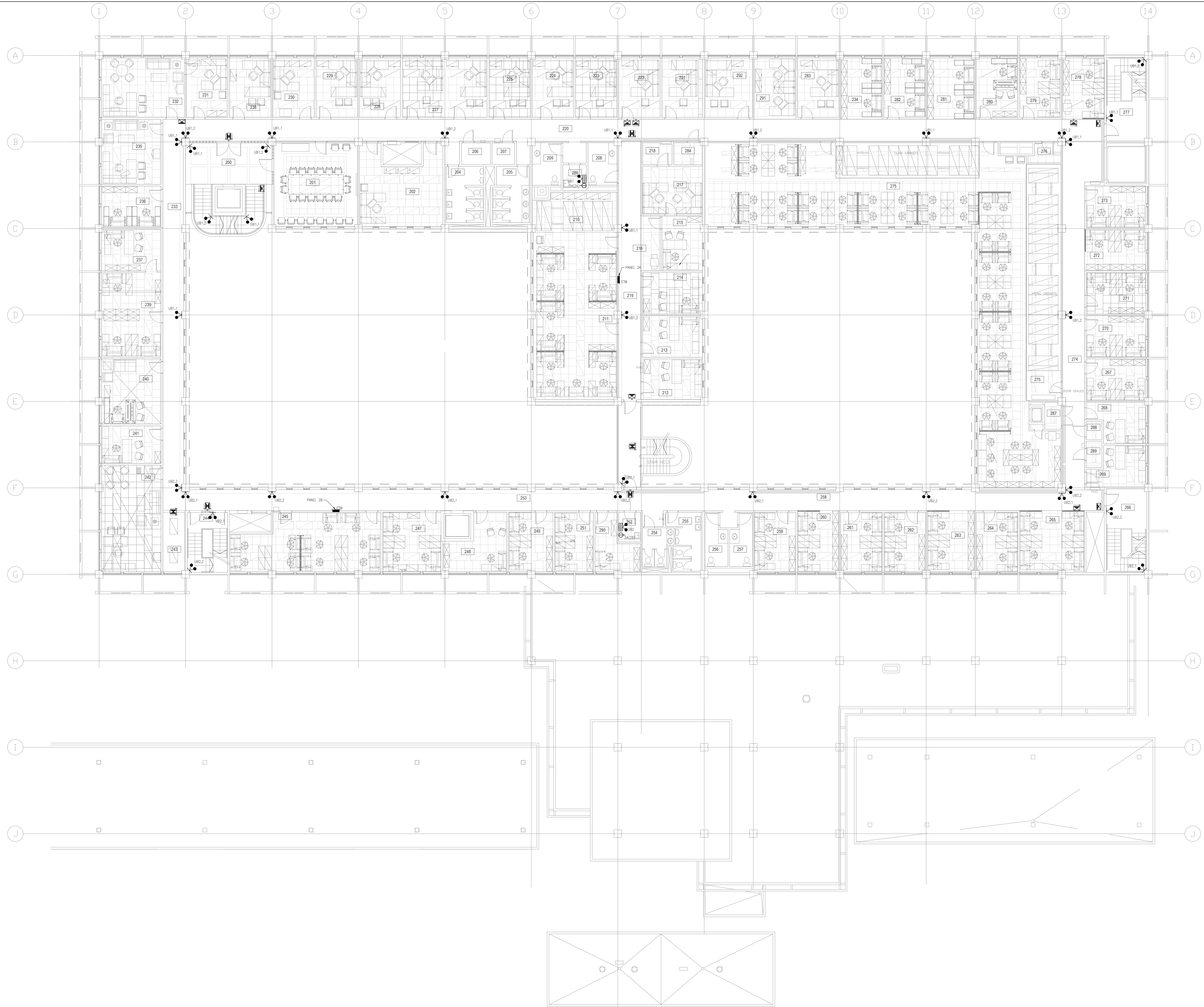
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CANADIAN HIGH COMMISSION / EMBASSY
**CHANCERY
 PHASE 2 HVAC UPGRADE**
 78 SHANTIPATH, CHANDIGARH

**NEW LAYOUT
 LIGHTING
 GROUND FLOOR**

architect / architecte
 designed by / conçu par G. LABELLE
 drawn by / dessiné par C. MEYER
 approved by / approuvé par P. HARDY
 property number / numéro de propriété 522-0-070
 scale / échelle 1:200
 date / date 2020-02-24
 sheet number / numéro de la page 9 of 15
 drawing number / numéro du dessin
 PBA ARD-533-15-E09-EQ-PRS .rvt 0



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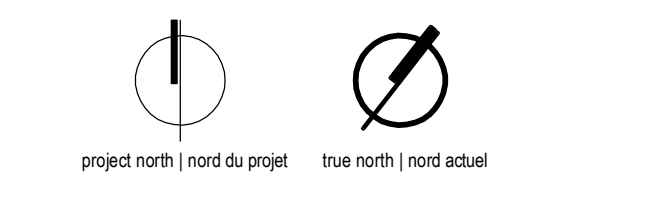
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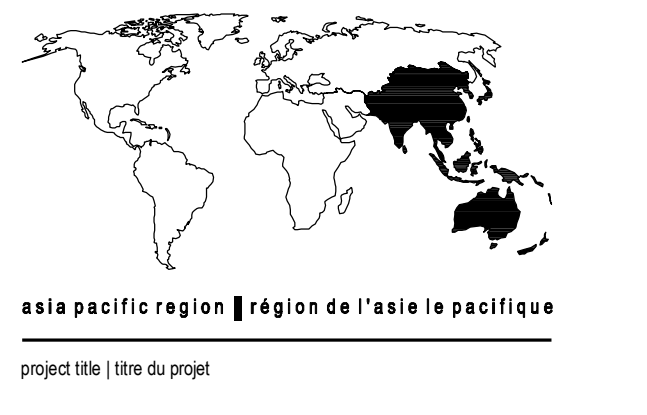
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revision	description / date / révisé / révision / description / date / révisé

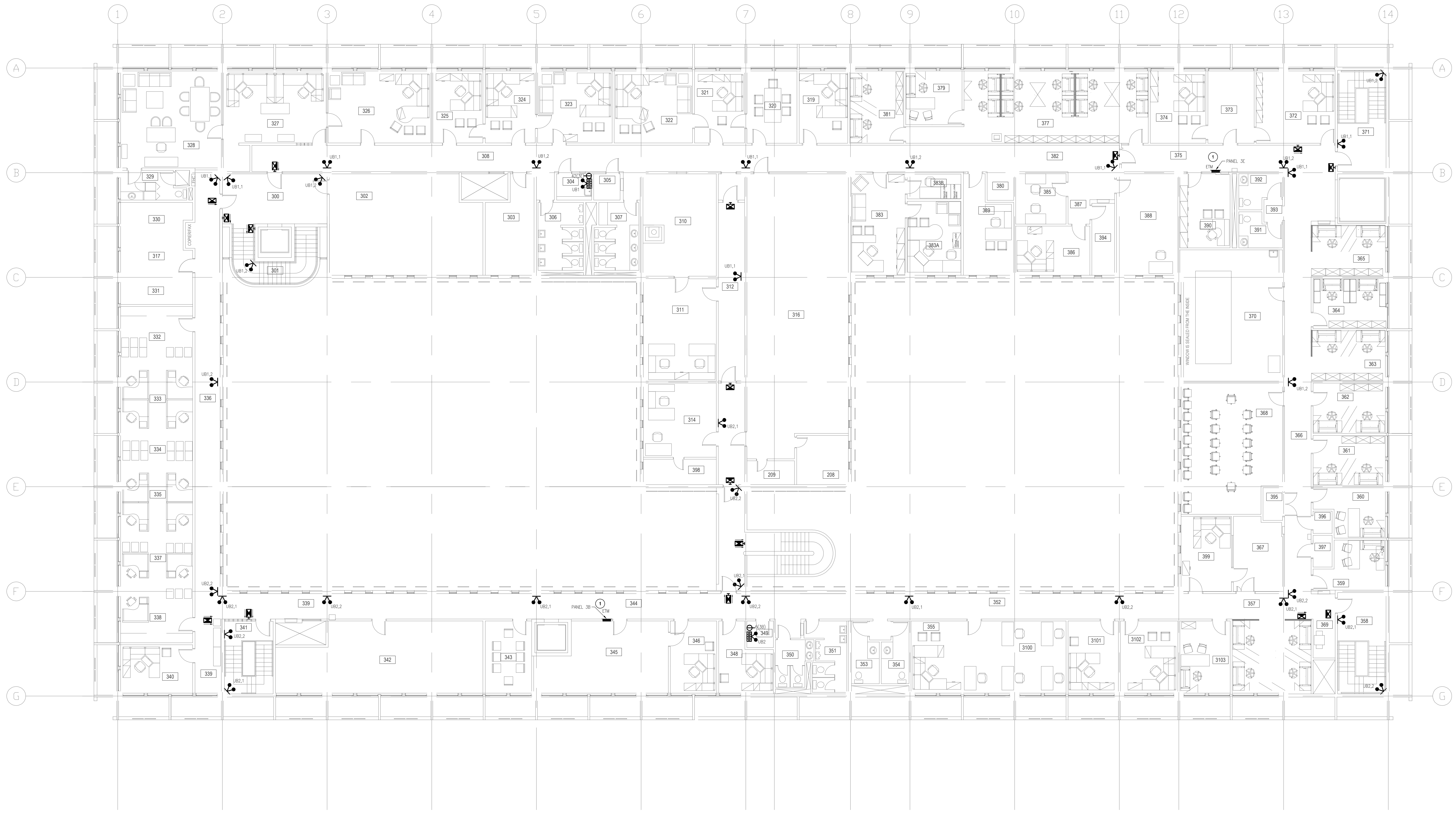


CHANCERY
PHASE 2 HVAC UPGRADE
718 SHANTIPATH, CHANNAYAPUR
Drawing file / titre du dessin

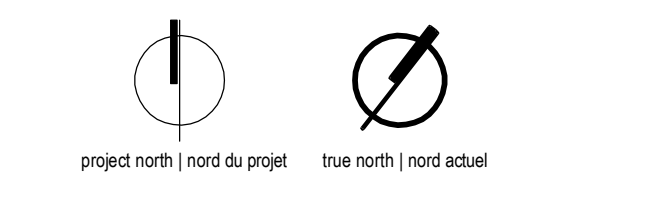
NEW LAYOUT
LIGHTING
SECOND FLOOR

architect / architecte	
designed by / conçu par	G. LABELLE
drawn by / dessiné par	C. NEEMTSU
approved by / approuvé par	P. HARDY
property number / numéro de propriété	522-0-020
scale / échelle	1:100
date / date	2020-09-25
sheet number / numéro de la page	13 of 15
drawing number / numéro du dessin	

SPECIFIC NOTES:
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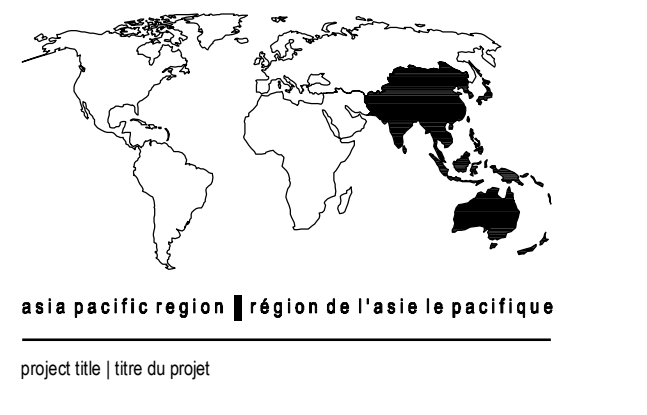


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CANADIAN HIGH COMMISSION / EMBASSY
CHANCERY
PHASE 2 HVAC UPGRADE
7/8 SHANTIPATH, CHANNAYAPUR

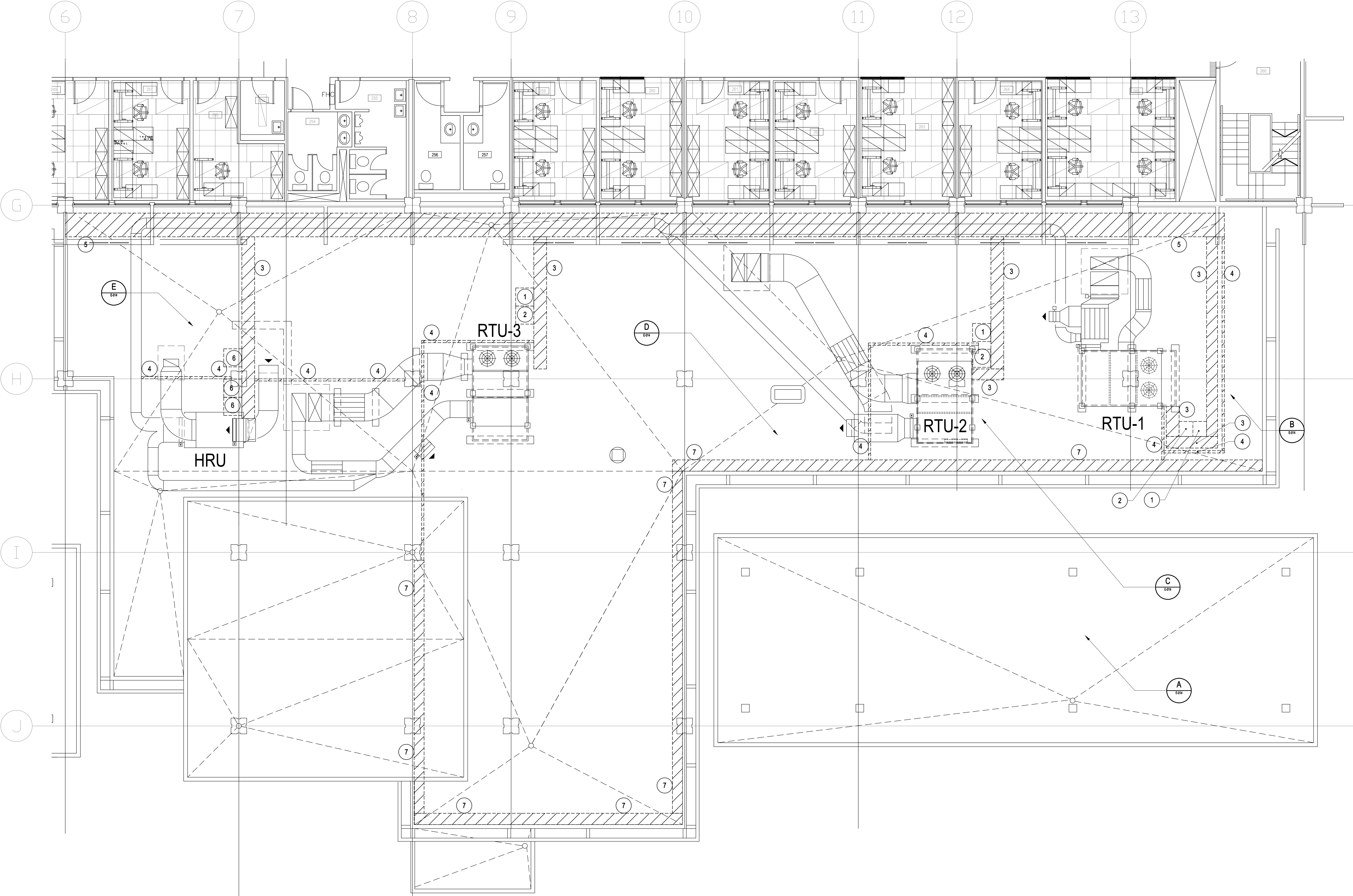
NEW LAYOUT
LIGHTING
THIRD FLOOR

architect / architecte	
designed by / conçu par	G. LABELLE
drawn by / dessiné par	C. NEAMEL
approved by / approuvé par	P. HARVEY
property number / numéro de projet	522-0-070
scale / échelle	1:100
date / date	2020-02-24
sheet number / numéro de la page	11 of 15
drawing number / numéro du dessin	

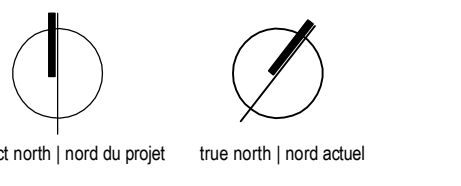
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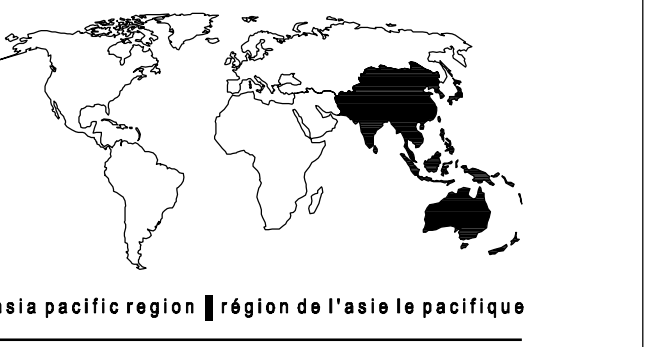
- SPECIFIC NOTES:**
- 1 JUNCTION BOX TO BE REMOVED
 - 2 TRANSFORMERS BOX TO BE REMOVED
 - 3 EXISTING CABLE TRAY FOR POWER TO BE REMOVED
 - 4 EXISTING CABLE TRAY FOR CONTROL TO BE REMOVED
 - 5 MAIN CABLE TRAY TO BE KEPT
 - 6 CIRCUIT BREAKER BOX TO BE REMOVED
 - 7 CABLE TRAY FOR CONTROL TO BE KEPT



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ISSUED FOR TENDER	2020-09-15						
Revision	P.1						
reason	description	date	initial	revision	description	date	initial

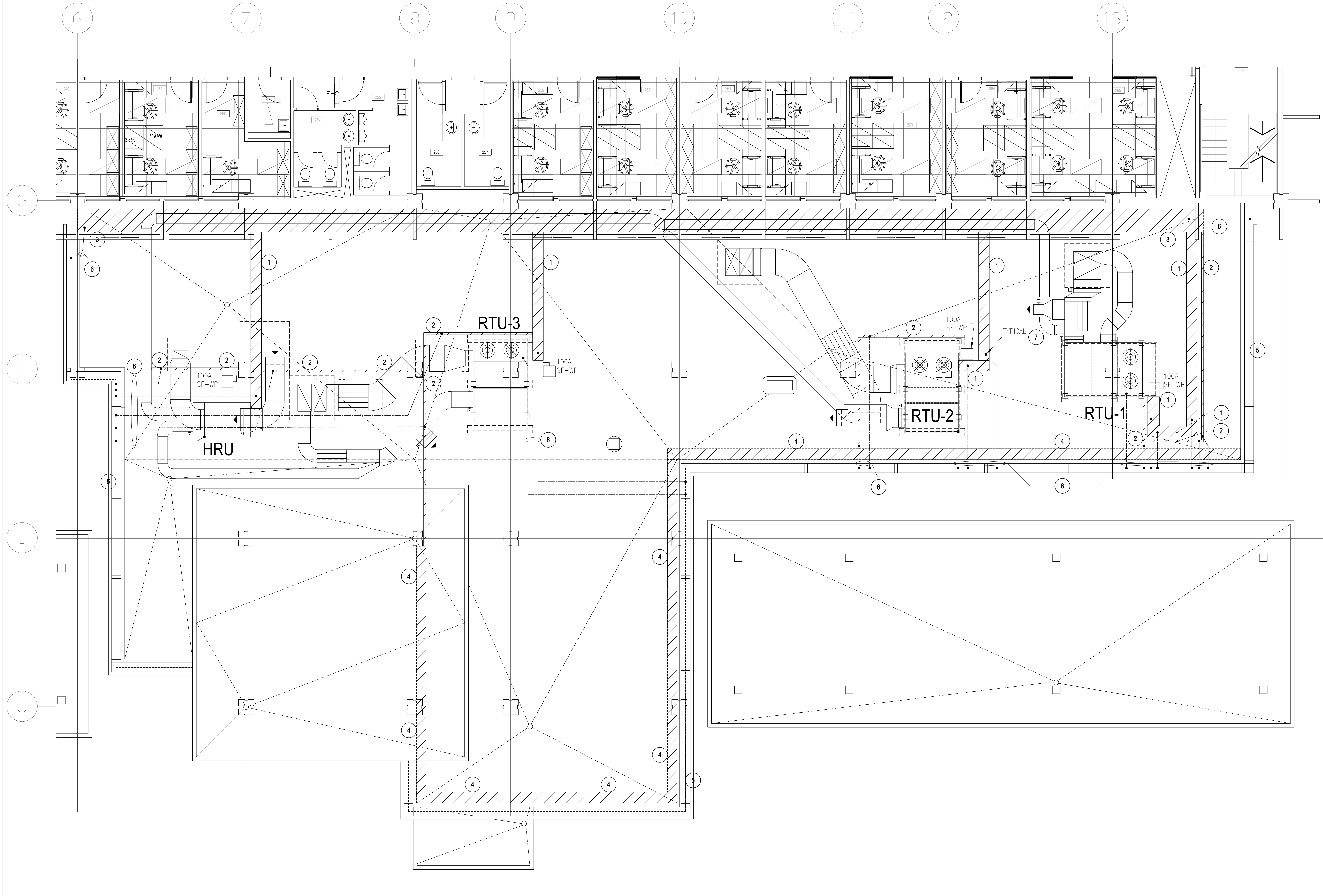


CANADIAN HIGH COMMISSION / ENBAASSY
CHANCERY
 PHASE 2 HVAC UPGRADE
 78 SHANTIPATH, CHANNAYAPUR

EXISTING HVAC ROOF

architect / architecte	
designed by / conçu par	C. LABELLE
drawn by / dessiné par	C. SENEZUKU
approved by / approuvé par	P. HARDY
property number / numéro de propriété	522-0-079
scale / échelle	1:50
date / date	2020-02-24
sheet number / numéro de la page	12 of 15
drawing number / numéro du dessin	

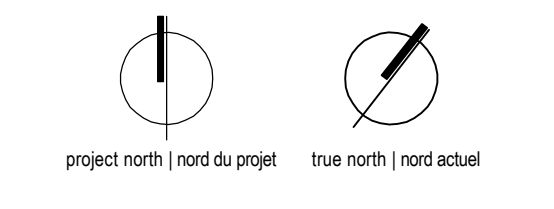
- SPECIFIC NOTES:**
- 1 NEW CABLE TRAY FOR POWER (300mm WIDTH)
 - 2 NEW CABLE TRAY FOR CONTROL (150mm WIDTH)
 - 3 EXISTING CABLE TRAY TO BE KEPT
 - 4 EXISTING CABLE TRAY FOR CONTROL TO BE KEPT
 - 5 EXISTING LIGHTNING CONDUCTOR TO BE KEPT
 - 6 NEW LIGHTNING CONDUCTOR
 - 7 NEW GAWELD CONNECTION



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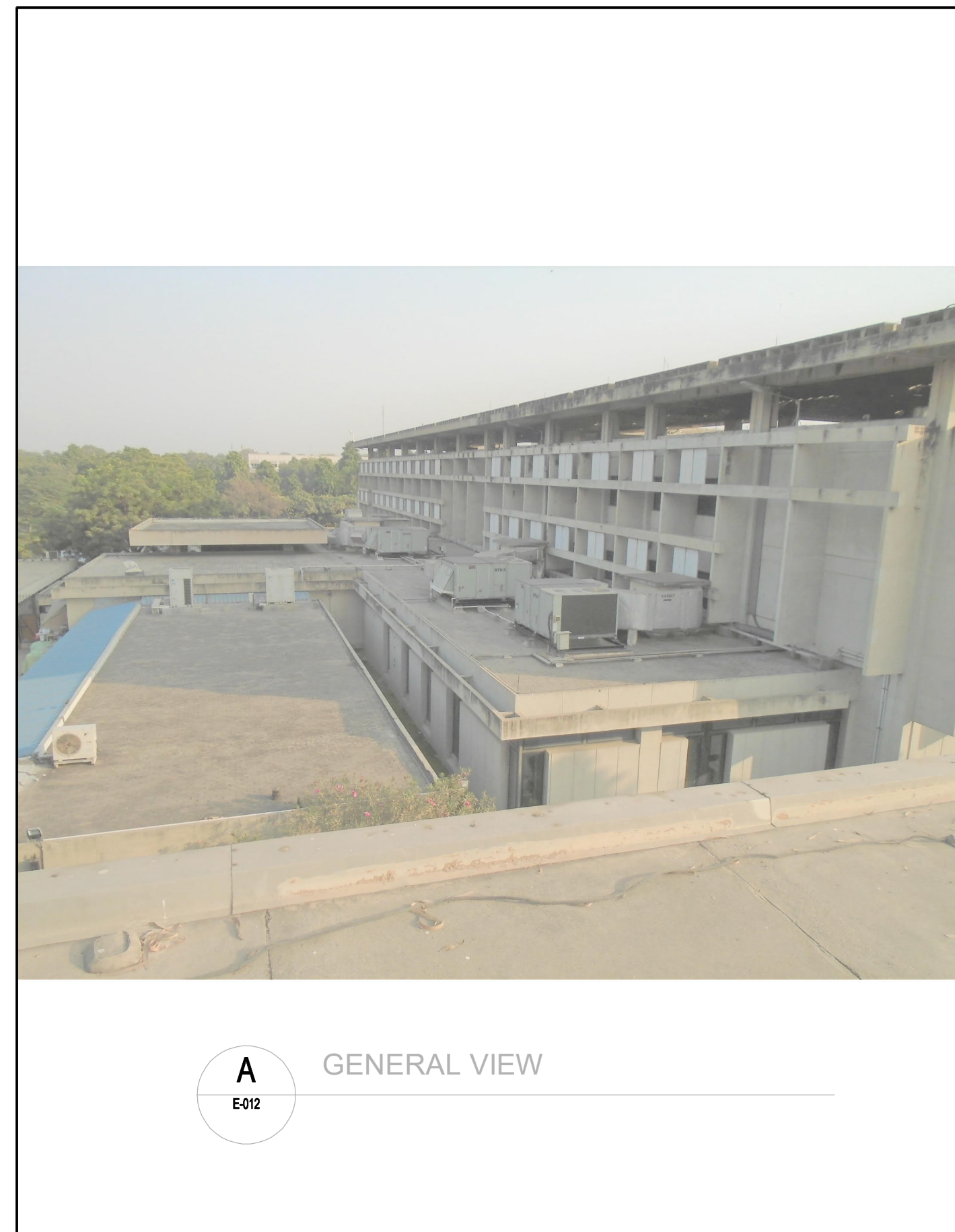
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0	ISSUED FOR TENDER	2020/09/25				



project title / titre du projet
 CANADIAN HIGH COMMISSION / EMBASSY
**CHANCERY
 PHASE 2 HVAC UPGRADE**
 718 SHANTIPATH, CHANNAYVAPUR

drawing title / titre du dessin
**NEW
 HVAC
 ROOF**

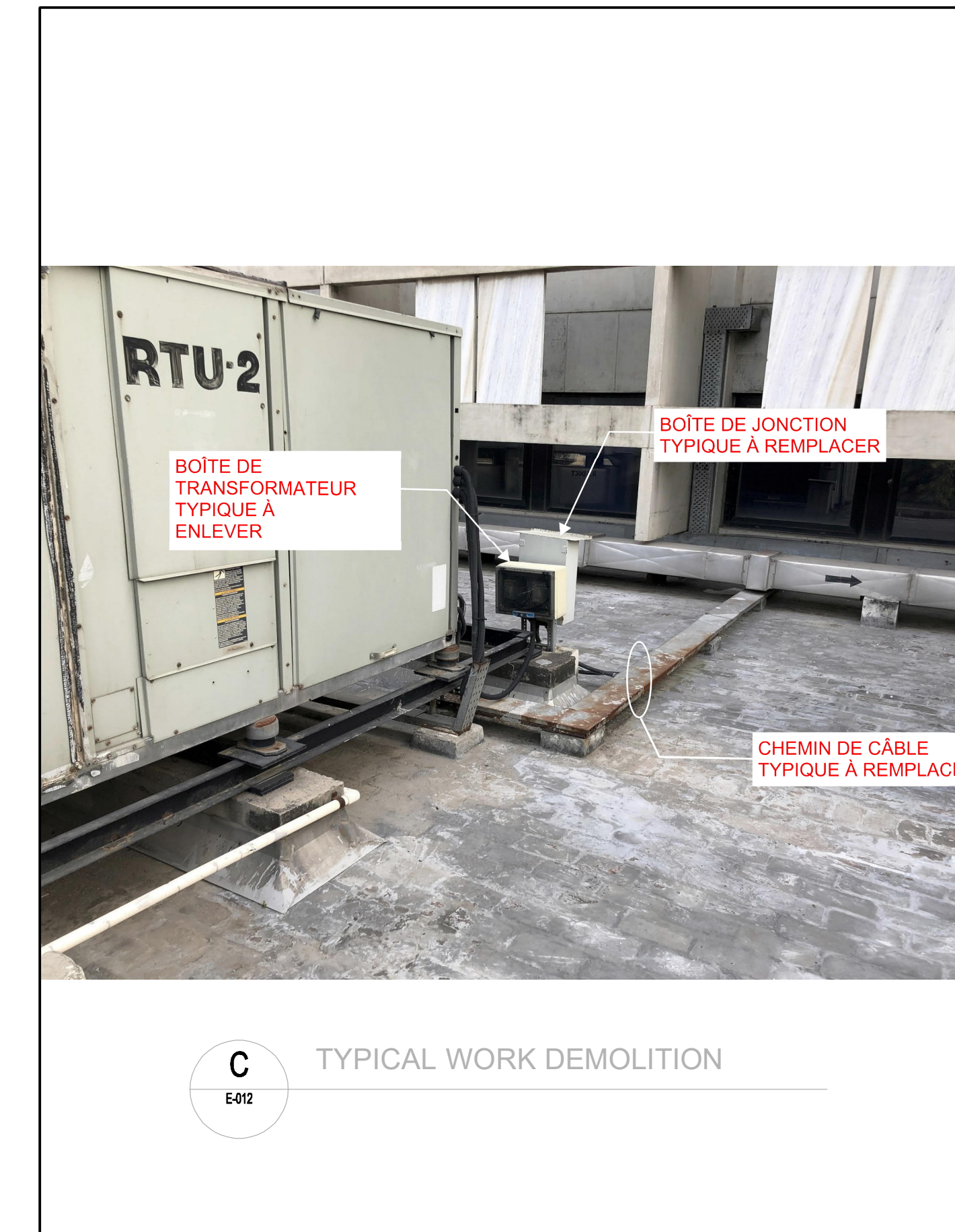
architect / architecte	
designed by / conçu par	C. LABELLE
drawn by / dessiné par	C. NEAUFIL
approved by / approuvé par	P. HUBERT
property number / numéro de propriété	522 0 070
scale / échelle	1:50
date / date	2020/02/24
sheet number / numéro de la page	13 of 15
drawing number / numéro du dessin	



A
 602 GENERAL VIEW



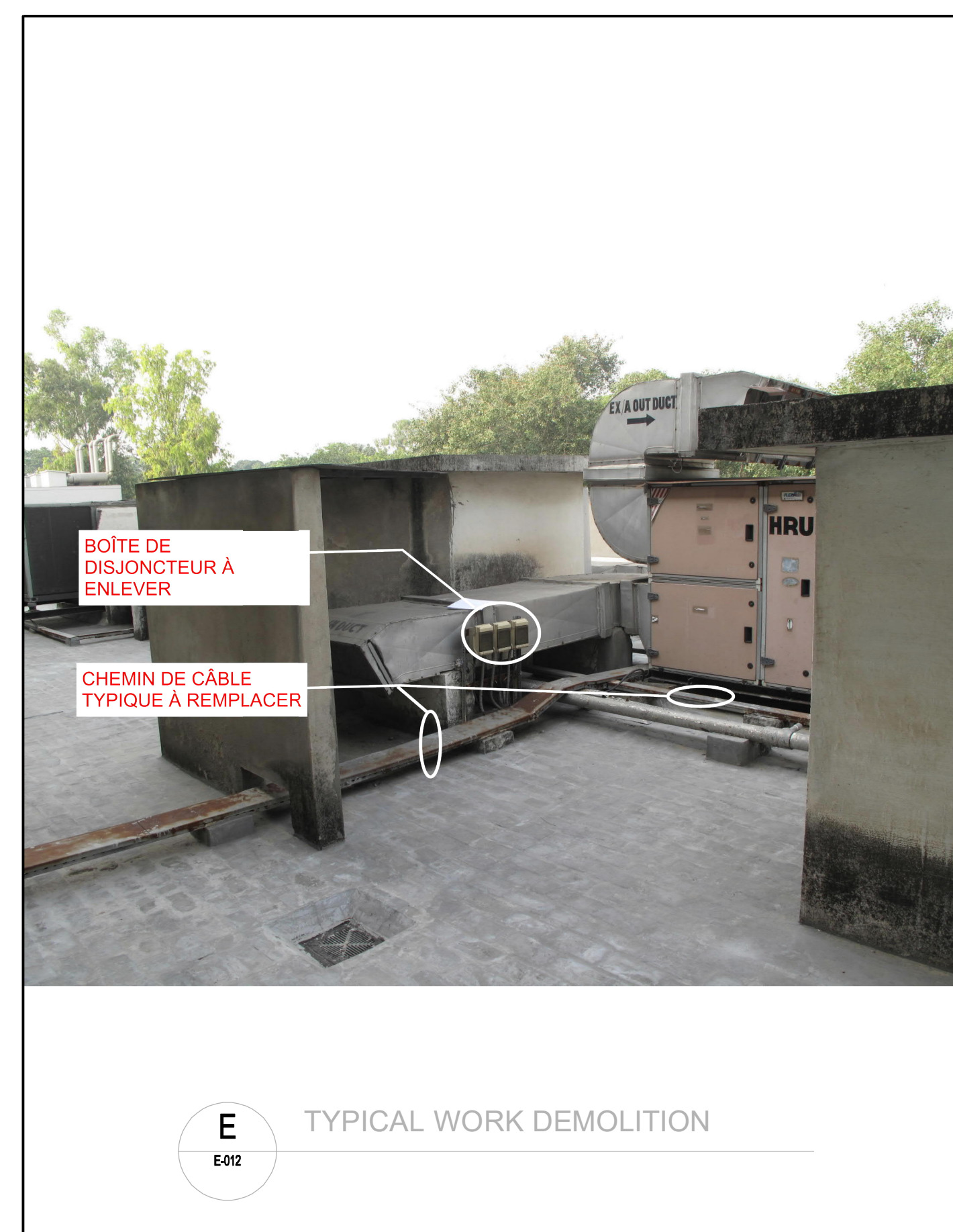
B
 602 TYPICAL WORK DEMOLITION



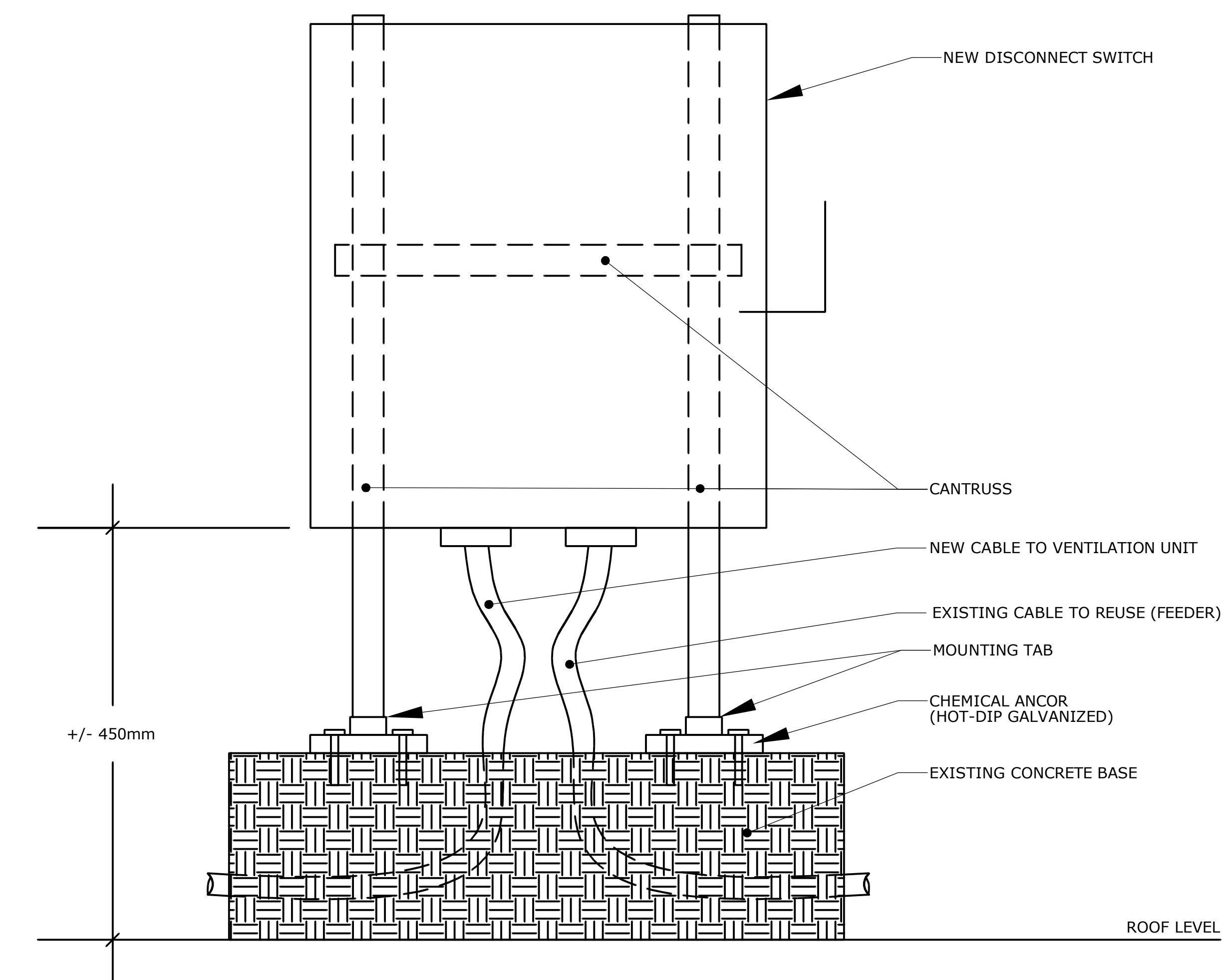
C
 602 TYPICAL WORK DEMOLITION



D
 602 TYPICAL WORK DEMOLITION

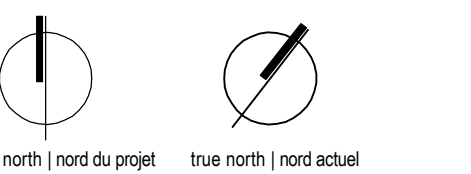


E
 602 TYPICAL WORK DEMOLITION



E
 602 TYPICAL DISCONNECT SWITCH INSTALLATION
 SCALE: NONE

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 P.14

revision: description date: initial / revision description: date: initials



asia pacific region / région de l'Asie le pacifique

project title / titre du projet

CANADIAN HIGH COMMISSION / EMBASSY

**CHANCERY
 PHASE 2 HVAC UPGRADE**

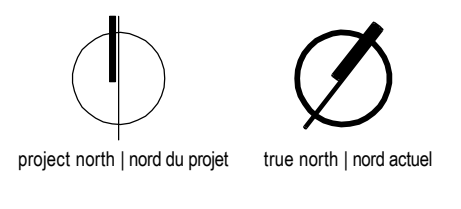
718 SHANTIPATH, CHANNAYAPUR

drawing title / titre du dessin

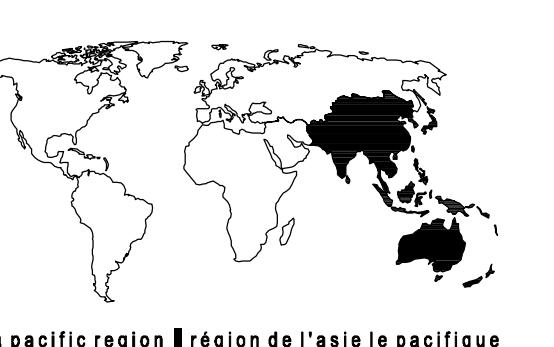
**PICTURES AND DETAILS
 HVAC
 ROOF**

architect / architecte	
designed by / conçu par	G. LABELLE
drawn by / dessiné par	C. NEAMTU
approved by / approuvé par	P. HANDEY
property number / numéro de propriété	522 0 070
scale / échelle	NONE
date / date	2020-02-24
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le pacifique région | région de l'axe le pacifique

CANADIAN HIGH COMMISSION / EMBASSY
CHANCERY
PHASE 2 HVAC UPGRADE
718 SHANTIPATH, CHANNAYAPUR

PANELS

architect | architecte
designed by | conçu par G. LABELLE
drawn by | dessiné par C. NEAMTU
approved by | approuvé par P. HENRI
property number | numéro de propriété 522 0 070
scale | échelle NONE
date | date 2020-02-24
sheet number | numéro de la page 15 of 15
drawing number | numéro du dessin

- SPECIFIC NOTES:
1 PROVIDE AND INSTALL NEW BREAKER
2 REUSE EXISTING BREAKER

(BC) WESTINGHOUSE: PL2 EXISTING
Table with columns: ROOM, ELECTRICAL ROOM, LEVEL, BASEMENT, MAN LUG, 25A. Rows include descriptions like EXISTING LOAD, SPARE, and PLUG ROOM 208.

(2A) WESTINGHOUSE: PL2A EXISTING
Table with columns: ROOM, CORRIDOR, LEVEL, SECOND FLOOR, MAN BREAKER, 8A. Rows include descriptions like EXISTING LOAD, SPARE, and PLUG ROOM 211.

(2B) WESTINGHOUSE: PL2 EXISTING
Table with columns: ROOM, CORRIDOR, LEVEL, SECOND FLOOR, MAN BREAKER, 8A. Rows include descriptions like EXISTING LOAD, SPARE, and PLUG ROOM 212.

(1F) EATON: PON-R-LINE 2A EXISTING
Table with columns: ROOM, ELECTRICAL ROOM, LEVEL, FIRST FLOOR, MAN BREAKER, 25A. Rows include descriptions like EXISTING LOAD, SERVICE POLE, and PLUG ROOM 155-158-16.



advanced building
solutions

THE HIGH COMMISSION OF CANADA, NEW DELHI, INDIA
Chancery – Phase 2 – HVAC Upgrade

Specifications – Electrical

2020-09-25

Project: 2015-123-113

Contract Number: ARD16400-533

THE HIGH COMMISSION OF CANADA

7/8, SHANTIPATH, CHANAKYAPURI

NEW DELHI, DELHI, INDIA

110021

CHANCERY – PHASE 2 – HVAC UPGRADE

DIVISIONS 20 AND 26

**Issued for tender
September 25th, 2020**



TABLE OF SECTIONS

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DIVISION 26 – ELECTRICITY:

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- 26 05 20 WIRE AND BOX CONNECTORS 0-1 000 V
- 26 05 21 WIRES AND CABLES (0-1 000 V)
- 26 05 28 GROUNDING – SECONDARY
- 26 05 29 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
- 26 05 31 SPLITTERS, JUNCTION, PULL BOXES AND CABINETS
- 26 05 32 OUTLET BOXES, CONDUIT BOXES AND FITTINGS
- 26 05 34 CONDUITS, CONDUIT FASTENINGS AND CONDUIT FITTINGS
- 26 05 36 CABLE TRAYS FOR ELECTRICAL SYSTEMS
- 26 24 16.01 PANELBOARDS BREAKER TYPE
- 26 27 26 WIRING DEVICES
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- 26 28 23 DISCONNECT SWITCHES – FUSED AND NON-FUSED
- 26 29 10 MOTOR STARTERS TO 600 V
- 26 41 13 LIGHTNING PROTECTION FOR STRUCTURES
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- 1.2 EXAMINATION OF THE SITES
- 1.3 VERIFICATION OF THE DRAWINGS AND SPECIFICATIONS
- 1.4 PRODUCTS USED FOR TENDERS AND EQUIVALENCY
- 1.5 SUBSTITUTION OF MATERIALS
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- 1.7 LAWS, REGULATIONS AND PERMITS
- 1.8 TAXES
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- 1.15 WASTE MANAGEMENT
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- 1.24 PAINTING
- 1.25 FRAMES, SUPPORTS, AND BRACKETS
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- 1.39 CLEANLINESS OF THE SYSTEMS
- 1.40 CLEANING
- 1.41 SECURITY SCREENING
- 1.42 SECURITY ESCORT
- 1.43 BREAKDOWN OF COSTS

PART 2 PRODUCT

- 2.1 NOT USED

PART 3 EXECUTION

- 3.1 NOT USED



Part 1 General

1.1 DEFINITION

- .1 The terms "Contractor", "General Contractor" and "Supervisor" refer to the person or entity designated as in contract with the Owner, Departmental Representative or Manager of the works.
- .2 The expressions "section", "sections", "each section", "each related section", "performed by section" and "supplied by section" refers to the firm responsible for the work of that section.
- .3 The terms "Engineer" and "Engineers" mean the firm or the Designated Representative of the engineering firm that issued the engineering section, specifications or plans related to the work covered by these documents.

1.2 EXAMINATION OF THE SITES

- .1 Before submitting its bid, each bidder must visit and inspect the site to become familiar with everything that could affect the works in any way. No later claims due to ignorance of local conditions will be considered by the Owner.

1.3 VERIFICATION OF THE DRAWINGS AND SPECIFICATIONS

- .1 Only drawings and specifications marked "for tender" should be used for the calculation of bids.
- .2 Check that the copy of the documents is complete: number of drawings, specifications' number of pages.
- .3 Specialties mentioned in the titles of the drawings are to facilitate the work of each section and should not be regarded as restrictive.
- .4 Drawings indicate the approximate placements of equipment. Each section must check the exact emplacements before any installation.
- .5 During bids, each section must study the electrical drawings and specifications and compare them with Architectural drawings and specifications and notify the Architect or Engineer at least five working days before submission of his tender of any contradictions, errors or omissions that can be observed.
- .6 During the execution of the works, notify the Architect or Engineer of any inconsistency, error or omission discovered before starting the work.
- .7 The Engineer reserves the right to interpret the contents of electrical drawings and specifications.
- .8 No indemnity or compensation will be given for the displacement of ducts, pipes, etc., deemed necessary because of the Architecture, the structure or any other normal consideration.



1.4 PRODUCTS USED FOR TENDERS AND EQUIVALENCY

- .1 Each section must prepare an overall price for a tender based only on the products described in the drawings and specifications. The person preparing the tender must not assume that the manufacturers' materials and equipment whose names appear on the "MANUFACTURER LIST" are automatically equivalent. Each section is solely responsible for the verification and validation of equivalence (and, where appropriate, of the special manufacturing requirements for it) of the product that will need to be used from a manufacturer on the list.
- .2 All modifications required by the usage of an equivalent material or device to that specified is to be performed at the cost of the division supplying the device, even if it applies to other specialties and if implications are discovered after the acceptance of the substitution request.

1.5 SUBSTITUTION OF MATERIALS

- .1 Equipment and materials from manufacturers other than those mentioned in the manufacturer list may be substituted only after the presenting the tender, provided that they are approved according to the following procedure:
 - .1 Equivalency requests must be made by the relevant section only. They must be submitted within a maximum of fifteen business days following the signing of the contract. They must be accompanied by the following documents:
 - .1 Original tender for the specified products.
 - .2 Tender received for products to be substituted.
 - .3 Justification of the request.
 - .4 Proofs of equivalency.
 - .2 The submission of equivalency requests to periods other than that mentioned above will only be considered for reasons truly exceptional and extraordinary.
- .2 The main points of comparison are construction, performance, capacity, dimensions, weight, encumbrance, technical specifications, parts' availability, maintenance, delivery delays, the evidence of tried and true equipment in service and impact on other specialties.
- .3 Any changes caused by the use of an equivalent equipment or material is to the cost of the section that provided the equipment, even when it applies to other specialties, and even if the implications are made apparent after the substitution request is accepted.
- .4 Any request for substitution will be rejected if it were to impede or delay the execution of the works.

1.6 IMPORTANT NOTE: SUPPLY AND INSTALL

- .1 Supply and install all materials and equipment described in this specification and/or shown in the drawings, whether the term "supply and install" is used or not. See also the article "MINOR WORKS".



1.7 LAWS, REGULATIONS AND PERMITS

- .1 All laws and regulations issued by the authorities having jurisdiction relating to the works described herein apply. Each section is required to comply with them without additional compensation.
- .2 Each section must obtain, at its expense, all necessary permits and certificates, pay all costs for drawing approvals and for inspections required by organisations having jurisdiction.
- .3 Submit to the Engineer a copy of the drawings bearing the seal of approval of the relevant inspection services.
- .4 Upon completion of the works, obtain and submit to the Owner, complete with a copy of the mailing slip for the package sent to the Engineer, all permits, approval certificates, and other obtained from the different offices and departments that have jurisdiction over this building.
- .5 Restrictions regarding tobacco usage:
 - .1 It is prohibited to smoke inside the building. Comply with restrictions applying to tobacco usage on the building property.
- .6 Discovery of dangerous materials:
 - .1 If materials applied by spray or trowel, likely to contain asbestos, polychlorinated biphenyls (PCBs), moulds or other designated hazardous materials are discovered during demolition, immediately stop work.
 - .1 Take corrective action and immediately notify the Owner.
 - .2 Do not restart work until written instruction is received.

1.8 TAXES

- .1 Pay all taxes required by law, including federal, provincial and municipal.

1.9 MINOR WORKS

- .1 Each section is required to provide all the required components and to do all the jobs which, although not specified in the estimate, are necessary for the operation of the equipment and to complete the work included in his contract.

1.10 TOOLS AND SCAFFOLDING

- .1 On the worksite, provide the full range of tools required for the proper execution of the work. Also supply, erect, and remove the scaffolding required to perform the work.

1.11 COOPERATION WITH OTHER TRADES

- .1 Each section must:
 - .1 Cooperate with other trades working in the same building or on the same project.
 - .2 Keep itself informed of additional drawings issued to these other trades.
 - .3 Ensure that these drawings do not come in conflict with its work.



- .4 Organize its work so as not to interfere in any way with other work done in the building.
- .5 Collaborate with the other sections to determine the location of accesses in walls and ceilings.
- .2 During the work, if necessary, the relevant section must remove and replace the tiles or access doors to reach its equipment and repair, at its own expense, all the damage it has caused. Protect the furniture and return the premises to a clean condition when the work is completed.

1.12 SCHEDULING OF OPERATIONS

- .1 Plan and execute work in such a way as to minimally disturb the normal use of the building.
- .2 During the tender process of the contract, present a schedule for the work in the form of a bar graph (Gantt diagram), specifying the expected steps in the work until completion, including the project milestones. Once the schedule is reviewed and approved, take necessary action to ensure the project progresses on schedule. Do not modify the calendar without consulting the Engineer and the Owner.
- .3 NOTE Work in occupied areas must be performed outside of normal work hours, Monday to Friday between 18 h and 7 h, as well as on Saturdays, Sundays and holidays.
- .4 Perform the following work during periods of inoccupation, Monday to Friday between 18 h and 7 h, as well as on Saturdays, Sundays and holidays.
- .5 Notify the Engineer and the Owner 1 week before performing work during periods of inoccupation.

1.13 MATERIALS

- .1 Unless otherwise indicated, use new materials clear of imperfections or defects, in the required quality, bearing the approval labels CSA, ULC, FM, AMCA, ARI, British Standards (BS), Indian Standards (IS) and other according to the specialties.

1.14 PROTECTION OF WORKS AND MATERIALS

- .1 Each section must protect its installations against all damage, from any cause, during the execution of works until the work is accepted in a definitive manner.
- .2 All equipment and materials stored on-site must be adequately protected, sheltered from bad weather, or any other possible damage.
- .3 At the end of each workday, seal with a screw cap or a suitable metal cap all openings in conduits of any kind.

1.15 WASTE MANAGEMENT

- .1 Perform a "waste audit" in order to determine what waste will be created by demolition and construction activities. Write a "waste reduction plan" and apply the principles of reduction, reuse and recycling of material where possible.



- .2 Provide a "source material triage program" to disassemble and collect, in an orderly manner, among the "general waste" the materials bound for "environmental disposal" listed below:
 - .1 Brick and Portland cement concrete.
 - .2 Corrugated cardboard.
 - .3 Drywall (unfinished).
 - .4 Steel.
 - .5 Wood (except painted, treated or laminated).
- .3 Submit logs of all material removed from site as "general waste" and "environmental disposal" with the following information:
 - .1 Time and date of removal operations.
 - .2 Description of the material and the quantity.
 - .3 Proof that the material was received at an approved waste treatment or disposal facility, as required.

1.16 SHOP DRAWINGS

- .1 Before fabrication or order of any component, submit a PDF copy by email for approval. Each drawing or data sheet should be submitted as a distinct PDF file. The PDF name should include the section, article and name of the article title in the specifications (example: 00_00_00_0.00_Equipment XYZ.pdf).
- .2 Submit shop drawings for all materials and equipment used in the project.
- .3 Drawings must include the dimensions, ampacity, specific rating, details devices, weight, number of attachment points, centre of gravity, seismic requirements, wiring schematics, capacities, controls schematics, curves, space requirements for maintenance and operation, and all other relevant information. If present, clearly indicate the location and dimensions of plumbing, heating, cooling, electrical, etc., connections by device. Each drawing must be verified, coordinated, signed, and dated by the relevant section before being submitted for approval.
- .4 All correspondence and/or documents submitted via project management software by the Contractor or a Sub Contractor will not be reviewed and will be not be considered as submitted/received.
- .5 Shop drawings must be relevant to the proposed equipment. The sheets from general catalogs are not accepted as shop drawings. Each drawing must be preceded by a title page indicating with the name of the project, the consultant's name, the date and identification tag of the equipment shown in the drawings and specifications. The title page must also include the revision number of the documents as well as the expected delivery date of the product. Drawings must be prepared and signed by the supplier. Drawings pulled from the supplier's website are not accepted.
- .6 Drawings for non-catalogued items must be specifically prepared for the project.



- .7 The verification of shop drawings is general and has the main purpose of avoiding as many errors as possible in manufacturing. This verification does not relieve the relevant section of its liability for errors, omissions, information, dimensions, quantity of equipment, etc., appearing in their drawings.
- .8 The verification of the shop drawings by the Engineers does not diminish the responsibility of the supplier to ensure that the equipment meets all applicable codes and standards, as well as the requirements in this specification.
- .9 When shop drawings are resubmitted or installed, inform the Engineer in writing of changes made, other than those requested by the Engineer.
- .10 When equipment is manufactured before the verification of the shop drawings by the Engineer, the Engineer may refuse the equipment. The Contractor is responsible for any costs associated with the refusal.
- .11 The drawings must be in English.

1.17 COORDINATION DRAWINGS

- .1 General:
 - .1 Coordination drawings, also called composite drawing, are required in all cases where interference between different trades' works need such drawings to illustrate that the work is realizable.
 - .2 Coordination drawings must show clearly and precisely all the work involved, those of the relevant section and those done by others.
 - .3 Communicate with the Architect to procure Architectural base plans.
- .2 Description:
 - .1 Coordination drawings consist of dimensioned plans, to scale, indicating the position of the equipment, ducts, piping, valves and other accessories with cuts and details required, complete with piping and duct dimensions, locations of sleeves, openings, anchorages and supports, relative positions with structure, architectural works, mechanical and electrical work, the positioning of the access doors, the clearances required for the maintenance of equipment and all other disciplines.
 - .2 Each mechanical and electrical section must provide on their coordination drawings the details of their levelling bases and housekeeping pads.
- .3 Preparation:
 - .1 Each relevant section must make their coordination drawings and coordinate them with other disciplines.
 - .2 All drawings must be coordinated by the Contractor in collaboration with all sections.
 - .3 The coordination drawings for each sector must be submitted all at once for verification.



- .4 Collaboration:
 - .1 Close collaboration must exist between the sections in order to determine the location of their respective work and avoid incompatibilities.
- .5 Distribution of coordination drawings:
 - .1 Before submitting the drawings to the Engineer for verification, the general Contractor and each of the sections must sign the plans.
 - .2 Submit to the Engineer two paper copies and one emailed digital PDF copy of the scaled coordination drawings signed by the General and Sub Contractors for verification.
- .6 Responsibility:
 - .1 No compensation will be given for the modifications of the work for the purpose of coordination and integration of the electromechanical systems.
 - .2 Notwithstanding the responsibility of coordinating the integration, work cannot be implemented without prior verification of the coordination drawings. Each section must redo, at its expense, all work nonconforming to the coordination drawings without any compensation based on a misinterpretation of the scope and limitations of its work. Such misinterpretations do not relieve the relevant section of its responsibilities and obligations to provide complete and duly proven, ready to operate systems in fully integrated and in perfect condition.
 - .3 Verification of the coordination drawings by the Engineer serves to ensure that the technical requirements appear to be generally met. The Engineer does not check the quality of the coordination carried out by the Contractors.
- .7 Pre-existing work:
 - .1 Coordination drawings should account for existing mechanical, electrical, structural and Architectural installations as well as planned work.
- .8 Coordination drawings are required for:
 - .1 The placement of sleeves, openings and perforations expected in the walls, floors, beams and columns.
 - .2 Anchors.
 - .3 Work on the fire sprinkler and fire prevention.
 - .4 All ventilation work – air conditioning.
 - .5 All well supports.
 - .6 All mechanical and electrical work in mechanical rooms, tunnels, wells, parking lots, and primary and secondary electrical rooms.
 - .7 All mechanical and electrical work in all places where space is particularly restricted.
 - .8 Work performed by a section that could have implications on the work of another section.
 - .9 Places described in sections of the Divisions 21, 22, 23, 25 and 26.



- .10 This clause is not restrictive. Coordination drawings may be demanded for places deemed necessary.
 - .11 For all work on automatic sprinklers, the coordination drawings are the responsibility of the Division 21.
 - .12 Coordination drawings of the heating plant, cooling towers, etc., are the responsibility of the Division 23 (section "HEATING – CHILLED WATER").
- .9 Original coordination drawings:
- .1 At the end of the work a USB flash drive (containing the "dwg" and "3D Revit model", depending on program used) is to be included with each O&M manual and two paper copies of the as-builts are to be submitted to the Owner, for no additional charge, by each section.

1.18 USING DIGITAL MODELS FOR COORIDNATION

- .1 DWG plans:
- .1 Where approved by the Owner Representative, the Engineer may provide to the Contractor the digital DWG plans which were used to produce contractual documents.
 - .2 The Contractor must respect the "RESPONSIBILITY WAIVER – DWG PLANS" form included at the end of this section, understanding the limitations of using the digital plans, and complete and sign the form. Submit the duly completed form to the Engineer.
 - .3 The Engineer reserves the right to not provide the design files to the Contractor and/or related sections.
 - .4 The Engineer reserves the right to claim fees for the conversion of design files and specifications issued "for tender" to the format or edition requested by the Contractor and/or related section.

1.19 TECHNICAL REQUESTS FOR INFORMATION

- .1 The Contractor must submit all requests for information (RFIs) by email.
- .2 All correspondence and/or document submitted via project management software by the Contractor or a Sub Contractor will not be reviewed and will be not be considered as submitted/received.
- .3 Technical Requests for Information:
 - .1 Each question must be submitted using a standardized RFI form.
 - .2 Each PDF RFI form may include only one question.
 - .3 Each question must be assigned a sequential number to facilitate tracking.
 - .4 The Contractor is responsible to review questions submitted by other sections to ensure that answers are not present in the contractual documents or previously provided, and to track progress of the RFIs to ensure work is not delayed.
 - .5 The RFI form must include, at minimum:
 - .1 Submission date of the question.



- .2 Name of the sender and recipient.
- .3 Subject line.
- .4 Clearly formulated question.
- .5 Clips of the plans, specifications and photos relating to the question.
- .6 Proposed solutions.
- .7 Sufficient space for the engineer to respond to the question on the form.

1.20 UP TO DATE DRAWINGS

- .1 Each section must, at its expense, clearly indicate all changes, additions, etc., on a separate copy of the drawings and specifications, so as to have a complete and accurate copy of the work as executed and materials installed when the contract is completed. In particular, any displacement, even minor, of underground piping must be indicated with precision
- .2 This copy of the drawings must be kept up to date and be available on site.
- .3 Deliver these plans to the Owner at the end of the works

1.21 OPERATION AND EQUIPMENT MAINTENANCE INSTRUCTION MANUALS

- .1 Each section must provide the Owner with four copies of manuals with detailed instructions for the operation and maintenance of all equipment and appliances included in his contract.
- .2 These manuals must contain:
 - .1 A list and illustration of all equipment components: pumps, fans, filters, controls, burners, alarm panels, lighting fixtures, transformer stations, generators, receptacles, fire alarms, etc.
 - .2 A copy of the approved shop drawings, and as executed.
 - .3 The instructions for lubrication published by the manufacturers with the specifications of the oils and greases to be used and the frequency of lubrication.
 - .4 A diagram of the controls with explanatory text.
 - .5 A list of the different sub-Contractors with names, addresses, and phone numbers.
 - .6 A list of representatives and/or manufacturers of the installed equipment with names, addresses, and phone numbers.
 - .7 These instructions must contain all the graphics, curves, capacities and other data provided by the manufacturers concerning the operation and details of all mechanical and electrical equipment installed in the building.
- .3 The entirety must be written in English.
- .4 Divide each manual in the sections using blank sheets which have coloured tabs with the necessary identification. For example: "CENTRAL SYSTEM FAN". At the beginning of the manual, insert a table of contents with the title of each section and identification of the corresponding tab.



- .5 Each manual is covered with a black cardboard, allowing the binding of loose sheets with 215 mm x 275 mm (8" x 11") binding strips.
- .6 Submit one PDF copy to the Engineer for comment. Once approved, provide three (3) copies of the manual to the Owner and one to the Engineer.
- .7 These manuals should be submitted before final trials. Provide an empty section to later add calibration and commissioning reports.

1.22 MANUFACTURERS' INSTRUCTIONS

- .1 Install the various pieces of prefabricated materials and equipment, in accordance with the manufacturer's instructions. Obtain all relevant instructions.
- .2 Ensure the presence of the manufacturers' representative to attest the conformity of the installation.

1.23 LAYOUT AND ACCESS TO THE EQUIPMENT

- .1 Install the equipment so that they are easily accessible for maintenance, disassembly, repair, and moving.

1.24 PAINTING

- .1 Apply a base coat of sealant on any non-galvanized metal equipment or equipment supports. Before leaving the premises, touch up the base coat of all the damaged areas after removing any rust.
- .2 The base coat is a sandable grey coloured water based acrylic, this product can be used as a base layer and to paint cut or perforated sections of galvanized apparatus, equipment or equipment supports, Sierra Performance S30 Griptec from Rust-Oleum or Sierra Performance S71 as an aerosol.
- .3 Apply one coat of metal mordant and one additional coat of black paint to the soldered joints of uninsulated black steel pipes.
- .4 On insulated black steel pipes, apply one layer of metal mordant on the soldered joints.
- .5 Ensure that access doors of all kinds, including the opening convector panels, electrical panels, etc., are painted in the open position to ensure freedom of movement.

1.25 FRAMES, SUPPORTS, AND BRACKETS

- .1 Each relevant section must provide and erect all frames and brackets required for the equipment it installs: reservoir tanks, panels, motors, starters, key switches, etc.
- .2 Install equipment at the height shown in the drawings, but never less than 75 mm (3") above the floor.
- .3 Build the supports and brackets out of welded and grinded steel. If necessary, install hooks, rails, eyelets, etc., to facilitate installation and removal of equipment.



1.26 PREVIOUSLY PLANNED OPENINGS AND SLEEVES

- .1 Generally, the sleeves, the openings, and the shafts required for piping, and mechanical and electrical conduits, have already been installed before the concrete is poured.
- .2 Visit the site to learn about existing shafts, openings and sleeves. View the plans available for information. Each relevant section must check the condition, location and size of these openings on-site. During the work, whenever possible, use these pre-existing openings, although in some cases, they may not be ideally located.
- .3 Shafts, openings, and sleeves installed or to be installed by others are identified and may not be used for other purposes than those indicated. Any relevant section using an opening or a sleeve provided for another section will need to free the opening and the sleeve at its expense.
- .4 If sleeves or openings to be installed by others are poorly located or inoperable, the section should identify the required opening in a manner acceptable to the Contractor. Drilling work to be done by another trade by the method chosen by the Contractor.
- .5 However, if the physical and Architectural conditions allow it, the relevant section must change its plans so as to use the poorly located sleeves at any request from the Contractor and to no additional cost to the Owner.
- .6 If the sleeves provided in the correct places are not used, either to simplify the workload or for any other valid and acceptable reason, the relevant section must make the new drilling required, at its expense, in accordance with the section "NEW OPENINGS, DRILLING IN WALLS, FLOORS, BEAMS, AND COLUMNS" and pay the cost of sealing unused openings.

1.27 NEW OPENINGS, DRILLING IN WALLS, FLOORS, BEAMS, AND COLUMNS

- .1 General:
 - .1 Unless otherwise indicated, all direct and indirect costs associated with tracing, marking, openings required for electrical conduits, or sleeves to install, are the responsibility of the General Contractor.
 - .2 The General Contractor is responsible for all damages and repair caused by the openings.
 - .3 Openings must be shown and located on the coordination drawings, located and identified on the site in a manner accepted by the Contractor and the structural Engineer before drilling.
 - .4 The openings must be sufficiently large to permit the laying of sleeves and thermal and acoustic insulation.
 - .5 Any drilling in the structure must be approved by the structural Engineer.
 - .6 Piercing holes with pneumatic or electric hammers by vibratory action as well as hand drilling and any other process by mechanical impacts are prohibited.
 - .7 In the concrete, drill the holes using a rotary water drill or any other equipment accepted by the structural Engineer.
 - .8 In the steel bridging, drill and reinforce openings, according to the guidelines of the structural Engineer.



- .9 It is not allowed to drill in capitals and column projections or strips without special permission from the structural Engineer who will decide how to proceed.
- .10 The General Contractor is responsible for all formwork required for the installation of rectangular ducts. Instructions related to dimensions, quantity, location, and testing must come from the related section. All additional steel framing and related work are also the responsibility of the General Contractor.
- .11 The General Contractor must employ a specialised firm to scan and digitize the existing slabs, with Georadar (GPR) or similar technology, in order to determine the location of buried elements and services such as conduits, pipes, and reinforcements, before making openings in the existing concrete.
- .2 Round, square and rectangular openings in concrete:
 - .1 All new openings of 150 mm (6") or less are the responsibility of the concerned section, under the instructions of the structural Engineer.
 - .2 All new round openings of more than 150 mm (6"), as well as the required square or rectangular openings must be made by the Contractor, at the expense of the latter, under the direction of the structural Engineer.
- .3 Openings in concrete block walls and drywall:
 - .1 Openings to be drilled by the Contractor. Sealing of openings by the Contractor. In the case of openings in piping of temperatures higher than 38°C, the relevant mechanical section must install a 20 gauge galvanized steel sleeve.
- .4 Concrete beams and columns:
 - .1 The drilling of new openings in the concrete beams and columns is prohibited.
- .5 Steel beams and columns:
 - .1 The drilling of new openings in the steel beams and columns is prohibited.
- .6 Openings in prefabricated ceilings:
 - .1 By the Contractor. However, the metal frames are provided by section providing equipment and are installed by the Contractor.
 - .2 When the metal ceiling battens are installed before pouring the concrete, and piping or conduits are to pass between the beams, the General Contractor must cut the battens where required, install the pipes, and when complete repair the battens and ceiling thermal insulation in a manner acceptable to the Architect.
- .7 Firestop and smoke deflector assemblies: complies with the standard CAN/ULC S115-05 – Standard method of fire tests of firestop systems. Place firestops and smoke deflectors around pipes, conduits, cables and other objects passing through firewalls in order to provide the same fire resistance as the neighbouring floors, ceilings and walls.

1.28 INSPECTIONS

- .1 It is absolutely necessary before any inspection request to the Engineer, that the testing was previously conducted and successful.



1.29 TESTING

- .1 Each section must cooperate with the other sections, so as to enable them to complete their tests within the time period allowed by the Contractor.
- .2 Once the test is finished, readjust all the equipment used for this test, to permit their proper operation.
- .3 General requirements:
 - .1 The Engineer may assist, at any time, in any test they deem necessary.
 - .2 All tests must be performed to the satisfaction of the Engineer.
 - .3 The Engineer may require a test of installations and equipment before accepting them.
 - .4 For temporary trials, obtain written permission to operate and test installations and permanent equipment before being accepted by the Engineer.
 - .5 Give a written 2 weeks notice to the Engineer before the date of the test.
 - .6 Provide equipment, meters, material and staff required to run tests during the project until the acceptance of installations by the Engineer and pay all fees.
 - .7 If a piece of equipment or device does not meet the manufacturer's data or the specified performance during a test, immediately replace the defective unit or part and pay all expenses incurred by the replacement. Make adjustments to the system to achieve the desired performance. Cover all costs, including those of new tests and repair.
 - .8 Prevent dust, dirt, and other foreign matter from entering the openings of installations and equipment during testing.
 - .9 Provide to the Engineer a certificate or letter from the manufacturer confirming that each section of the installation was implemented to their satisfaction.
 - .10 Submit the written test results to the Engineer.
 - .11 The tests must be performed and accepted prior to the installation of the thermal insulation.
 - .12 Do not conceal or embed piping, conduits, or equipment before the tests are completed and accepted.
 - .13 By submitting the pipe or conduits to the test pressures required in each of the respective sections, take the necessary precautions to prevent the deterioration of equipment and accessories that cannot withstand such pressures.
 - .14 If it is impossible to test the entire installation in a single trial, it can be divided into several zones, each of which will be tested individually. The installation must be tested in several stages.
 - .15 Provide hydraulic pumps, air compressors, fans and other equipment necessary to perform all tests and related temporary work.
 - .16 Correct any leak detected. The defective part must be removed, repaired and the test is redone until the results are satisfactory.
 - .17 Whenever tests are conducted with water, place the pressure gauge at the highest point of the installation.



- .18 Whenever tests are conducted with compressed air, use soap and water on the piping and apparatus to detect air leaks. The air temperature must be the same in the pressure readings. Install a thermometer for this purpose.
- .19 For joints with caulking, it is not permitted to repair cracks using other materials.
- .20 At the end of work, provide a report for ampacity reading on each phase for each panels, do this reading when the building is full occupancy during business hour.
- .21 Provide two copies of a written report for each of the tests performed.

1.30 "EARLY ACCEPTANCE", "WITH RESERVATION" AND "WITHOUT RESERVATION"

- .1 Refer to general conditions and additional general conditions of the Architect or Client for the definition of "early acceptance", "with reservation " and "without reservation".

1.31 INSTRUCTIONS TO THE OWNER

- .1 Give to the representative of the Owner all the details on the operation of the equipment specified and installed under this contract. Provide qualified personnel to operate this equipment until the Owner's representative is adequately qualified to take charge of the operation and maintenance of said equipment.
- .2 This training can be combined with the final testing period provided that the Owner's team is available.
- .3 It is understood that such tests are not an automatic acceptance of equipment by the Owner.
- .4 The Owner has the right to do this test as soon as the work is considered sufficiently complete by the relevant Engineer's section, and considered in accordance with the drawings and specifications

1.32 WARRANTY

- .1 Each section guarantees its work for a period of one year after acceptance "with reservation" of the work by the Owner. It is required to repair or replace, at its expense, any defects that would become apparent during this period and that, within 48 h after having been formally notified.
- .2 Manufacturers must offer a one (1) year warranty from the starting operation date or eighteen (18) months from the date of delivery to the site, as appropriate. The warranty must include the cost of materials and labour, and the replacement of defective parts and/or manufacturing defect. In the case of chillers, a five-year warranty applies if the refrigerant charge is contaminated due to the compressor motor burning.
- .3 The warranty is for a period greater than one (1) year (extended/or special warranties), for the areas indicated in the respective specifications.
- .4 The use of permanent equipment for temporary purposes does not relieve the relevant section of its responsibilities and obligations with respect to the acceptance and guarantee of its work.



- .5 The Engineer and/or the Owner reserve the right start the equipment and mechanical and electrical works without affecting the section's obligation to see to the full maintenance of its work up to acceptance "with reservation".

1.33 OBLIGATIONS DURING THE WARRANTY PERIOD

- .1 During the warranty period, in addition to the obligations described in the specifications, the relevant section must provide any technical assistance required by the Engineer and/or Owner with respect to the operation of the installations and their improvements or adjustments as required.
- .2 The temporary use or testing with the goal of adjusting equipment or any other purpose, or permanent use by the Owner of the mechanical and electrical works before the final acceptance of the works should not be interpreted as evidence that such works are accepted by the Owner and does not alter the terms of the warranty. During this time period, the relevant section retains responsibility for the maintenance of installation. No claim for damage or failure of any part of the work put into use will be considered by the Owner.

1.34 MAINTENANCE DURING THE CONSTRUCTION PERIOD

- .1 This article applies only in cases where the equipment is used during the construction period.
- .2 In addition to the responsibilities and obligations of each section, as to the temporary or permanent use of its installations and the use of equipment by the Owner or any other section during construction and before final acceptance of the work, the relevant section still remains as responsible for the operation, preventive maintenance, or other, of its equipment during the same period.
- .3 For these purposes, each relevant section should, in general manner, use its own labour and its own equipment and administer the direct supervision of these tasks.
- .4 However, the relevant section does not have the responsibility to provide the staff required for the equipment's operation during the construction period and before final acceptance of work. However, it remains responsible for the equipment during testing, the adjustment period, calibration, and maintenance of this equipment.

1.35 TEMPORARY SERVICES

- .1 From a mechanical and electrical point of view, temporary services include: electricity, telephone service, fire alarms, lighting, water supply, sanitation and drainage, heating, ventilation, controls, intercom systems, fire protection, refrigeration, and all the systems necessary for the completion of the works.
- .2 All temporary services, as well as energy costs, are the responsibility of the general Contractor. Refer to general conditions of contract.
- .3 No device that is not part of the permanent installation will be used for temporary services before the building is deemed complete.
- .4 The temporary service period ends upon acceptance "with reservation".



1.36 RENOVATIONS

- .1 Continuous service:
 - .1 The following services are not to be interrupted without prior agreement with the Owner: telephone, electricity, lighting, intercom, fire alarms, sprinklers, fire protection water, aqueduct water, domestic water, sanitary plumbing, storm drainage, external drainage systems, ventilation – air-conditioning, etc.
 - .2 To ensure the continuity of services during the hours required by the Owner, each relevant section must do all temporary works required, including labour and equipment.
 - .3 All major service cuts must be performed outside the occupancy hours of the building. For example: medical gas, electricity, water, steam, etc.
- .2 Demolition:
 - .1 All demolition work, including road cuts, utilities, and sealing of disused pipes, are the responsibility of the Contractor.
- .3 Occupied rooms:
 - .1 The work is being done during the occupancy of rooms in the building, therefore, the work must be performed by stages in the rooms designated by the Owner.
 - .2 Perform work after prior agreement with the Owner and establish an acceptable work schedule with the Owner.
 - .3 Before undertaking work in a given area, ensure the availability of all equipment, tools, and labour required to perform the work without interruption.
 - .4 Follow the Owner's instructions as to the delivery to the worksite of its personnel and equipment.
 - .5 The Owner will indicate which staircase can be used and within what limits it is permitted to circulate in the present corridors.
 - .6 Take all necessary precautions to adequately protect existing installations in these areas.
 - .7 At no time must the traffic and the functioning of the building services be impeded. Follow all of the Owner's instructions.
- .4 Noise:
 - .1 Because of the proximity of the occupied premises, take all necessary measures to reduce the noise from construction and demolition.
- .5 Other restrictions:
 - .1 In order not to impair the function of the building that must remain in operation during construction:
 - .1 No vehicles other than trucks used to transport equipment has access to the site for the duration of the works.
 - .2 The use of all elevators is prohibited for construction purposes.
 - .3 The interior circulation outside the boundaries of the services to be renovated must be minimized.



- .4 The access permitted to the various rooms, for demolition and construction purposes, must be determined by the Owner.
- .2 Obey the Owner's rules and directives about signs, announcements, advertisements, smoking, etc.
- .3 Limit equipment/materials to the area delimited set by the Owner for the storage of equipment. They must not congest the area. No part of the construction is to be burdened with a load of equipment that may be hazardous for it.
- .4 Follow the Owner's sterility standards.
- .6 Dismantling of existing piping, materials, and equipment. Unless otherwise instructed:
 - .1 Workers holding the required qualifications must perform work involving the removal of asbestos-containing insulation. In situations where asbestos-containing insulation is discovered on catalogues or non-catalogues piping, the Contractor or the related section must refer to the general clauses of the contract and immediately inform the Project Manager and/or the Owner's representative.
 - .2 Existing removed materials and equipment to be given to the Owner must be carefully removed and transported with all precautions necessary, at the expense of each concerned mechanical and electrical section, to the place or places provided by the Owner in the building for this purpose.

1.37 EQUIPMENT PROVIDED AND INSTALLED BY OWNER

- .1 The descriptions of the equipment supplied and installed by the Owner is given in the list included at the end of this section.
- .2 This list describes the work carried out by the Owner. Each relevant section should therefore read it carefully as it is expected to supply and install all additional equipment, piping, accessories, starters, etc., necessary for the smooth operation of this equipment.
- .3 Anticipate services in the proximity of this equipment and connections if necessary. See the article "SPECIAL CONNECTIONS" in each of the sections of the Divisions concerned.
- .4 Each relevant section is liable for any damage it may cause the equipment to which it performs electromechanical connections.
- .5 Refer to the Architectural drawings and specifications for the equipment.

1.38 CERTIFICATION OF COMPLIANCE

- .1 At the end of the work, each section must submit to the Engineer a certification of compliance stating that all work was performed following the drawings and specifications, and all applicable standards and codes. Refer to example form at the end of this section.
- .2 Submit the certificate to the Engineer at the same time as the request for an attestation of successful work completion.
- .3 Have an administrator from the company sign this form and affix their seal to it.



1.39 CLEANLINESS OF THE SYSTEMS

- .1 Take every necessary measure and precaution to keep the inside of all of the ventilation systems' components and ducts clean.
- .2 Duct cleanliness:
 - .1 All ducts and ventilation equipment should be regularly maintained for cleanliness. Along the progression and the work and nearing completion of the work, examinations will be done to ensure that dust levels do not exceed 0.75 mg/100 cm² to respect the NADCA ACR-standard. See section 23 01 31, article "QUALITY CONTROL".

1.40 CLEANING

- .1 Clean the work area as work progresses. At the end of each workday, or more often if the Owner sees fit, remove the trash, carefully arrange the equipment to be used, and do the work site cleanup.
- .2 Once the work is completed, remove the scaffolding, temporary protective equipment, and surplus materials. Repair any defects observed at this stage.
- .3 Clean and polish glass, mirrors, hardware parts, ceramic tiles, chrome or enamel surfaces, laminated surfaces, aluminum, stainless steel or porcelain-enamel parts, floors and sanitary fixtures. Clean manufactured items in accordance with manufacturer's written instructions.
- .4 Clean the areas used for the execution of works and put them in a state at least equivalent to that which existed before the work began, the cleaning must be approved by the Owner.

1.41 SECURITY SCREENING

- .1 All personnel involved in the execution of the work will be subjected to a security screening. Obtain the required authorisations, as per the requirements, for all personnel who are to be present on site.
- .2 Personnel will be screened every day the beginning of the workday, where they will be provided with a security pass they must carry on their person at all times, to be returned to security at the end of the day.

1.42 SECURITY ESCORT

- .1 All personnel involved in the execution of the work will be required to be accompanied by a security officer when performing work in areas prohibited to the public during normal working hours. They must be accompanied in all areas when working during unoccupied times.
- .2 Submit all requests for escorts at least fourteen (14) days in advance. Where requests are made within the prescribed period, the cost of the security escort will be covered by the Departmental Representative. In the case of late requests, the cost will be the responsibility of the Contractor.



- .3 All requests for escorts may be cancelled, without penalty, if notice is give at least four (4) hours before the time. In the case of late requests, the cost will be the responsibility of the Contractor.

1.43 BREAKDOWN OF COSTS

- .1 Before submitting a request for first payment, provide a detailed breakdown of costs relative to the contract, indicating also the overall price of the contract, as per the Engineer’s instructions. Once approved by the Engineer, the breakdown will serve as a reference for payment installment calculations.

Part 2 Product

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.



COMPLIANCE CERTIFICATE

Project: _____

Project address: _____

Discipline: _____

Specification section: _____

We certify that all materials and equipment used, as well as all apparent or concealed work that we have completed or that we have ordered completed, are in all aspects, compliant with the plans, specification, addenda, and changes prepared by the Engineers of Bouthillette Parizeau Inc., and with all applicable codes, laws and regulations in effect.

Company name: _____

Address: _____

Telephone number: _____

Signatory name: _____

Signature: _____

Signatory title: _____

COMPANY SEAL



RESPONSIBILITY WAIVER – DWG PLANS

The _____

Mr./Ms. _____

Bouthillette Parizeau
8580, avenue de l'Esplanade
Montréal (Québec)
H2P 2R8

Project: _____

Subject: _____

We, _____, relieve Bouthillette Parizeau of any liability resulting from the use of their digital drawings for the development of contractual documents and our coordination, and/or detail drawings, or for any other use related to the project.

We also recognize and agree that:

- That the electronic drawings in question are provided to us for our use only and that they cannot be disseminated without the permission of Bouthillette Parizeau.
- That no assurance is given to us as to the consistency and accuracy of the information contained in it.
- That Bouthillette Parizeau cannot be held responsible should the digital drawings in question contain certain inaccuracies or errors.
- That Bouthillette Parizeau cannot be held responsible for any errors that results from the use of the drawings by us, our subcontractors, or our suppliers.
- That we will remain fully responsible for our submitted drawings or orders, according to contract stipulations.

In addition, we will undertake to verify in site the accuracy of the dimensions and information contained within the digital drawings, as if we had created them ourselves.

Signature: _____

Name (in print): _____

Address: _____

Telephone: _____

Email: _____

END OF SECTION



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Part 1 General

1.1 SCOPE OF WORK

- .1 Work Includes:
 - .1 In general, work consists of the supply of all required materials, workforce, equipment and tools required to complete the electrical installations as described in writing, plans, and specifications. Most notably, work is comprised of:
 - .1 Distribution network of 220/415 V, normal and emergency.
 - .2 Electrical and mechanical grounding.
 - .3 Outlets and sockets.
 - .4 Emergency lighting.
 - .5 Exit lighting.
 - .6 Cable tray.
 - .7 Lightning protection.
 - .8 Connecting electrical fittings.
 - .9 Connecting electrical partitions.
 - .10 Connection of other equipment as outlined in the plans.
 - .11 Connection of electrical hardware.
 - .12 All steel structural supports for conductors, cables, devices, and equipment. Support (hook) for DATA cable as indicated.
 - .13 All specified tests.
 - .14 Relocation of existing equipment.
 - .15 Demolition and removal of equipment deemed obsolete.
 - .16 Installation of temporary equipment to ensure continuity of service.

1.2 RELATED WORK

- .1 The following work must be carried out by following the prescribed requirements, and is also included in other sections of the specifications:
 - .1 Openings in the building to install cables and electrical conductors.
 - .2 Supply of electrical partitions.

1.3 MATERIALS

- .1 Unless stated to the contrary use new materials, without defect, and of the quality required, bearing the appropriate approval labels by CSA, ULC, FM, Bureau of Indian Standards, International Electro technical Commission (IEC), BS 7671, or EN, UK standards according to the specifications.



1.4 DOCUMENTS/SAMPLES TO SUBMIT FOR APPROVAL/INFORMATION

- .1 Shop Drawings:
 - .1 Wiring diagrams and device installation details must indicate proposed location, proposed layout, control panels, accessories, piping, ducts, and all other elements which must be shown in order to ensure a coordinated construction installation.
 - .2 Wiring diagrams must indicate the terminal ends, internal wiring of each device and in addition interconnections between the different devices.

1.5 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Operating voltages to CAN3-C235 and India Standards.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 50 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

2.2 MATERIALS AND EQUIPMENT

- .1 Material and equipment to be ULC, British Standard (BS), IEC, Bureau of Indian Standards, EN or UK standards certified. Where these certifications material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in part 1 "ACTION AND INFORMATIONAL SUBMITTALS".

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction.

2.4 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT PROTECTED BY SPRINKLERS

- .2 Any electrical equipment which is enclosed in a perforated cover/box/container and that is installed in a sprinkler-protected area must be protected by a hood or non-combustible cover that is arranged in such a way that it does not impede the proper functioning of the sprinkler system.



2.7 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates labels as follows:
 - .1 Nameplates: lamicoïd 3 mm black matt white finish face, white core and orange for clean power system, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.
 - .2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 mm x 50 mm	One line	3 mm high letters
Size 2	12 mm x 70 mm	One line	5 mm high letters
Size 3	12 mm x 70 mm	Two lines	3 mm high letters
Size 4	20 mm x 90 mm	One line	8 mm high letters
Size 5	20 mm x 90 mm	Two lines	5 mm high letters
Size 6	25 mm x 100 mm	One line	12 mm high letters
Size 7	25 mm x 100 mm	Two lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates labels to be approved by Consultant prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.
- .9 Devices:
 - .1 Identify all electrical equipment with visible safety labels on the device cover, the door of the device, or on the device frame.
 - .2 Use the same device code as indicated on drawings.
 - .3 Identify (circuit number and panel) on each receptacle and on each electrical pole with P-TOUCH adhesive tag.
 - .4 For CLEAN POWER (CP) source, indicate *CLEAN POWER* and FOR COMPUTER ONLY on each receptacle with P-TOUCH adhesive tag as indicates on drawings.
 - .5 Provide a list of all device identification for approval prior to the manufacturing.
 - .6 Assure that all device identifications are affixed to the equipment and that they are in English.
 - .7 List of equipment to identify:
 - .1 Distribution panel.
 - .2 All specific elements identified in plans or in each section of the specifications.



2.8 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Use colour coded wires in communication cables, matched throughout system.
- .4 Phases:
 - .1 Identify with letters of size 5 cm in height, each phase A, B, C, N, on the inside of each transformer entry point, each low-voltage switchboard, and each motor control centre on all live components.
 - .2 Identify components and assigned phases using the colour codes outlined below:

Identification	120/208 V	120/240 V	347/600 V
Phase A	Red	Red	Red with stripe
Phase B	Black	Black	Black with stripe
Phase C	Blue	---	Blue with stripe
Neutral	White	White	White
Ground	Green	Green	Green

- .3 Use yellow coloured wiring for lighting return switches and orange coloured wiring for driver deflecting switches and inverters.

2.9 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Description	Prime	Auxiliary
Up to 250 V	Yellow	
Up to 600 V	Orange	
Up to 5 kV	Yellow	Blue
Up to 15 kV	Yellow	Red
Telephone	Blue	
Other communication systems	Green	Blue
Fire alarm	Red	
Other security systems	Purple	Yellow
Lighting	White	
Emergency	Black	
Used	Green	



- .4 Conduits:
 - .1 Colour code conduits, boxes and metallic sheathed cables.
 - .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
 - .3 Paint all junction and pull boxes.

2.10 CIRCUIT IDENTIFICATION

- .1 Secondary panels at 220/415 V:
 - .1 Identify in type each of the circuits in the secondary panel on a protected plastic tab inserted in the panel box door. Use the same circuit number that appears in the plans. Be sure to describe succinctly the load.
- .2 Distribution panel at 220/415 V:
 - .1 Identify each circuit in the panel with a visible safety label and place the label near each disconnect and breaker.

2.11 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment green" finish.
 - .2 Paint indoor switchgear and distribution enclosures light gray.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 no. 1 except where specified otherwise.

3.3 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.



3.4 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Wall receptacles: as the existing installation
 - .2 Panel boards: as required by Code or as indicated.
 - .3 Telephone and interphone outlets: as the existing.

3.7 LOCATION OF OUTLETS

- .1 Place the outlets according to the plans and align them in a symmetrical fashion.
- .2 Install back-to-back outlets along a common wall leaving a horizontal gap of at least 300 mm between boxes.
- .3 At the engineer's request, the placement of outlets can be modified up to 3000 mm without additional cost or credit if the change was advised prior to installation.
- .4 Place lighting outputs and outlets in suspended ceilings without harming the ceiling suspensions. Ensure that the outlets are accessible.
- .5 Make setting adjustments once the interior is complete.



- .6 Place light switches between 225 and 300 mm from single door frames on the latch side, and between 225 and 300 mm from the frame for double doors.
- .7 The exact location of outlets should be coordinated using the architectural drawings prior to installation.

3.8 COORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.
- .2 Ensure circuit protective devices such as overcurrent trips, relays and fuses match the required capacity values according to their labels.

3.9 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panel boards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in part 1 "ACTION AND INFORMATIONAL SUBMITTALS", phase and neutral currents on panel boards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350 and 600 V circuits, feeders and equipment with a 1 000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Consultant.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

3.10 PERFORMANCE

- .1 Electrical contractor to collaborate with other trades in such a way that the performance of equipment can be tested in a timely fashion.



- .2 Once testing of equipment is complete, devices can be adjusted in such a way to obtain maximum efficiency.
- .3 General Requirements:
 - .1 All testing must be completed in the presence of the engineer and to their satisfaction.
 - .2 The engineer may require their own testing prior to accepting the results.
 - .3 For temporary testing, obtain written permission to perform the tests.
 - .4 A written warning giving a notice of 48 hours to the engineer is required prior to testing.
 - .5 Provide the necessary devices, equipment, meters, materials, and personnel required for the execution of testing throughout the project until such a time as the engineer accepts the performance.
 - .6 If a piece of equipment or a device does not operate as per the manufacturer's guarantee or the results of a test do not yield the desired results, the faulty piece of equipment must be replaced without delay and payment shall be deferred until the new piece of equipment is installed and desired operating results are obtained.
 - .7 Prevent dust, dirt, and other foreign materials from penetrating the openings in installations and devices during the testing phase.
 - .8 Provide the engineer with a certificate or a manufacturer's letter confirming that the power supply to the device has been installed to their satisfaction.
 - .9 Provide written confirmation of the results obtained from testing.
 - .10 Testing trials must be completed and accepted prior to the installation of thermal insulation.
 - .11 Do not hide or recess any outlets, accessories, or devices until testing is complete and results have been accepted.
- .4 Special Requirements:
 - .1 The presence of the electrical contractor may be required for a test conducted by another trade.
- .5 Factory Testing:
 - .1 The owner and engineer reserve the right to examine equipment in use and to attend the testing to ensure factory device requirements are met.
 - .2 Advise the engineer and owner at least one week in advance with the exact date and time that testing will occur.
 - .3 Provide two certified copies of testing reports to the Engineer.

3.11 SYSTEM STARTUP

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.



- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.12 DEMOLITION

- .1 Remove and transport off-site all demolished equipment including the following: conduits, boxes, outlets, switches, lighting devices, power distribution devices, auxiliary systems, safety/warning communications systems, and all accessories.
- .2 Remove wiring and conduits back to the panel, or to the last remaining box.
- .3 Seal all openings left in accordance with the requirements contained in article "FIREPROOFING".
- .4 Repair any power circuits, control wiring or communications wiring that may have been damaged during demolition work.

3.13 REMOVAL AND RE-INSTALLATION OF EXISTING EQUIPMENT

- .1 Remove and install all electrical devices, conduits and required conductors to allow for the completion of architectural, mechanical, and structural work as outlined in the drawings and specifications. Consult the drawings and specifications of other disciplines as required.

END OF SECTION



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Part 1 General

1.1 REFERENCES

- .1 Electrical and Electronic Manufacturers' Association of Canada (EEMAC):
 - .1 EEMAC 1Y-2-1961 – Bushing Stud Connectors and Aluminum Adapters (1 200 A Maximum Rating).
 - .2 National Electrical Manufacturers Association (NEMA).
 - .3 Bureau of Indian Standards.
 - .4 International Electro technical Commission (IEC).
 - .5 BS 7671.
 - .6 EN UK Standards.

1.2 ACTION AND INFORMATION SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Product

2.1 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper.
- .2 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for stranded copper conductors.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper conductors.
 - .5 Sized for conductors as indicated.
- .3 Clamps or connectors for armoured cable, Teck cable flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 no.18, Bureau of Indian Standards, International Electro technical Commission (IEC), BS 7671, or EN UK Standards.

2.2 WIRE CONNECTORS

- .1 Mechanical connectors for conductor size 8 AWG or less.



- .2 Mechanical connection for copper-to-copper conductors of size 6 AWG or larger, use appropriate connector.
- .3 Mechanical connection for copper-to-Nual conductors of size 6 AWG or larger, use appropriate connector.
- .4 Mechanical connection for Nual-to-Nual conductors of size 6 AWG or larger, use appropriate connector.
- .5 Contractor to provide suitable product and spec to be reviewed by the Government Representative Engineer.

2.3 TERMINAL BLOCKS

- .1 All wire connection in junction boxes and panels for fire-alarm, low-voltage lighting control, other low-voltage systems, etc., will be made on terminal blocks in sufficient quantities for each wire connection.
- .2 Terminal blocks, complete with DIN rail, end plates, identification, extremity flanges and jumpers.
- .3 Contractor to provide suitable product and spec to be reviewed by the Government Representative Engineer.

2.4 ACCEPTABLE MANUFACTURERS

- .1 Wire connectors:
 - .1 Indiamart
 - .2 3M
 - .3 ABB (Thomas and Betts)
- .2 Terminal Blocks:
 - .1 Indiamart
 - .2 Weidmüller
 - .3 Wieland

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connector installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.



3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 no.65.
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 no.65. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.
 - .5 Install in accordance with Bureau of Indians Standards, International Electro technical Commission (IEC) , bs 7671 or EN UK standards.

3.3 WIRE JUNCTIONS

- .1 Tape connectors, that do not have their own insulating jacket, with at least two (2) semi-overlapping rows of Scotch 88 vinyl tape from 3M.
- .2 The di-electric characteristics of the junction must not be inferior to those of the conductor insulation.
- .3 Wire junctions and connectors which do not have a smooth surface should be wrapped with Scotchfil from 3M prior to being taped.

END OF SECTION



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Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Unless indicated otherwise, circuits at 15 A, 220 V will be of size as indicated in annex II of this section.

1.2 PRODUCT DATA

- .1 Provide product data in accordance with Section 01 33 00 – Submittal Procedures.

1.3 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 8 AWG and larger. Minimum size: 12 AWG.
- .2 Unless indicated otherwise, copper conductors: Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE Jacketed.
- .3 Conductors and cables must bear the manufacturer's label, insulation type, size and voltage rating at regular intervals on the outer conductor or cable with permanent markings.

2.2 ARMOURED CABLE (POWER)

- .1 Conductors:
 - .1 Grounding conductor: Unless stated otherwise copper.
 - .2 Circuit conductors: Unless stated otherwise copper.
- .2 Insulation:
 - .1 Cross-linked polyethylene RW90 XLPE.
 - .2 Voltage rating: 600 V.
- .3 Tape: Mylar
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: flat, interlocking, aluminum.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .7 Fastenings:
 - .1 One hole, malleable iron, steel, aluminum, in humid areas, straps to secure surface cables 50 mm and smaller. Two holes steel straps for cables larger than 50 mm.



- .2 Channel type U supports for two or more cables. Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight approved for armoured cable.
- .9 Single conductor cable characteristics:
 - .1 Concentric ground conductor.
- .10 Multi-conductor cable characteristics:
 - .1 Class B stranded copper conductors.
 - .2 Class B stranded copper grounding conductor.
 - .3 Filling with non-hygroscopic material.
- .11 Contractor to provide suitable product and spec to be reviewed by the Government Representative Engineer.

2.3 ARMOURED CABLES (BX)

- .1 Conductors: insulated, unless otherwise indicated, copper RW-90, unless AL is specified in the plan.
- .2 Armour: interlocking type fabricated from galvanized steel aluminum strip.
- .3 Connectors: anti short connectors.
- .4 Type AC90 (BX) for connection:
 - .1 Sockets installed in plasterboard or suspended ceilings.
 - .2 Light switches installed in plasterboard.
 - .3 Receptacles in drywall with a maximum length of 5m.
 - .4 Hanging devices such as motorized dampers, valves, and other similar devices (approximate length of ± 900 mm between the ductwork and the suspended device).
 - .5 Type ACWU90, PVC coated, fire retardant covering, and compliant to applicable Building Code classification for this project wet locations.

2.4 CABLES FOR COMPUTER EQUIPMENT

- .1 Flexible metal sheathed for intensive use, water-tight, shielded, service conductor RW-90, clearly identified with the circuit number for connecting computer devices via the raised floor.

2.5 APPROVED MANUFACTURERS

- .1 Conductors:
 - .1 Alcan (General Cable)
 - .2 Nexans
 - .3 Phillips
 - .4 Pirelli



- .2 Armoured cables:
 - .1 Alcan (General Cable)
 - .2 Nexans
 - .3 Phillips
- .3 Cables with two (2) hours fire-protection:
 - .1 Pyrotenax
- .4 AC90 and ACWU90 cables:
 - .1 Alcan (General Cable)
 - .2 Nexans
 - .3 Phillips
 - .4 Pirelli

Part 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors – 0 – 1 000 V.
- .2 Cable Colour Coding: to Section 26 05 53 – Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be two (2) wire circuits only, i.e. common neutrals not permitted.
- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.
- .8 Supply and install wires and cables required for the connection of all electrical equipment and devices to make them fully operational even if the wires or cables are not specifically shown on the drawings.



- .9 Install conductors or cables in conduits or metal sheaths as indicated in this section.
- .10 Install a neutral conductor bypass circuit at 220 V.
- .11 Use only lubricants approved by the manufacturer for cable pulling.
- .12 Install cables and leads continuously without joints from their point of origin to the powered device. If necessary, create joints in approved boxes.
- .13 Support conductors in vertical conduit with Type M carriers, manufactured by O-Z Products. Space them as follows:
 - .1 Conductors of size 1/0 and smaller: supports every 30 m.
 - .2 Conductors of size 2/0 to 4/0: supports every 25 m.
 - .3 Conductors of size 250 to 350 MCM: support every 20 m.
 - .4 Conductors of size 350 to 500 MCM: supports every 15 m.
 - .5 Conductors of size 600 to 700 MCM: supports every 12 m.
- .14 Support vertically mounted armored cables or type Teck such as AC90, ACU90, RP90, RC90, or Teck90 according to the requirements outlined in Table 21, of the Canadian Construction – Electrical.
- .15 Refer to table1 at the end of this section to determine the maximum number of conductors/conduits.

3.3 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
 - .2 Use armoured cable in cable tray.
 - .3 Contractor to provide suitable product and spec to be reviewed by the Government Representative Engineer.

3.4 INSTALLATION OF TECK90 CABLE POWER (0 -1 000 V)

- .1 Group cables wherever possible on U channels.
- .2 Install exposed or concealed cable securely supported by staples, straps, hangers.
- .3 Installation of single-conductors:
 - .1 Splice drivers as recommended by the manufacturer.
 - .2 At the ends of the cables, attach the line forming the ground screen, link each to the ground terminal provided inside the cell cables in each position.
 - .3 Otherwise let float the wires of the ground green to the other end of the cables.
 - .4 On top of the cells where the cables enter, provide for non-metallic metal plates (aluminum) at the starting point of the cables and insulation at the arrival point of the cables. Route all cables through the same opening in a metal frame.
 - .5 Drill these plates and attach the fittings to the appropriate cables.



- .6 The fitting used to secure the cables to the plates are aluminum, screwed to the metal shell, and are of the type recommended by the manufacturer.
- .7 The metal shell of the cables must be connected to the metal plate at the base of the cables. This means that the PVC sheath cables must not be damaged in order to avoid contact between the metal casing and the metal support cables, and must establish a closed circuit between armored wires.
- .8 The order and the phase must be as it appears in the drawing.
- .9 Maintain an equal spacing of at least the largest diameter of the cable between each of the cables installed in open air or in the cable racks.

3.5 INSTALLATION OF ARMoured CABLES (BX)

- .1 Group cables wherever possible on U channels.
- .2 Secure cables directly to the frame at a distance of 300 mm from each side of the outputs and at 1500 mm maximum on all lines.
- .3 Cut the metal casing of the cables with a suitable tool and provide insulating sleeves at the ends.
- .4 Install armoured cables only vertically inside wall.

3.6 TESTING RESISTANCE IN INSULATION

- .1 Measure the di-electric value of circuits, power cables, and equipment with a maximum voltage of 350 V and a 500 V megger.
- .2 Measure the di-electric value of circuits, power cables, and equipment with a maximum voltage of 350 V and 600 using a meg-ohmmeter of 1 000 V.
- .3 In either case, ensure that the value of the resistance to ground, before power is applied, is not less than the requirement as set forth by the manufacturer.
- .4 Provide certification that all drivers have been checked and that any defective conductors have been replaced.

3.7 CONVERSION TABLE MM²

- .1 Refer to ANNEXE III for table conversion from AWG conductor size to mm² size.



APPENDIX I

MAXIMUM NUMBER OF RW-90 CONDUCTORS PER CONDUIT						
Conductor Size AWG	Size of Conduit in mm					
	16	21	27	35	41	53
14	7	14	22	40	55	90
12	4	10	16	30	40	66
10	4	6	12	20	30	50
8	---	3	6	10	16	26
6	---	---	3	8	9	18
4	---	---	---	3	6	12
3	---	---	---	3	6	12
2	---	---	---	---	6	9
1	---	---	---	---	4	6
1/0	---	---	---	---	---	6

Note:
 For dimensions not listed, refer to Chapter V – Electrical to Construction Code of Canada Electrical Code.



APPENDIX II

MAXIMUM LENGTH (IN METERS) OF A BRANCH CIRCUIT AT 120 V VERSUS VOLTAGE DROP			
Conductor Size AWG	Rating in Amps (A)		
	15	20	30
12	20	15	---
10	30	25	15
8	50	40	25
6	90	65	40

Notes :

- For non-specified loads, refer to Chapter V – Electrical to Construction Code of Canada (Canada Electrical Code (table no. D3)).
- Distance calculated for copper conductors at a temperature of 60°C.



APPENDIX III

SPEC A185
 April, 2010

AWG (American Wire Gauge) to mm² (Millimeters squared) Conversion

AWG to mm ² CONVERSION TABLE	
AWG/kcmil	[mm ²]*
20	0.52
18	0.82
16	1.31
14	2.08
12	3.31
10	5.26
8	8.36
6	13.3
4	21.2
2	33.6
1	42.4
1/0	53.5
2/0	67.4
3/0	85.0
4/0	107
250	127
300	152
350	177
400	203
450	228
500	253
600	304
750	380
800	405
1000	507

* Equivalent mm² cross-sectional area

mm ² to AWG CONVERSION TABLE		
mm ²	[mm ²]*	AWG/kcmil
0.5	0.52	20
0.75	0.82	18
1.5	1.31	16
2.5	2.08	14
2.5	3.31	12
4	3.31	12
6	5.26	10
10	8.36	8
16	13.3	6
25	21.2	4
35	33.6	2
35	42.4	1
50	53.5	1/0
70	67.4	2/0
95	85.0	3/0
95	107	4/0
120	107	4/0
120	127	250
150	152	300
185	177	350
185	203	400
240	228	450
240	253	500
300	304	600
400	380	750
400	405	800
500	507	1000

Multiple AWG choices – consult responsible engineer for required ampacity

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3.2 INSTALLATION – GENERAL

3.3 EQUIPMENT GROUNDING

3.4 FIELD QUALITY CONTROL



Part 1 General

1.1 REFERENCES

- .1 CSA International:
 - .1 CSA Z32-F04 – Electrical Safety and Essential Electrical Systems in Health Care Facilities.

1.2 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Products

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as required.
- .3 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
- .4 Insulated grounding conductors: green, copper conductors, size as indicated.
- .5 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .6 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermite welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

2.2 RECOMMENDED MANUFACTURERS

- .1 Burndy Corp.
- .2 McGraw-Edison (Canada) Ltd.
- .3 Thomas & Betts



Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION – GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories as outlined in Chapter V – Electrical Code of Canada.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5 Soldered joints not permitted.
- .6 Flexible ducts, providing a bonding wire connected at each end to a ground terminal.
- .7 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .8 Install green isolated conductor in each conduit.

3.3 EQUIPMENT GROUNDING

- .1 Linking built engines or other devices transmitting vibrations with a separate conductor, green, to a grounding terminal in the junction box or connection placed between the rigid pipe and the flexible conduit connecting the device.

3.4 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests before energizing electrical system.
- .3 Disconnect ground fault indicator during tests.

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Part 1 General

1.1 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Products

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 mm x 41 mm, 2.5 mm thick, surface mounted or suspended set in poured concrete walls and ceilings.

2.2 ACCEPTABLE MANUFACTURERS

- .1 Supports:
 - .1 Burndy
 - .2 Canstrut
 - .3 Hilti
 - .4 Pilgrim
 - .5 Unistrut

Part 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm (2" in diameter).
 - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.



- .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 3 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

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3.2 JUNCTION, PULL BOXES AND CABINET INSTALLATION

3.3 IDENTIFICATION



Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings:
 - .1 In accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Products

2.1 SPLITTERS

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position, of calibre 14.
- .2 Terminations: main and branch lugs and connection blocks to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three (3) spare terminals or lugs on each connection or lug block sized less than 400 A.
- .4 Continuous copper bars, complete with soldered terminals, capacity indicated in the plans.

2.2 JUNCTION AND PULL BOXES

- .1 Construction: 16 gauge minimum steel, welded steel cans, painted with a coat of paint applied with an electrostatic process, dimensions as indicated.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat turned edge covers.
- .4 With knockouts, factory made.
- .5 When apparent, TC type with frame, covered/concealed hinges, lock, no visible screws.
- .6 Boxes with large dimensions equipped with steel angle frame to form a rigid assembly, easily removable lids.

2.3 ACCEPTABLE MANUFACTURERS

- .1 Contractor to provide suitable product and spec to be reviewed by the Government Representative Engineer.



Part 3 Execution

3.1 SPLITTER INSTALLATION

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINET INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.
- .5 Install all junction and pull boxes as indicated in the plans or where necessary.

3.3 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00 – Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name and voltage and phase or as indicated.

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Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International):
 - .1 CSA C22.1-F06 – Canadian Electrical Code, Part 1, 20th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.3 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES – GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required, steel, 14 gauge minimum, with thickness of 40 mm, and dimensions outlined in the Canadian Electrical Code.
- .3 Gang boxes where wiring devices are grouped in the same area.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.
- .6 All boxes protruding less than 2.4 m from the ground will be of the FS type.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Single or multi gang flush device boxes for flush installation, minimum size 76 mm x 50 mm x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 mm x 54 mm x 48 mm.
- .4 Extension and plaster rings for flush mounting devices in finished tile walls.

2.3 MOUNTING BOXES IN MASONRY OR GYPSUM BOARD

- .1 Electro-galvanized sheet steel outlet boxes, multi, gang, flush mounting into masonry walls, block or gypsum board.
- .2 Recessed box 101 mm x 101 mm, plaster to cover 12.5 mm or more.
- .3 Boxes in exterior walls with insulation and vapor barrier, Thomas & Betts no. BCR2000.



2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel outlet boxes of NBD type, for flush mounting, encased in concrete, with extension frames and frames plastering matched as required.
- .2 Box of projection type FS (a group), if for a single pipe, or 101 mm x 101 mm, if more than one channel.

2.5 CONDUIT BOXES

- .1 Cast aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.6 CEILING BOXES

- .1 Octagonal box projecting from 101 mm diameter, serial no. 54151, to the required depth.
- .2 Sunken octagonal box of 101 mm diameter, serial no. 54521, to the required depth.

2.7 FITTINGS – GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.
- .5 Divider boxes
 - .1 PVC single our multi gang boxes for receptacles install on divider.

2.8 APPROVED MANUFACTURERS

- .1 Contractor to provide suitable product and spec to be reviewed by the Government Representative Engineer.
- .2 Outlet boxes:
 - .1 Temco
 - .2 Iberville
 - .3 ABB

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.



- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 The openings in the box must correspond to the dimensions of conduits, mineral insulated cables and armored cable. The use of reducers is not permitted.
- .6 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .7 Identify systems for outlet boxes as required.
- .8 Group in one box: switches, outlets, and other similar devices, placed side by side. If there are more than two devices, GSB boxes with GBC plaster rings must be used.
- .9 Outlet boxes shown as back-to-back on the plans must be placed a minimum of 300 mm apart.
- .10 In the gypsum walls, attach the boxes to metal studs, as shown in the plans.

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Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.2 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Products

2.1 CONDUITS

- .1 Electrical metallic tubing (EMT): to CSA C22.2 no. 83, with couplings, and expanded ends.
- .2 Rigid PVC conduit: to CSA C22.2 no. 211.2.
- .3 Flexible metal conduit: to CSA C22.2 no. 56, flexible aluminum.
- .4 Connectors and conduit fittings, thin-walled steel, compression type.

2.2 CONDUIT FASTENINGS

- .1 One hole, steel straps to secure surface conduits where the diameter is equal to 50 mm or less.
 - .1 Two hole, steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 3 meters on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 no. 18, manufactured for use with conduit specified.
Coating: same as conduit.
- .2 Ensure factory "ells (L)" where 90° bends for conduits 25 mm and larger.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.4 FISH CORD

- .1 Polypropylene.

2.5 ACCEPTABLE MANUFACTURERS

- .1 Contractor to provide suitable product and spec to be reviewed by the Government Representative Engineer.



- .2 EMT or rigid metal ducts or suitable equivalent:
 - .1 Columbia International Ltd.
 - .2 Siezfried Kreser Industries Ltd.
- .3 PVC conduits:
 - .1 Canron
 - .2 Columbia International Ltd.
 - .3 Ipex
- .4 Flexible conduit:
 - .1 Nexans
 - .2 Columbia International Ltd.
- .5 Expanding joints:
 - .1 Crouse-Hinds

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Surface conduit on existing wall for new connection.
- .3 Use electrical metallic tubing (EMT).
- .4 Use flexible aluminium conduit for connection to work in movable metal partitions.
- .5 Minimum conduit size for lighting and power circuits: 19 mm.
- .6 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .7 Dry conduits out before installing wire.
- .8 Unless otherwise indicated, all ducts are to be concealed in walls, floors, ceilings and suspended ceilings.
- .9 Install protruding ducts in parallel with structural lines and so as not to harm the equipment of other trades.
- .10 No drilling is to be done through the beams for the passage of conduits.
- .11 Maintaining the continuity of the grounding throughout the facility, taking care to make solid connections between the conduits and equipment. A green wire grounding must be



- added to each flexible conduit connecting a device capable of vibrating, such as, motors and all ducts are to be installed in concrete.
- .12 The inner radius of curvature of the ducts is at least six times the internal diameter of the pipe. When a group of ducts run side by side, the bending radii are concentric.
 - .13 Connect the threaded conduit liners and devices using two nuts and a threaded sleeve, and insulated steel. Merge conduit with thin-walled steel type connectors screw.
 - .14 Ream ends of threaded rigid conduit to remove metal burrs. Carefully cut fillets and coat gaskets or use an equivalent product to seal. Maintain the length of fillets to the minimum necessary for the connections to the boxes.
 - .15 During construction, equip ducts with plugs to prevent foreign bodies from entering.
 - .16 Leave a nylon cord at least 3 mm in diameter in each empty conduit where the installation of cables is part of another section.
 - .17 Conduit raceways between two outputs, pull boxes or sliding sleeves must not have more than three 90° elbows or equivalent or be more than 60 m in length, except the external telephone network, where indicated in the plans.
 - .18 Attach conduits as follows:
 - .1 Supply and install all the necessary supports galvanized for electrical work.
 - .2 Conduits:
 - .1 When the insulated conduits are in contact with a surface of concrete or masonry, affix them using cast iron or steel straps.
 - .2 Where a group of passages (four or more) flows in parallel, affix them to the steel supports by anchoring them directly to the frame or by means of threaded rods or other supports.
 - .3 The size of the rods, supports, and spacing of supports are based on weight bearing as required by the code. When conduits of various sizes are grouped, the spacing of the supports is determined by the smallest conduit of the group.
 - .3 Install cross braces spaced up to 12 m center-to-center and longitudinal braces on all horizontal runs of suspended conduits to 300 mm of the ceiling tile. This requirement may be omitted if the maximum diameter is less than 65 mm for a conduit or if conduits of an individual group has a total weight less than 15 lb/m.
 - .19 Continuous **nets** are not allowed. In some cases it is impossible to install ordinary fittings, in these circumstances use Erikson type fittings.
 - .20 Support conduits suspended using galvanized brackets, as described elsewhere in this book.
 - .21 The spacing of supports and fasteners must be in accordance with the latest edition of the Electrical Code of Canada.
 - .22 Support vertical conduits at floor level and use intermediate supports required by the code.



- .23 In suspended ceilings, support the metal sheath cables to the frame and not the ceiling structure.
- .24 The conduits should not touch the conduit insulation, mechanical equipment, or be buried in the insulation or fireproofing materials.
- .25 When a recessed panel is located in a room with a suspended ceiling, install three empty conduits of 21 mm diameter between the panel and the interior of the suspended ceiling and three upper pipes 21 mm between the panel and the suspended ceiling of the lower stage. These conduits must be easily accessible for future work/maintenance.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

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3.2 CABLES IN CABLE TRAY



Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product data:
 - .1 Submit manufacturer's product data sheets for cable tray indicating dimensions, materials, and finishes, including classifications and certifications.
- .2 Shop drawings:
 - .1 Submit shop drawings showing materials, finish, dimensions, accessories, layout and installation details.

Part 2 NOTE PRODUCTS

2.1 CABLE-TROUGH

- .1 Cable-troughs and fittings: to CAN/CSA C22.1 no. 126.1 and 126.2.
- .2 Ventilated type, Class A to CAN/CSA C22.2 no. 126.2.
- .3 Cable tray in aluminium, 150 and 300 mm, ventilation type bottom. Height 50 mm.
- .4 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cable-trough supplied.
 - .1 Radius on fittings: 600 mm minimum.
- .5 Solid covers for complete cable-trough system including fittings.
- .6 Barriers where different voltage systems are in same cable-trough.
- .7 Ground cable trays with 2 AWG bare copper conductor attached to each tray section in accordance with CEC requirements. Ground cable suitable for cable tray material.
- .8 Model: cable tray: ALU1206V (or steel equivalent number) and ALU1209V (or steel equivalent number) , cover: ALUW06VFC (or steel equivalent number) and ALU09VFC (or steel equivalent number) from ABB or equivalent.

2.2 SUPPORTS

- .1 Provide splices, supports for a continuously grounded system as required.
- .2 Use existing cable tray support and install new support for each cable tray meter length. New support model: Superstrut, AUS-RISER KIT c/w bolts and aluminium or steel from ABB, use aluminium or steel cantruss.

2.3 ACCEPTABLE MANUFACTURERS

- .1 B-Line
- .2 ABB



- .3 Contractor to provide suitable product and spec to be reviewed by the Government Representative Engineer.
- .4 Reference : Variant Infratech Pvt.

Part 3 Execution

3.1 INSTALLATION

- .1 Install complete cable-trough system.
- .2 Support cable-trough on both sides.
- .3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.
- .4 Securely assemble the various components together with bolts, nuts and washers, of aluminium. Mount or descend with the help of concave or convex vertical adjustable bends or elbows.
- .5 Filling capacity of cable trays must meet CSA requirements.

3.2 CABLES IN CABLE TRAY

- .1 Install cables individually.
- .2 Lay cables into cable tray. Use rollers when necessary to pull cables.
- .3 Secure cables in cable tray at 6 m centres, with nylon ties.

Identify cables every 30 m with size 2 nameplates. Attach all cables to the cable tray using P type clamps manufactured by ABB, leave sufficient space to 100% of the largest cable diameter cable.

END OF SECTION



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PART 1 GENERAL

1.1 SHOP DRAWINGS

PART 2 PRODUCTS

2.1 PANELBOARDS

2.2 BREAKERS

2.3 EQUIPMENT IDENTIFICATION

PART 3 EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION



Part 1 General

1.1 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Products

2.1 PANELBOARDS

- .1 Distribution panel boards as per CSA C22.2 No.29 and product of the same one manufacturer.
 - .1 Install circuit breakers in panel boards before shipment.
- .2 220 V panel boards, capacity of bus bars, rated breaking capacity and circuit breakers, as indicated on the panel board sheets.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Minimum of two (2) flush locks for each panel board. Two keys for each panel board and key panel boards alike.
- .5 Aluminum bus bars; neutral bar of the same carrying capacity as the phase bar or a carrying capacity double that of the phase bar where indicated.
- .6 Bus Bars will have bolted-on breakers.
- .7 Frame of the door panels with concealed bolts and hinges
- .8 Door and door frame coated with oven-baked enamel.
- .9 Isolated ground bus.
- .10 Include grounding bus bar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.
- .11 Gray painted steel housing, 12 gauges minimum, hinged door with concealed lock for access to the circuit breakers and integrated with hinged exterior door lock for access to the wiring spaces of the area.
 - .1 Types of panel boards:
 - .1 Receptacles /Lighting 220/415 V: PRL2 10 kA
 - .2 Models by Cutler -Hammer Company. The equivalents made by Schneider Group, Siemens, General Electric are also accepted.
 - .2 The panels should have either nominal short-circuit holding or the nominal value of integrated protection of the equipment with the upstream protective device as shown in the panel paperwork. The panel's face value protection equipment must meet CSA C22.2 testing requirements No. 29 and must be labeled to show the face value of integrated protection, voltage, and enabled devices downstream.
 - .3 All panels installed in mechanical and electrical rooms protected by sprinklers must have sprinkler-proof housing.



2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.02 – Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panel boards except as indicated otherwise.
- .3 Main breaker, separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Lock-on devices for receptacles, fire alarm, clock outlet, emergency, door supervisory, intercom, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

- .1 Full nomenclature for circuits with typewritten legend showing the location and the load of each circuit in a plastic coated tag inside the panel board.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for panel board installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of the Consultant.
 - .2 Inform the Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.

3.2 INSTALLATION

- .1 Locate panel boards as indicated and mount securely, balanced, and square, to adjoining surfaces.
- .2 Fit the distribution panels on fireproof plywood, fire protection of two (2) hours. Wherever possible, group the distribution panels on a common backboard at 21 mm.
- .3 Mount distribution panel boards to the height as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.
- .6 Where panels of different systems (i.e. standard and vital power) supply a common patient care area, ground busses in panels to be interconnected to ground conductor.
- .7 Provide three (3) empty conduits, 27 mm from each panel, recessed in walls and ducts which end in a pull box in the ceiling space.



- .8 Measure the voltage load currents stabilized in each power circuit board and rearrange circuits in the panel to balance the loads on the phases with a maximum deviation of 20% from each. Maintain adequate phasing out of derivations of multiphase circuits. Submit the expense report to the Consultant for approval and make corrections if necessary.

END OF SECTION



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- 1.1 IDENTIFICATION
- 1.2 SHOP DRAWINGS
- 1.3 REFERENCE

PART 2 PRODUCTS

- 2.1 RECEPTACLES
- 2.2 COVER PLATES
- 2.3 SOURCE QUALITY CONTROL
- 2.4 LIST OF MANUFACTURERS

PART 3 EXECUTION

- 3.1 EXAMINATION
- 3.2 INSTALLATION



Part 1 General

1.1 IDENTIFICATION

- .1 Identify all electrical outlets with an adhesive tape of "P -Touch" type made by Brothers and marked with the following: circuit, number, panel, identification.

1.2 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

1.3 REFERENCE

- .1 British Standard (BS).

Part 2 PRODUCTS

2.1 RECEPTACLES

- .1 Duplex receptacles, 13 A-250V, grounded U socket to conform to CSA C22.2 No. 42 and British Standard (BS), with the following characteristics:
 - .1 Lateral or rear connection of wire size 10 AWG.
 - .2 Severing links for conversion in divided doses.
 - .3 Eight (8) rear connection ports, four (4) screw terminals for side connections.
 - .4 Triple sliding contacts and riveted grounding contact.
 - .5 Color: white
 - .6 Isolated switch "ON-OFF" for each receptacle.
- .2 Other voltage outlets and permissible intensity as indicated.
- .3 For the entire installation, use only components from a single manufacturer.
- .4 All outlets and switches grouped together must be of the same model and covered with a single plaque.
- .5 Contractor to provide suitable product and spec to be reviewed by the Government Representative Engineer.

2.2 COVER PLATES

- .1 Equip all wiring devices with a cover plate such that it complies with CSA Standard C22.2 No. 42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 In general, nylon, unbreakable, white color.

2.3 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.



2.4 LIST OF MANUFACTURERS

.1 Electrical outlets, switches, and low voltage lighting controls:

.1 Lighting switches and sockets:

- .1 Havells - # BS1363 or equivalent (Honeywell)
- .2 Cooper (Arrow-Hart)
- .3 Hubbell
- .4 Leviton
- .5 Pass & Seymour

.2 Switch plates and sockets:

- .1 Cooper (Arrow-Hart)
- .2 Hubbell
- .3 Leviton
- .4 Pass & Seymour
- .5 Temco

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of the Consultant.
- .2 Inform the Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied, and after receipt of written approval to proceed from the Consultant.

3.2 INSTALLATION

.1 Receptacles:

- .1 Install receptacles in gang-type outlet box when more than one receptacle is required in one location.
- .2 Mount receptacles at height as indicated.
- .3 Where split receptacles has one portion switched, mount vertically and switch in upper position.

.2 Cover plates:

- .1 Install suitable common cover plates where wiring devices are grouped.
- .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

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1.1 SHOP DRAWINGS

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

2.2 THERMAL MAGNETIC BREAKERS

2.3 MAGNETIC BREAKERS

PART 3 EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION



Part 1 General

1.1 SHOP DRAWINGS

- .1 Refer to section 20 00 10 for shop drawings to be provided.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Moulded-case circuit breakers to standard CSA C22.2 No. 5.
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

2.2 THERMAL MAGNETIC BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- .2 Moulded case for thermomagnetic tripping, bolted, multipole, simultaneous opening with incorporated fuses, where indicated, breaking capacity and short circuit value, as indicated.
- .3 Minimum short-circuit interrupting capacity:
 - .1 220/415 V: 10 kA

2.3 MAGNETIC BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of the Consultant.
 - .2 Inform the Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.



3.2 INSTALLATION

- .1 Install circuit breakers as indicated.
- .2 Provide hardware fittings when required.

END OF SECTION



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PART 1 GENERAL

1.1 NOT USED

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

2.2 EXAMINATION

2.3 INSTALLATION



Part 1 General

1.1 NOT USED

- .1 Not Used.

Part 2 Products

2.1 DISCONNECT SWITCHES

- .1 Mechanically interlocked door to prevent opening when handle in "on" position.
- .2 Fuse-holders: to CSA C22.2 No. 39, relocatable and suitable without adaptors, for type and size of fuse indicated.
- .3 Quick-make, quick-break action.
- .4 "On-Off" switch position indication on switch enclosure cover.
- .5 Intensive use type, to sudden opening and closing, with or without fuses, as indicated, locked door in the closed position with the possibility of cancellation by qualified personnel, possible lockout by three (3) padlocks, portfolio fuses class J fuses, solid neutral, NEMA -1 housing inside, NEMA -3R and technical rooms sprinklered and NEMA -4X outdoors, model H, series Cutler Hammer or equivalent by Siemens.

- .1 Execution

2.2 EXAMINATION

- .1 Verification of conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for disconnect switches - fused and non-fused installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of the Consultant.
 - .2 Inform the Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Consultant.

2.3 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.
- .2 Ensure the required disconnect is 1 m in front of the switches.

END OF SECTION



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PART 1 GENERAL

1.1 NOT USED

PART 2 PRODUCTS

2.1 MATERIALS

PART 3 EXECUTION

3.1 INSTALLATION

3.2 FIELD QUALITY CONTROL



Part 1 General

1.1 NOT USED

- .1 Not Used.

Part 2 Products

2.1 MATERIALS

- .1 Every mechanical section involved must ensure that there are formal and preliminary agreements between the manufacturer and the starter-motor based on the mutual acceptance of their products. The section that provides the engine is solely responsible for the choice of overload and overcurrent relays.
- .2 All connections inside the starters should be made on screw terminals, type 9700B mounted on rail with warning plates and end plates, by Wieland. To that end, provide a terminal identified with a minimum of four air terminals.
- .3 Unless otherwise indicated, all starters over 50 HP must be of reduced voltage. Magnetic reduced voltage starters must have the characteristics mentioned for magnetic starter speeds.

Part 3 Execution

3.1 INSTALLATION

- .1 Install starters and control devices in accordance with manufacturer's instructions.
- .2 Install and wire starters and controls as indicated.
- .3 Ensure correct fuses installed.
- .4 Confirm motor nameplate and adjust overload device to suit.
- .5 Make the motor and equipment connections provided under other divisions and under the supervision of the suppliers/manufacturers of these devices.
- .6 Ensure that the voltage and number of phases of the power supply circuits and equipment are compatible.
- .7 Ensure overload relays are suitable for the engines they protect. To this end, approval of the caliber of these relays by the supplier/manufacturer of each engine is required.
- .8 Install jumpers on the terminals provided for the control connection, so you can try each starter, even if the command circuits are not relayed.
- .9 Check the thermal protection of each engine starter. Make a list of the results and return it to the Consultant.

3.2 FIELD QUALITY CONTROL

- .1 Operate switches and contactors to verify correct functioning.



- .2 Perform starting and stopping sequences of contactors and relays.
- .3 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.
- .4 Before operating the engine for the first time, the electrical contractor must:
 - .1 Ensure the presence of the section that refers to the engine.
 - .2 Check the direction of rotation of motors. If rotation is wrong, make corrections and new fittings on the engine and not in the ignition, in order to respect the color coding of the wiring.
 - .3 Before starting the engine, ensure the free movement of any layer of shaft mechanical seal pump.
 - .4 Check protection overload and overcurrent to ensure they are adequate.
 - .5 Check the “megger” insulation.
 - .6 Measure the voltage of the electric circuit powering the motor.
 - .7 Check voltage (volt) and current (ampere) of each of the motors upon starting and at normal operation on each phase.
 - .8 Check the operation positions of the controls and switches.
- .5 Ensure the presence of the manufacturer of the engine and / or the device.
- .6 At all costs, the engines should not be started unless the requirements mentioned above have been executed.
- .7 Engine manufacturers must provide the start-up curves of their engines.

END OF SECTION



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- 1.1 RELATED REQUIREMENTS
- 1.2 REFERENCE STANDARDS
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS

PART 2 PRODUCTS

- 2.1 MATERIALS
- 2.2 DESCRIPTION

PART 3 EXECUTION

- 3.1 EXAMINATION
- 3.2 INSTALLATION
- 3.3 CLEANING
- 3.4 PROTECTION



Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 28

1.2 REFERENCE STANDARDS

- .1 Institute of Electrical and Electronics Engineers, Inc. (IEEE)
 - .1 IEEE 837-2002, Standard for Qualifying Permanent Connections Used in Substation Grounding.
- .2 CSA Group (CSA)
 - .1 CAN/CSA-B72-M87 (R2008), Installation Code for Lightning Protection Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer.

Part 2 Products

2.1 MATERIALS

- .1 Conductor: stranded size as existing cable.
- .2 Fastenings and attachment straps: aluminum.
- .3 Connections: connections formed by thermit process (Cadweld).

2.2 DESCRIPTION

- .1 System to consist of equipment connection on the roof.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for lightning protection installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.

3.2 INSTALLATION

- .1 Install lightning protection to CAN/CSA-B72.
- .2 Bond discharge conductors to service mast or other non-current-carrying electrical parts.



- .3 Submit certificate of installation to Consultant.
- .4 Contractor to perform test to confirm continuity of system and report findings to Government Representative Engineer.

3.3 CLEANING

- .1 Leave Work area clean at end of each day.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by lightning protection installation.

END OF SECTION



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PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

PART 2 PRODUCTS

2.1 BATTERY UNIT

2.2 EQUIPMENT MOUNTING

2.3 EXIT LIGHT

PART 3 EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION

3.3 FIELD QUALITY CONTROL

3.4 CLEANING

3.5 PROTECTION



Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for egress lighting, battery and remote lamps heads and include product characteristics, performance criteria, physical size, finish and limitations.

Part 2 Products

2.1 BATTERY UNIT

- .1 Rugged steel cabinet with corrosion-resistant undercoating.
- .2 Removable front panel on cabinet provides easy access and allows the unit to be mounted at ceiling height.
- .3 Solid-state pulse-type charger
 - .1 Current-limited, temperature compensated, short-circuit proof and reverse-polarity protected.
- .4 Unit comes standard with electronic lockout and brownout circuits.
- .5 Sealed dust-proof transfer relay, test switch and LED indicator lights.
- .6 Long-life, maintenance-free lead acid battery.
- .7 Input 200 - 240 Volts – 50 HZ, output 24 Volts DC.
- .8 Capacity: 288 Watts.
- .9 Cab-tire, 1 meter long. Provide single receptacle 15A-220V for connection.
- .10 Complete with 2 LED head projector
- .11 Model: LDX SERIES from Ready-Lite or equivalent.

2.2 EQUIPMENT MOUNTING

- .1 Enclosed system:
 - .1 Mounted in CSA type 1
 - .2 Front access only.
 - .3 Charger mounted in isolated upper compartment.
 - .4 Shelf for mounted wall installation
- .2 Lamp heads: adjustable mounting, swivel type, c/w LED halogen, glare free, minimum 4 Watt capacity, 24 Volts DC, color white.
- .3 CSA certified C22.2 No.141-15.
- .4 Mode: RM-2-LD13 from Ready-Lite.

2.3 EXIT LIGHT

- .1 Photoluminescent running man aluminium sign.



- .2 Background: photoluminescent, illumination green illuminating.
- .3 Non-toxic, non-radioactive.
- .4 Visible at 15 meters for a minimum of 90 minutes.
- .5 Life expectancy of 25 years and more.
- .6 Arrows and mounting installation as indicated.
- .7 Aluminium silver frame.
- .8 UL924, CAN/ULC S572, Bureau of Indian Standards, International Electro technical Commission (IEC), BS 7671, or EN UK standards approvals.
- .9 Model: AIMP4000 SERIES from Aimlite or equivalent. Reference : geoip.imimg.com

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for central emergency system installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

- .1 Identify conductors for polarity and voltage.
- .2 Direct light heads as directed by Consultant and as indicated.
- .3 Install with conductors sized to maintain current flow with maximum 5% voltage drop.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.

3.4 CLEANING

- .1 Final Cleaning: make final cleaning on each component.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by central emergency lighting system installation.

END OF SECTION



Request for Proposals (RFP) for
MECHANICAL AND ELECTRICAL UPGRADES

High Commission of Canada, New Delhi, India

Solicitation Number 21-175731 Project Number: B-DELHI-116



Global Affairs
Canada

Affaires mondiales
Canada

October 2020

SITE PLAN

High Commission of Canada, Chanakyapuri, New Delhi



SITE PLAN DETAILS



OVERVIEW OF ROOFTOP UNITS (RTU) & (HRU)



Oct. 2020

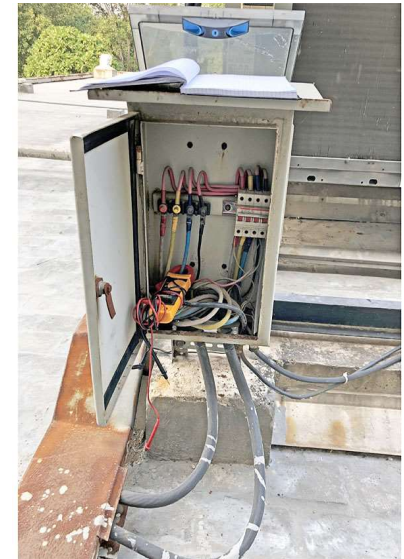
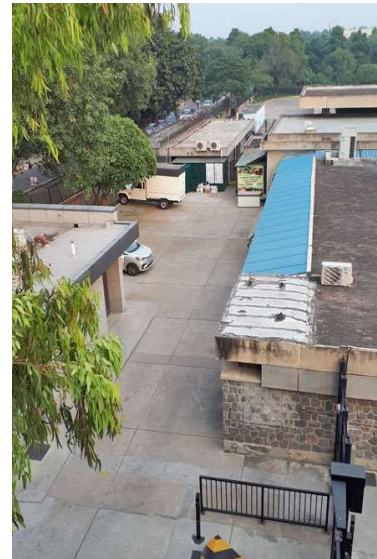
Project: B-DELHI-116 Mechanical and Electrical Upgrades

4

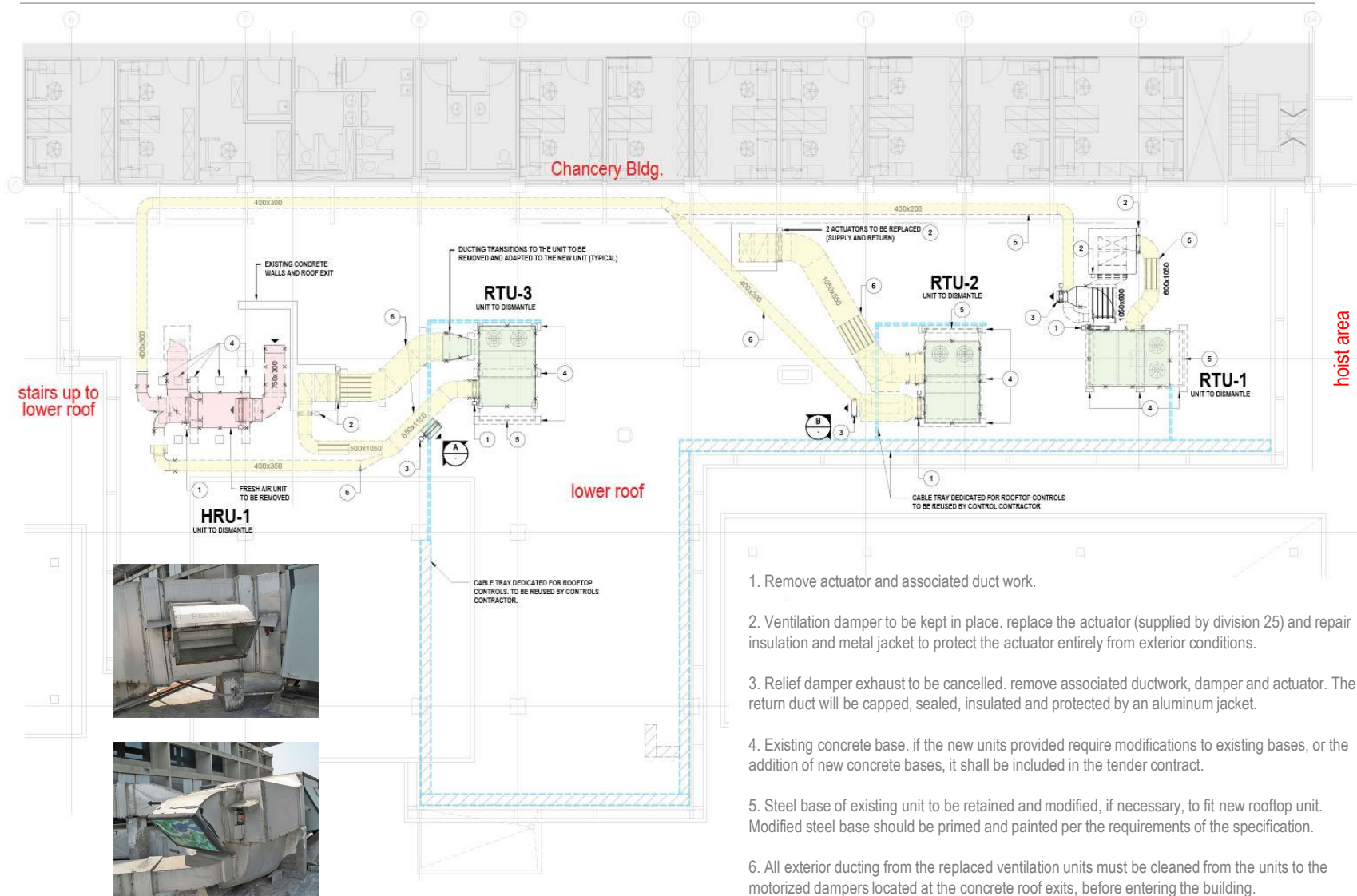
EXISTING ROOF TOP UNITS AND DUCTS



EXISTING ROOF TOP UNITS, DUCTS AND JUNCTION BOX



DEMOLITION OF EXISTING ROOF TOP UNITS



1. Remove actuator and associated duct work.
2. Ventilation damper to be kept in place. replace the actuator (supplied by division 25) and repair insulation and metal jacket to protect the actuator entirely from exterior conditions.
3. Relief damper exhaust to be cancelled. remove associated ductwork, damper and actuator. The return duct will be capped, sealed, insulated and protected by an aluminum jacket.
4. Existing concrete base. if the new units provided require modifications to existing bases, or the addition of new concrete bases, it shall be included in the tender contract.
5. Steel base of existing unit to be retained and modified, if necessary, to fit new rooftop unit. Modified steel base should be primed and painted per the requirements of the specification.
6. All exterior ducting from the replaced ventilation units must be cleaned from the units to the motorized dampers located at the concrete roof exits, before entering the building.

SPECIFICATIONS OF RTUs (Typical)

THE TRANE COMPANY
A DIVISION OF AMERICAN STANDARD INC.
CLARKSVILLE, TN 37040-1008

MODEL NO. WCH200BD00GA
SERIAL NO. 714101035D
DATE OF MFG. 4/2007
ELECTRICAL RATING 380-415/50/3
MIN/MAX OPER. VOLT 357/440
MIN CKT AMP 33
MFS/+MCB 60
MOP N/A

CONTROL CKT. VOLTS 24 VAC
MAX DISCHARGE TEMP IS 94 DEG C.
EXT STATIC PRESS MM OF WATER

MIN TEST PRESSURE HIGH 278 LOW 144 PSIG

THIS UNIT SHOULD BE INSTALLED AND REGULARLY MAINTAINED IN ACCORDANCE WITH THE SERVICE LITERATURE MANUAL(S).

COMP	QTY	PH	HZ	RLA-VOLTS	LRA
# 1	1	3	50	17.4-380	118
# 2	1	3	50	17.4-380	118

FAN QTY HZ PH FLA-VOLTS HP FACTORY CHARGED
COND 2 50 1 2.9-380 .75 CKT#1 19.30 LBS R22
EVAP STANDARD 1 50 3 7.6-380 3 CKT#2 19.30 LBS R22
EVAP OVERSIZE 1 50 3 11.0-380 5

SCRATCH INK OFF SQUARE WHEN OVERSIZE MOTOR IS INSTALLED

DATA FOR UNITS WITH ELECTRIC HEAT ACCESSORY		STANDARD EVAP MOTOR		OVERSIZE EVAP MOTOR		MOP	
AMERICAN STANDARD HEATER MODEL	HTR RATED KW	MIN CKT AMP	MFS/+MCB	MIN CKT AMP	MFS/+MCB		
AYHHTRN436A	380	22	96	100	99	100	N/A
AYHHTRN436A	415	26	100	110	103	100	N/A
AYHHTRN454A	380	33	117	125	121	125	N/A
AYHHTRN454A	415	40	123	125	127	150	N/A
AYHHTRN472A	380	45	139	150	142	150	N/A
AYHHTRN472A	415	53	147	150	150	150	N/A
NONE/NUL							

SCRATCH INK OFF SQUARE OF SPECIFIC HEATER INSTALLED.
COCHER POUR INDIQUER LE MODELE INSTALLE.

CLEARANCE TO COMBUSTIBLE MATERIAL W/WO ELECTRIC HEAT (INCHES):
TOP 72; L.SIDE 24; R.SIDE 24; FRONT 24; BACK 18; DUCT 0.

+HACR TYPE REQUIRED PER NEC

ASSEMBLED IN U.S.A. X39630365-1

THE TRANE COMPANY
A DIVISION OF AMERICAN STANDARD INC.
CLARKSVILLE, TN 37040-1008

MODEL NO. WCH200BD00GA
SERIAL NO. 715100446D
DATE OF MFG. 4/2007
ELECTRICAL RATING 380-415/50/3
MIN/MAX OPER. VOLT 357/440
MIN CKT AMP 53
MFS/+MCB 60
MOP N/A

CONTROL CKT. VOLTS 24 VAC
MAX DISCHARGE TEMP IS 94 DEG C.
EXT STATIC PRESS MM OF WATER

MIN TEST PRESSURE HIGH 278 LOW 144 PSIG

THIS UNIT SHOULD BE INSTALLED AND REGULARLY MAINTAINED IN ACCORDANCE WITH THE SERVICE LITERATURE MANUAL(S).

COMP	QTY	PH	HZ	RLA-VOLTS	LRA
# 1	1	3	50	17.4-380	118
# 2	1	3	50	17.4-380	118

FAN QTY HZ PH FLA-VOLTS HP FACTORY CHARGED
COND 2 50 1 2.9-380 .75 CKT#1 19.30 LBS R22
EVAP STANDARD 1 50 3 7.6-380 3 CKT#2 19.30 LBS R22
EVAP OVERSIZE 1 50 3 11.0-380 5

SCRATCH INK OFF SQUARE WHEN OVERSIZE MOTOR IS INSTALLED

DATA FOR UNITS WITH ELECTRIC HEAT ACCESSORY		STANDARD EVAP MOTOR		OVERSIZE EVAP MOTOR		MOP	
AMERICAN STANDARD HEATER MODEL	HTR RATED KW	MIN CKT AMP	MFS/+MCB	MIN CKT AMP	MFS/+MCB		
AYHHTRN436A	380	22	96	100	99	100	N/A
AYHHTRN436A	415	26	100	110	103	100	N/A
AYHHTRN454A	380	33	117	125	121	125	N/A
AYHHTRN454A	415	40	123	125	127	150	N/A
AYHHTRN472A	380	45	139	150	142	150	N/A
AYHHTRN472A	415	53	147	150	150	150	N/A
NONE/NUL							

SCRATCH INK OFF SQUARE OF SPECIFIC HEATER INSTALLED.
COCHER POUR INDIQUER LE MODELE INSTALLE.

CLEARANCE TO COMBUSTIBLE MATERIAL W/WO ELECTRIC HEAT (INCHES):
TOP 72; L.SIDE 24; R.SIDE 24; FRONT 24; BACK 18; DUCT 0.

+HACR TYPE REQUIRED PER NEC

ASSEMBLED IN U.S.A. X39630365-01

THE TRANE COMPANY
A DIVISION OF AMERICAN STANDARD INC.
CLARKSVILLE, TN 37040-1008

MODEL NO. WCH200BD00GA
SERIAL NO. 714101106D
DATE OF MFG. 4/2007
ELECTRICAL RATING 380-415/50/3
MIN/MAX OPER. VOLT 357/440
MIN CKT AMP 53
MFS/+MCB 60
MOP N/A

CONTROL CKT. VOLTS 24 VAC
MAX DISCHARGE TEMP IS 94 DEG C.
EXT STATIC PRESS MM OF WATER

MIN TEST PRESSURE HIGH 278 LOW 144 PSIG

THIS UNIT SHOULD BE INSTALLED AND REGULARLY MAINTAINED IN ACCORDANCE WITH THE SERVICE LITERATURE MANUAL(S).

COMP	QTY	PH	HZ	RLA-VOLTS	LRA
# 1	1	3	50	17.4-380	118
# 2	1	3	50	17.4-380	118

FAN QTY HZ PH FLA-VOLTS HP FACTORY CHARGED
COND 2 50 1 2.9-380 .75 CKT#1 19.30 LBS R22
EVAP STANDARD 1 50 3 7.6-380 3 CKT#2 19.30 LBS R22
EVAP OVERSIZE 1 50 3 11.0-380 5

SCRATCH INK OFF SQUARE WHEN OVERSIZE MOTOR IS INSTALLED

DATA FOR UNITS WITH ELECTRIC HEAT ACCESSORY		STANDARD EVAP MOTOR		OVERSIZE EVAP MOTOR		MOP	
AMERICAN STANDARD HEATER MODEL	HTR RATED KW	MIN CKT AMP	MFS/+MCB	MIN CKT AMP	MFS/+MCB		
AYHHTRN436A	380	22	96	100	99	100	N/A
AYHHTRN436A	415	26	100	110	103	100	N/A
AYHHTRN454A	380	33	117	125	121	125	N/A
AYHHTRN454A	415	40	123	125	127	150	N/A
AYHHTRN472A	380	45	139	150	142	150	N/A
AYHHTRN472A	415	53	147	150	150	150	N/A
NONE/NUL							

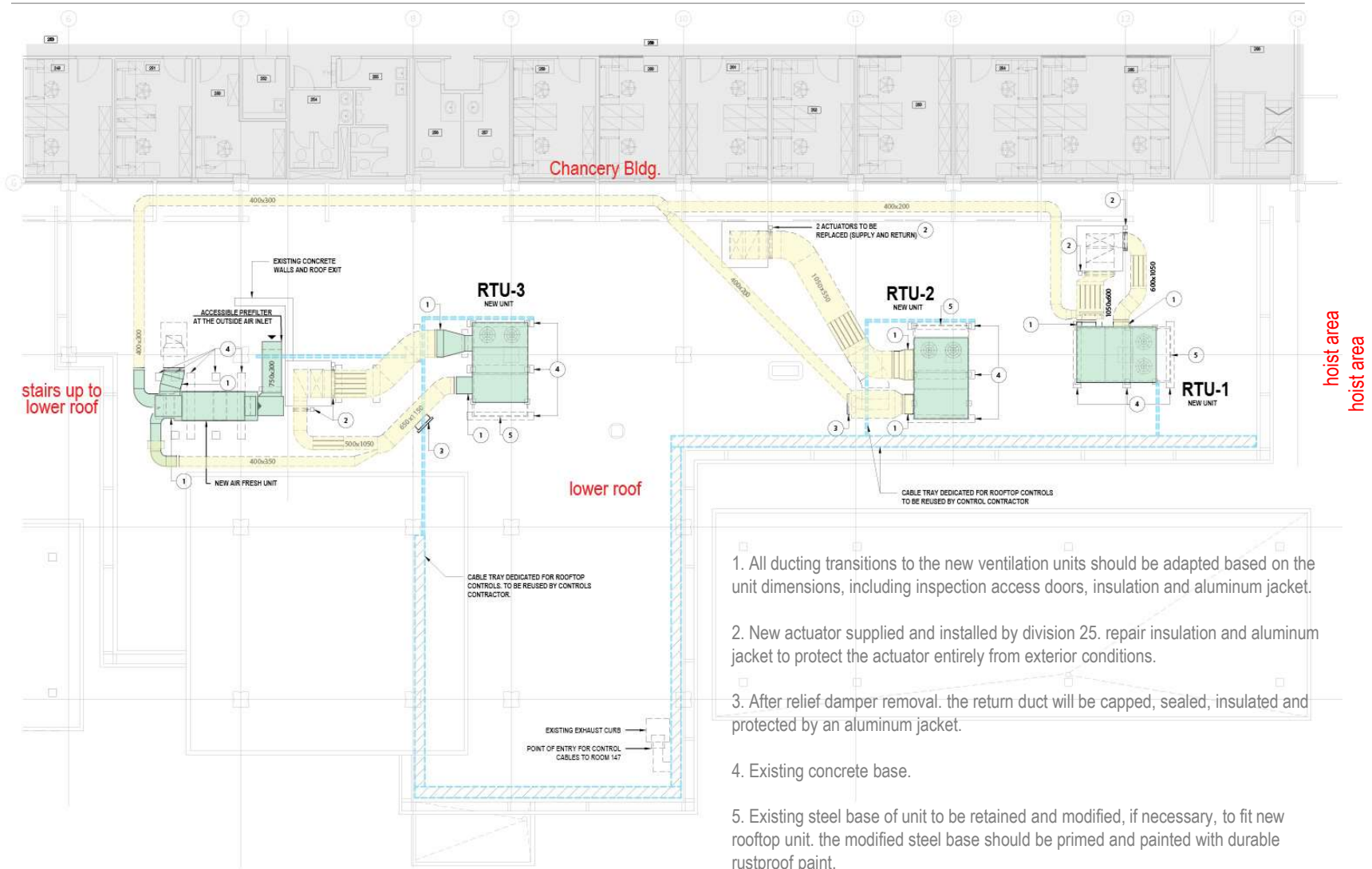
SCRATCH INK OFF SQUARE OF SPECIFIC HEATER INSTALLED.
COCHER POUR INDIQUER LE MODELE INSTALLE.

CLEARANCE TO COMBUSTIBLE MATERIAL W/WO ELECTRIC HEAT (INCHES):
TOP 72; L.SIDE 24; R.SIDE 24; FRONT 24; BACK 18; DUCT 0.

+HACR TYPE REQUIRED PER NEC

ASSEMBLED IN U.S.A. X39630365-01

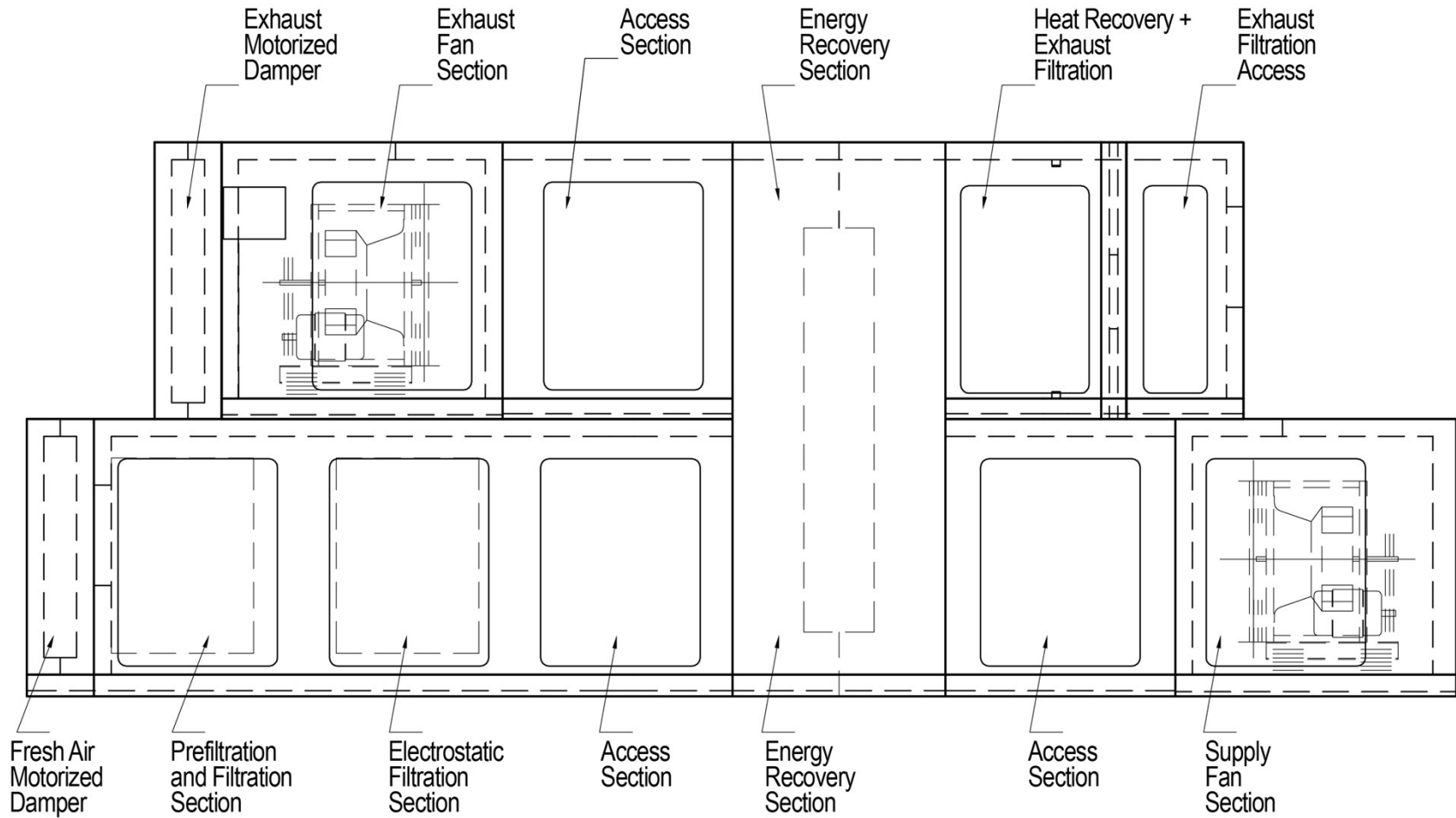
NEW ROOF TOP UNITS (RTU)



EXISTING ELECTRICAL PANELS



DEDICATED OUTSIDE AIR (DOA) UNIT DETAIL - HRU-1



SPRINKLERS - TYPICAL CEILINGS IN CORRIDORS



EMERGENCY LIGHTING UNITS TO BE REPLACED (TYPICAL)





Contract Number / Numéro du contrat
Security Classification / Classification de sécurité

SECURITY REQUIREMENTS CHECK LIST (SRCL)
LISTE DE VÉRIFICATION DES EXIGENCES RELATIVES À LA SÉCURITÉ (LVERS)

PART A - CONTRACT INFORMATION / PARTIE A - INFORMATION CONTRACTUELLE

1. Originating Government Department or Organization / Ministère ou organisme gouvernemental d'origine DFATD	2. Branch or Directorate / Direction générale ou Direction High Commission of Canada, New Delhi, India
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3. a) Subcontract Number / Numéro du contrat de sous-traitance	3. b) Name and Address of Subcontractor / Nom et adresse du sous-traitant
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4. Brief Description of Work / Brève description du travail
 Replacement of Mechanical Rooftop Air Handling Units (3x RTUs; 1 DOA/HRU; 1 Control Panel) for TRU area of the Chancery. Potential additional work includes minor sprinkler system upgrades in 3 basement rooms and the addition of emergency egress lighting through the Chancery (floors 1-3 and basement).
 (The sprinkler and emergency lighting inclusions to the contract will depend on budget availability, determined after receipt of bids.)

5. a) Will the supplier require access to Controlled Goods?
Le fournisseur aura-t-il accès à des marchandises contrôlées? No / Non Yes / Oui

5. b) Will the supplier require access to unclassified military technical data subject to the provisions of the Technical Data Control Regulations?
Le fournisseur aura-t-il accès à des données techniques militaires non classifiées qui sont assujetties aux dispositions du Règlement sur le contrôle des données techniques? No / Non Yes / Oui

6. Indicate the type of access required / Indiquer le type d'accès requis

6. a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets?
Le fournisseur ainsi que les employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS?
(Specify the level of access using the chart in Question 7. c)
(Préciser le niveau d'accès en utilisant le tableau qui se trouve à la question 7. c) No / Non Yes / Oui

6. b) Will the supplier and its employees (e.g. cleaners, maintenance personnel) require access to restricted access areas? No access to PROTECTED and/or CLASSIFIED information or assets is permitted.
Le fournisseur et ses employés (p. ex. nettoyeurs, personnel d'entretien) auront-ils accès à des zones d'accès restreintes? L'accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS n'est pas autorisé. No / Non Yes / Oui

6. c) Is this a commercial courier or delivery requirement with **no** overnight storage?
S'agit-il d'un contrat de messagerie ou de livraison commerciale **sans** entreposage de nuit? No / Non Yes / Oui

7. a) Indicate the type of information that the supplier will be required to access / Indiquer le type d'information auquel le fournisseur devra avoir accès

Canada <input type="checkbox"/>	NATO / OTAN <input type="checkbox"/>	Foreign / Étranger <input checked="" type="checkbox"/>
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7. b) Release restrictions / Restrictions relatives à la diffusion

No release restrictions Aucune restriction relative à la diffusion <input type="checkbox"/>	All NATO countries Tous les pays de l'OTAN <input type="checkbox"/>	No release restrictions Aucune restriction relative à la diffusion <input checked="" type="checkbox"/>
Not releasable À ne pas diffuser <input type="checkbox"/>		
Restricted to: / Limité à: <input type="checkbox"/>	Restricted to: / Limité à: <input type="checkbox"/>	Restricted to: / Limité à: <input type="checkbox"/>
Specify country(ies): / Préciser le(s) pays:	Specify country(ies): / Préciser le(s) pays:	Specify country(ies): / Préciser le(s) pays:

7. c) Level of information / Niveau d'information

PROTECTED A PROTÉGÉ A <input type="checkbox"/>	NATO UNCLASSIFIED NATO NON CLASSIFIÉ <input type="checkbox"/>	PROTECTED A PROTÉGÉ A <input type="checkbox"/>
PROTECTED B PROTÉGÉ B <input type="checkbox"/>	NATO RESTRICTED NATO DIFFUSION RESTREINTE <input type="checkbox"/>	PROTECTED B PROTÉGÉ B <input type="checkbox"/>
PROTECTED C PROTÉGÉ C <input type="checkbox"/>	NATO CONFIDENTIAL NATO CONFIDENTIEL <input type="checkbox"/>	PROTECTED C PROTÉGÉ C <input type="checkbox"/>
CONFIDENTIAL CONFIDENTIEL <input type="checkbox"/>	NATO SECRET NATO SECRET <input type="checkbox"/>	CONFIDENTIAL CONFIDENTIEL <input type="checkbox"/>
SECRET SECRET <input type="checkbox"/>	COSMIC TOP SECRET COSMIC TRÈS SECRET <input type="checkbox"/>	SECRET SECRET <input type="checkbox"/>
TOP SECRET TRÈS SECRET <input type="checkbox"/>		TOP SECRET TRÈS SECRET <input type="checkbox"/>
TOP SECRET (SIGINT) TRÈS SECRET (SIGINT) <input type="checkbox"/>		TOP SECRET (SIGINT) TRÈS SECRET (SIGINT) <input type="checkbox"/>

Security Classification / Classification de sécurité
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Contract Number / Numéro du contrat
Security Classification / Classification de sécurité

PART A (continued) / PARTIE A (suite)

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets?
 Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS? No / Non Yes / Oui
 If Yes, indicate the level of sensitivity:
 Dans l'affirmative, indiquer le niveau de sensibilité :

9. Will the supplier require access to extremely sensitive INFOSEC information or assets?
 Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate? No / Non Yes / Oui
 Short Title(s) of material / Titre(s) abrégé(s) du matériel :
 Document Number / Numéro du document :

PART B - PERSONNEL (SUPPLIER) / PARTIE B - PERSONNEL (FOURNISSEUR)

10. a) Personnel security screening level required / Niveau de contrôle de la sécurité du personnel requis

<input type="checkbox"/> RELIABILITY STATUS COTE DE FIABILITÉ	<input type="checkbox"/> CONFIDENTIAL CONFIDENTIEL	<input type="checkbox"/> SECRET SECRET	<input type="checkbox"/> TOP SECRET TRÈS SECRET
<input type="checkbox"/> TOP SECRET-SIGINT TRÈS SECRET – SIGINT	<input type="checkbox"/> NATO CONFIDENTIAL NATO CONFIDENTIEL	<input type="checkbox"/> NATO SECRET NATO SECRET	<input type="checkbox"/> COSMIC TOP SECRET COSMIC TRÈS SECRET
<input type="checkbox"/> SITE ACCESS ACCÈS AUX EMBLEMES			

Special comments:
 Commentaires spéciaux : Contractor personnel to be escorted at all times at the Mission site and within the Chancery.

NOTE: If multiple levels of screening are identified, a Security Classification Guide must be provided.
 REMARQUE : Si plusieurs niveaux de contrôle de sécurité sont requis, un guide de classification de la sécurité doit être fourni.

10. b) May unscreened personnel be used for portions of the work?
 Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail? No / Non Yes / Oui
 If Yes, will unscreened personnel be escorted?
 Dans l'affirmative, le personnel en question sera-t-il escorté? No / Non Yes / Oui

PART C - SAFEGUARDS (SUPPLIER) / PARTIE C - MESURES DE PROTECTION (FOURNISSEUR)

INFORMATION / ASSETS / RENSEIGNEMENTS / BIENS

11. a) Will the supplier be required to receive and store PROTECTED and/or CLASSIFIED information or assets on its site or premises?
 Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS? No / Non Yes / Oui

11. b) Will the supplier be required to safeguard COMSEC information or assets?
 Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC? No / Non Yes / Oui

PRODUCTION

11. c) Will the production (manufacture, and/or repair and/or modification) of PROTECTED and/or CLASSIFIED material or equipment occur at the supplier's site or premises?
 Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ? No / Non Yes / Oui

INFORMATION TECHNOLOGY (IT) MEDIA / SUPPORT RELATIF À LA TECHNOLOGIE DE L'INFORMATION (TI)

11. d) Will the supplier be required to use its IT systems to electronically process, produce or store PROTECTED and/or CLASSIFIED information or data?
 Le fournisseur sera-t-il tenu d'utiliser ses propres systèmes informatiques pour traiter, produire ou stocker électroniquement des renseignements ou des données PROTÉGÉS et/ou CLASSIFIÉS? No / Non Yes / Oui

11. e) Will there be an electronic link between the supplier's IT systems and the government department or agency?
 Disposera-t-on d'un lien électronique entre le système informatique du fournisseur et celui du ministère ou de l'agence gouvernementale? No / Non Yes / Oui



Contract Number / Numéro du contrat
Security Classification / Classification de sécurité

PART C - (continued) / PARTIE C - (suite)

For users completing the form **manually** use the summary chart below to indicate the category(ies) and level(s) of safeguarding required at the supplier's site(s) or premises.

Les utilisateurs qui remplissent le formulaire **manuellement** doivent utiliser le tableau récapitulatif ci-dessous pour indiquer, pour chaque catégorie, les niveaux de sauvegarde requis aux installations du fournisseur.

For users completing the form **online** (via the Internet), the summary chart is automatically populated by your responses to previous questions.

Dans le cas des utilisateurs qui remplissent le formulaire **en ligne** (par Internet), les réponses aux questions précédentes sont automatiquement saisies dans le tableau récapitulatif.

SUMMARY CHART / TABLEAU RÉCAPITULATIF

Category Catégorie	PROTECTED PROTÉGÉ			CLASSIFIED CLASSIFIÉ			NATO				COMSEC					
	A	B	C	CONFIDENTIAL CONFIDENTIEL	SECRET	TOP SECRET TRÈS SECRET	NATO RESTRICTED NATO DIFFUSION RESTREINTE	NATO CONFIDENTIAL NATO CONFIDENTIEL	NATO SECRET	COSMIC TOP SECRET COSMIC TRÈS SECRET	PROTECTED PROTÉGÉ			CONFIDENTIAL CONFIDENTIEL	SECRET	TOP SECRET TRÈS SECRET
											A	B	C			
Information / Assets Renseignements / Biens Production																
IT Media / Support TI																
IT Link / Lien électronique																

12. a) Is the description of the work contained within this SRCL PROTECTED and/or CLASSIFIED?
La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE? No / Non Yes / Oui

**If Yes, classify this form by annotating the top and bottom in the area entitled "Security Classification".
Dans l'affirmative, classifiez le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire.**

12. b) Will the documentation attached to this SRCL be PROTECTED and/or CLASSIFIED?
La documentation associée à la présente LVERS sera-t-elle PROTÉGÉE et/ou CLASSIFIÉE? No / Non Yes / Oui

**If Yes, classify this form by annotating the top and bottom in the area entitled "Security Classification" and indicate with attachments (e.g. SECRET with Attachments).
Dans l'affirmative, classifiez le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire et indiquez qu'il y a des pièces jointes (p. ex. SECRET avec des pièces jointes).**



Contract Number / Numéro du contrat
Security Classification / Classification de sécurité

PART D - AUTHORIZATION / PARTIE D - AUTORISATION

13. Organization Project Authority / Chargé de projet de l'organisme			
Name (print) - Nom (en lettres moulées) Mark Lisiecki		Title - Titre Project Manager	Signature <i>Mark Lisiecki</i>
Telephone No. - N° de téléphone 613-276-1011	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel mark.lisiecki@international.gc.ca	Date May 13, 2020
14. Organization Security Authority / Responsable de la sécurité de l'organisme			
Name (print) - Nom (en lettres moulées) Ernest Roy		Title - Titre Personnel Security Screening Officer (A-I)	Signature <i>Ernest Roy</i>
Telephone No. - N° de téléphone 343-203-3065	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel Ernest.Roy@international.gc.ca	Date
15. Are there additional instructions (e.g. Security Guide, Security Classification Guide) attached? Des instructions supplémentaires (p. ex. Guide de sécurité, Guide de classification de la sécurité) sont-elles jointes?			<input type="checkbox"/> No / Non <input type="checkbox"/> Yes / Oui
16. Procurement Officer / Agent d'approvisionnement			
Name (print) - Nom (en lettres moulées) Gabrielle Rees		Title - Titre Manager, Mission Procurement	Signature Gabrielle Rees
Telephone No. - N° de téléphone 343-203-8287	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel gabrielle.rees@international.gc.ca	Date 2020-10-15
17. Contracting Security Authority / Autorité contractante en matière de sécurité			
Name (print) - Nom (en lettres moulées)		Title - Titre	Signature
Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date

Security Classification / Classification de sécurité
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