FAIR WAGES EXEMPTION

Project No: 095074/354604

Project Title: PARRY SOUND, ONTARIO

TRANSPORT CANADA, CANADIAN COAST GUARD

BASE RECONSTRUCTION

It is the policy of the government that bidders on federal government construction projects in Designated Provinces may request exemptions from the application of the prevailing wage rates referred to both in Section 2 of the Labour Conditions forming part of the project tender documents and in Appendix "A" mentioned in that section and that such exemption shall be granted. Other conditions such as hours of work, overtime etc. contained in the Labour Conditions will continue to apply.

THIS POLICY APPLIES TO THIS PROJECT

Please indicate whether or not you wish to be exempted from the application of prevailing wage rates in the event that your tender is accepted.

☐ Yes, I wish to be exempted

Signature: _____

Name of Contractor: _____

☐ No, I do not wish to be exempted

Signature: _____

Name of Contractor: _____

THIS SIGNED FORM MUST BE RETURNED WITH YOUR TENDER

Minister
Public Works Canada

Ministre
Travaux publics Canada

Ottawa, Ontario
K1A 0M2

To all Contractors, Sub-Contractors.
To all Canadians.

Re: Construction Contracts
Use of Canadian Products

Throughout the history of Canada we have depended on other countries for manpower and materials for our growth as a nation.

As we look at our heritage we find it rich in ethnic quality and wealthy in materials that were imported to construct our buildings. The Centre Block of our Parliament Buildings is a good example of this.

But now we have the manpower and natural resources to build our structures, and we, in Public Works, have been striving to use Canadian materials wherever and whenever possible.

I want to emphasize the Department's and my wish, that Canadian materials be used. I urge you to think Canadian in order to increase Canadian content and thereby add a positive factor to our economy.

Thank you for your support.

Yours truly,

Roméo LeBlanc

Canada

NOTICE TO BIDDERS

ONLY ONE (1) PRE-TENDER SITE TOUR WILL BE HELD.

ATTENDANCE WILL BE RESTRICTED TO TWO(2) REPRESENTATIVES PER CONTRACTOR.

PRE-TENDER SITE TOUR WILL BE HELD ON JULY 11, 1984 AT 10:30 HOURS AT THE SITE.

BIDDERS PLANNING TO ATTEND ARE ASKED TO TELEPHONE MR. R.K. DHAR AT 416-224-4132 BEFORE THE ABOVE DATE AND TIME.

1 Receipt of Tenders

.1 Envelopes containing this tender are to be marked "TENDER FOR PROJECT NO. 095074/354604
PARRY SOUND, ONTARIO
TRANSPORT CANADA, CANADIAN COAST GUARD
BASE RECONSTRUCTION

and are to be addressed:

CHIEF, CONTRACT ADMINISTRATION
PUBLIC WORKS CANADA
ONTARIO REGION
4900 YONGE STREET
10TH FLOOR, TENDERING OFFICE
WILLOWDALE, ONTARIO
M2N 6A6

.2 The name and address of the Tenderer and the date due must be shown on the envelope.

.3 Tenders must be received on or before the exact time and date fixed for their reception. Tenders received after that time will not be considered.

2 Tender Form

.1 Tenders are to be on the form provided by the Department. No substitute will be considered.

.2 A tender submitted in accordance with these instructions may be revised by letter, telegram or telex provided the revision is received at the office designated for the reception of tenders, on or before the time and date set for the closing of tenders.

.3 The tenderer, or the person or persons duly authorized to sign on his behalf, must initial and date each and every correction, change, erasure or alteration contained in the completed tender document.

3 Signature on Tender Form

.1 Tenders must be properly signed in full compliance with the requirements indicated below. Where the tenderer is a:

LIMITED COMPANY: The name(s) and status of the authorized signing officer(s), must be accurately printed in the space provided for that purpose. The signature(s) of the authorized officer(s) and the corporate seal must be affixed. If the tender is signed by other than the President or Vice President AND the Secretary or Secretary-Treasurer of the Company a copy of a by-law or resolution remains in full force and effect.

PARTNERSHIP: The name(s) of the person(s) signing must be accurately printed in the space provided. One or more of the partners must sign in the presence of a witness who must also sign.

SOLE PROPRIETORSHIP: The name of the sole proprietor must be PRINTED in the space provided. The sole proprietor must sign in the presence of a witness who must also sign.

4 Bid Depository

.1 Subcontractors for the trades named in the tender advertisement shall bid through the designated Bid Depository in accordance with the "Standard Rules of Practice for Bid Depositories (Federal Government Building Construction Projects)".

5 Approval of Alternative Materials

.1 Wherever materials are specifically by trade names or by manufacturer's names, the tender must be based on the use of such materials. During tendering period, alternative materials will be considered if full descriptive data are submitted in writing at least 16 days before the tender closing date. Approval of submission will be signified by the issuance of an addendum to the tender documents.

6 Municipal Capital Development Charges

.1 Do not include in your tender any amount for special municipal capital development charges respecting sewerage and water supply, attaching to the work.

7 Tender Acceptance

.1 The Department will not necessarily accept the lowest or any of the offers.

8 Enquiries

.1 Telephone enquiries may be made during the tender period to:

.1 A/C 416-224-4240 - Head, Tendering & Contract Administration for clarification of tender requirements, closing time, and distribution list of tender documents up to 24 hours prior to closing time).

.2 A/C 416- 224-4132 - Mr. R.K. Dhar
for clarification of drawings and specification.

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1 List of Tender Documents

.1 Tender form

.2 Articles of Agreement

.3 Schedule "B" - Terms of Payment

.4 Schedule "C" - General Conditions

.5 Schedule "D" - Labour Conditions 7540 & Appendix "A"

.6 Schedule "E" - Insurance Conditions

.7 Schedule "F" - Contract Security Conditions

.8 Schedule "A" - Plans and Specifications

.9 Any Addenda issued during tender period.

1 Description of Work

PARRY SOUND, ONTARIO
TRANSPORT CANADA
CANADIAN COAST GUARD
BASE RECONSTRUCTION

2 Official Name and Address of Tenderer

.....

.....
POSTAL CODE: AREA CODE: TELEPHONE NO:

3 Offer

I/We hereby offer to Her Majesty the Queen in right of Canada represented by the Minister of Public Works to execute in a careful and workmanlike manner the work described above which is more particularly described in the documents entitled "Plans and Specifications" and in the manner therein set out for the Total amount of (amount to be in words).....

.....

$.....which amount is all - inclusive (subject to any additions or deductions provided for in the "Articles of Agreement", the "General Conditions", and "Terms of Payment" or the "Labour Conditions" of the Standard Government form of construction contract) except that in the event of a change in any tax imposed under the Excise Act, the Excise Tax Act, the Old Age Security Act, the Customs Act or the Customs Tariff, made public after, (1) the date of the last revision, the amount of this offer shall be increased or decreased in the manner provided in GC 22.2, GC 22.3 and GC 22.2 of the "General Conditions".

4 Acceptance Period

I/We undertake, within fourteen (14) days of receipt of notification of acceptance of my/our offer, to execute a contract, in the standard Government form, for the performance of the work if notified by the Department of acceptance of my/our offer within 30 days of the tender closing date.

5 Construction Time

I/We undertake to complete the work within ..THIRTY-FIVE(35)MONTHS... from the date of notification of acceptance of my/our offer.

6 Compilation of Tender Form

This tender form comprises pages .....ONE TO SIX INCLUSIVE.....

I/We will subcontract the following parts of the work to the subcontractors listed for each part. I/We agree not to make changes in the following list without the written consent of the Engineer. In my/our opinion the subcontractors named hereunder are reliable and competent to perform that part of the work for which each is listed. I/We understand that if I/we name alternative subcontractors, or if I/we fail to name a subcontractor, or if I/we fail to mention that the work will be done by our own forces where applicable, my/our tender will be disqualified.

I/We certify that tenders for the trades named below were received through the designated Bid Depository in accordance with the "Standard Canadian Bid Depository Principles and Procedures for Federal Government Projects", second edition, April 1, 1970. I/We understand that if I/we have failed to comply with the said Bid Depository Principles and Procedures, my/our tender will be disqualified.

Part of Work	Subcontractors	Address
MECHANICAL		
ELECTRICAL		

My/Our Tender is based on the use of Canadian Material in accordance with GC 23.1 of the General Conditions, with the exception of the following non-Canadian items.

ITEM	CLASS OF MATERIAL	COUNTRY OF ORIGIN	APPROX. QUANTITY	PRICE PER UNIT	AMOUNT	CANADIAN PRODUCT AMOUNT

If Canadian Material for items listed above is required my/our tenders is to be increased by:

(In words).....

.....$.....

I/We have in the past executed the following works which are similar to the work for which the present offer is made:

NOTE: Not necessary if the Contractor has similar work underway for Public Works, Canada).

Works	Place	Year	For Whom

When Tendering

.1 FOR TENDER LESS THAN $25,000:
No security accompanies this tender. I/We understand that the Department may require security upon award of contract in accordance with 2.1 hereunder.

.2 FOR TENDER $25,000 AND OVER: I/We herewith enclose security in accordance with EITHER:

.1 a bid bond, in an approved form and from a company whose bonds are acceptable, in an amount of at least 10% of the tender, OR

.2 a security deposit in an amount of at least 10% of the tender, OR, where the tender exceeds $250,000. in an amount of $25,000. plus 5% of the amount by which the tender exceeds $250,000. The maximum requirement for any tender is $250,000. The security deposit must be a certified cheque drawn on a member of the Canadian Payments Association or a local cooperative credit society that is a member of a central cooperative credit society having a membership in the Canadian Payments Assocation, payable to the Receiver General for Canada, OR
bonds of the Government of Canada unconditionally guaranteed as to principle and interest by the Government of Canada, if such bonds are
.1 payable to bearer,
.2 accompanied by a duly executed instrument of transfer to the Receiver General for Canada in the form prescribed by the Domestic Bonds of Canada Regulations, or
.3 registered as to principal or as to principal and interest in the name of the Receiver General for Canada pursuant to the Domestic Bonds of Canada Regulations.

.3 The security deposit, as indicated in 1.2.2 above, will be forfeited if I/We refuse to enter into a contract when called upon to do so.

.4 I/We understand that if the security furnished is not in the approved form, as described herein, my/our tender is subject to disqualification.

2 Upon Award of Contract

.1 Upon notification of acceptance of my/our tender, I/We will furnish contract security in accordance with the provisions of the Contract Security Conditions "F".

.2 The amount of the security deposit mentioned in 2.1 may be reduced by the amount of the security deposit which accompanied the tender.

.3 In the absence of a specific direction to hold the security uncashed, the security submitted will be deposited in the Consolidated Revenue Fund of Canada.

3 Approved Form of Security

Bonds can be accepted only if they are in the approved form and issued by an approved surety company. Samples of the approved form of Bid Bond, Performance Bond Labour and Material Payment Bond and a list of surety companies acceptable to the Government of Canada are available for inspection at and may be obtained from any office of Public Works, Canada.

1 Signature of Contractor (refer to Instructions to Tenderers)

SEALED, ATTESTED TO AND DELIVERED on the

day of 19 on behalf of

Name of Contractor

Print - Name and Title of Person Signing

Signature of Partner or Sole Owner or Authorized Signing Officer Seal

Print - Name and Title of Person Signing

Signature of Partner or Authorized Signing Officer

WITNESS:

These Articles of Agreement made in duplicate this day of 19 .

Between

Her Majesty the Queen, in right of Canada (referred to in the contract documents as "Her Majesty") represented by the Minister of (referred to in the contract documents as the "Minister")

and

(referred to in the contract documents as the "Contractor")

Witness that in consideration for the mutual promises and obligations contained in the contract, Her Majesty and the Contractor convenant and agree as follows:

A1 Contract Documents

1.1 Subject to A1.4 and A1.5, the documents forming the contract between Her Majesty and the Contractor, referred to herein as the contract documents, are

1.1.1 these Articles of Agreement,

1.1.2 the documents attached hereto, marked "A" and entitled "Plans and Specifications", referred to herein as the Plans and Specifications,

1.1.3 the document attached hereto, marked "B" and entitled "Terms of Payment", referred to herein as the Terms of Payment,

1.1.4 the document attached hereto, marked "C" and entitled "General Conditions", referred to herein as the General Conditions,

1.1.5 the document attached hereto, marked "D" and entitled "Labour Conditions", referred to herein as the Labour Conditions,

1.1.6 the document attached hereto, marked "E" and entitled "Insurance Conditions" referred to herein as the Insurance Conditions,

1.1.7 the document attached hereto, marked "F" and entitled "Contract Security Conditions", referred to herein as the Contract Security Conditions, and

1.1.8 any amendment or variation of the contract documents that is made in accordance with the General Conditions.

1.2 The Minister hereby designates of , of the Government of Canada as the Engineer for the purposes of the contract.

1.3 In the contract

1.3.1 "Fixed Price Arrangement" means that part of the contract that prescribes a lump sum as payment for performance of the work to which it relates; and

1.3.2 "Unit Price Arrangement" means that part of the contract that prescribes the product of a price multiplied by a number of units of measurement of a class as payment for performance of the work to which it relates.

1.4 Any of the provisions of the contract that are expressly stipulated to be applicable only to a Unit Price Arrangement are not applicable to any part of the work to which a Fixed Price Arrangement is applicable.

1.5 Any of the provisions of the contract that are expressly stipulated to be applicable only to a Fixed Price Arrangement are not applicable to any part of the work to which a Unit Price Arrangement is applicable.

A2 Date of Completion of Work and Description of Work

2.1 The Contractor shall, between the date of these Articles of Agreement and the day of 19 , in a careful and workmanlike manner, diligently perform and complete the following work:

which work is more particularly described in the Plans and Specifications.

A3 Contract Amount

3.1 Subject to any increase, decrease, deduction, reduction or set-off that may be made under the contract, Her Majesty shall pay the Contractor at the times and in the manner that is set out or referred to in the Terms of Payment

3.1.1 the sum of $ in consideration for the performance of the work or the part thereof that is subject to a Fixed Price Arrangement, and

3.1.2 a sum that is equal to the aggregate of the products of the number of units of measurement of each class of labour, plant and material that is set out in a Final Certificate of Measurement referred to in GC44.7 multiplied in each case by the appropriate unit price that is set out in the Unit Price Table in consideration for the performance of the work or the part thereof that is subject to a Unit Price Arrangement.

3.2 For the information and guidance of the Contractor and the persons administering the contract on behalf of Her Majesty, but not so as to constitute a warranty, representation or undertaking of any nature by either party, it is estimated that the total amount payable by Her Majesty to the Contractor for the part of the work to which a Unit Price Arrangement is applicable will not exceed $

3.3 A3.1.1 is applicable only to a Fixed Price Arrangement.

3.4 A3.1.2 and A3.2 are applicable only to a Unit Price Arrangement.

A4 Contractor's Address

4.1 For all purposes of or incidental to the contract, the Contractor's address shall be deemed to be:

A5 Unit Price Table

5.1 Her Majesty and the Contractor agree that the following table is the Unit Price Table for the purposes of the contract:

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Item	Class of Labour plant or material	Unit of Measurement	Price per Unit	Estimated total quantity	Estimated total price

Unit Price Table (concluded)

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Item	Class of Labour plant or material	Unit of Measurement	Price per Unit	Estimated total quantity	Estimated total price

5.2 The Unit Price Table that is set out in A5.1 designates the part of the work to which a Unit Price Arrangement is applicable.

5.3 The part of the work that is not designated in the Unit Price Table referred to in A5.2 is the part of the work to which a Fixed Price Arrangement is applicable.

N.B.

The attention of the Contractor is drawn to the following statutory provision:

"It is a term of every contract providing for the payment of any money by Her Majesty that payment thereunder is subject to there being an appropriation for the particular service for the fiscal year in which any commitment thereunder would come in course of payment."

Section 33, *Financial Administration Act*, R.S. 1970, c.F-10

IN WITNESS WHEREOF the parties hereto have executed these Articles of Agreement as of the day and y first above written.

FOR LIMITED COMPANY
SEALED, ATTESTED TO AND DELIVERED on behalf of the Contractor by

SIGNATURE OF AUTHORIZED SIGNING OFFICER

(Print Name of Officer)

(Print Title of Officer)

SIGNATURE OF AUTHORIZED SIGNING OFFICER

(Print Name of Officer)

(Print Title of Officer)

Corporate Seal

FOR PARTNERSHIP OR SOLE PROPRIETORSHIP
SEALED, ATTESTED TO AND DELIVERED on behalf of the Contractor by

SIGNATURE OF PARTNER OR SOLE PROPRIETOR

Seal

(Print Name of Partner or Sole Proprietor)

in the presence of

Signature of Witness

SIGNATURE OF PARTNER

Seal

(Print Name of Partner)

in the presence of

Signature of Witness

EXECUTED ON BEHALF OF HER MAJESTY by

SIGNATURE OF AUTHORIZED DEPARTMENTAL OFFICER

(Print Name of Officer)

(Print Title of Officer)

in the presence of

Signature of Witness

and countersigned by

SIGNATURE OF AUTHORIZED DEPARTMENTAL OFFICER

(Print Name of Officer)

(Print Title of Officer)

in the presence of

Signature of Witness

TP1 Amount Payable – General

1.1 Subject to any other provisions of the 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

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.

TP2 Amounts Payable to the Contractor

2.1 The amounts referred to in TP 1.1.1 are the aggregate of

2.1.1 the amounts referred to in the Articles of Agreement, and

2.1.2 the amounts, if any, that are payable to the Contractor pursuant to the General Conditions.

TP3 Amounts Payable to Her Majesty

3.1 The amounts referred to in TP 1.1.2 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 For the purposes of this Term of Payment, "payment period" means a period of 30 consecutive days or such other interval as is agreed between the Contractor and the Engineer.

4.2 The Contractor shall, on the expiration of a payment period, deliver to the Engineer in respect of that payment period a written progress claim that fully describes any part of the work that has been completed, and any material that was delivered to the work site but not incorporated into the work, during that payment period.

4.3 The Engineer shall, not later than ten days after receipt by him of a progress claim referred to in TP4.2,

4.3.1 inspect the part of the work and the material described in the progress claim; and

4.3.2 issue a progress report, a copy of which he will give to the Contractor, that indicates the value of the part of the work and the material described in the progress claim that, in his opinion,

4.3.2.1 is in accordance with the contract, and

4.3.2.2 was not included in any other progress report relating to the contract.

4.4 Subject to TP1 and TP4.5, Her Majesty shall, not later than 30 days after the issue of a progress report referred to in TP4.3, pay the Contractor

4.4.1 an amount that is equal to 95% of the value that is indicated in that progress report if a labour and material payment bond has been furnished by the Contractor, or

4.4.2 an amount that is equal to 90% of the value that is indicated in that progress report if a labour and material payment bond has not been furnished by the Contractor.

4.5 It is a condition precedent to Her Majesty's obligation under TP4.4 that the Contractor has made and delivered to the Engineer a statutory declaration described in TP4.6 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

4.6.1 up to the date of his progress claim he has complied with all his lawful obligations with respect to the Labour Conditions; and

4.6.2 up to the date of his immediately preceding progress claim

4.6.2.1 he has paid his suppliers in full for all materials, and

4.6.2.2 he has discharged all his lawful obligations to his subcontractors.

4.7 Subject to TP1 and TP4.8, Her Majesty shall, not later than 60 days after the date of issue of an Interim Certificate of Completion referred to in GC44.2, pay the Contractor the amount referred to in TP1 less the aggregate of

4.7.1 the sum of all payments that were made pursuant to TP4.4;

4.7.2 an amount that is equal to the Engineer's estimate of the cost to Her Majesty of rectifying defects described in the Interim Certificate of Completion; and

4.7.3 an amount that is equal to the Engineer's estimate of the cost to Her Majesty of completing the parts of the work described in the Interim Certificate of Completion other than the defects referred to in TP4.7.2.

4.8 It is a condition precedent to Her Majesty's obligation under TP4.7 that the Contractor has made and delivered to the Engineer 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 he has

4.9.1 complied with all his lawful obligations with respect to the Labour Conditions;

4.9.2 paid his suppliers in full for all materials; and

4.9.3 discharged all his lawful obligations to his subcontractors.

4.10 Subject to TP1 and TP4.11, Her Majesty shall, not later than 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 aggregate of

4.10.1 the sum of all payments that were made pursuant to TP4.4; and

4.10.2 the sum of all payments that were made pursuant to 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 Engineer.

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 he has discharged and satisfied all his lawful obligations and any lawful claims against him that arose out of his performance of the contract.

TP5 Progress Report and Payment Thereunder Not Binding on Her Majesty

5.1 Neither a progress report 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 When Her Majesty delays in making a payment that is due pursuant to TP4.4 and TP4.7, the Contractor shall be entitled to receive simple interest on the amount that is overdue from and including the day that it became overdue up to and including the date that the payment was made, at the annual rate of interest described in TP6.3.

6.3 The rate of interest referred to in TP6.2 shall be 1 1/2% plus the average accepted tender rate that was current for Government of Canada three-month treasury bills immediately preceding the day that a payment referred to in TP6.2 became overdue.

6.4 The Contractor shall not be entitled to receive interest on any other amount that is unpaid including, without limitation, an amount that is calculated in accordance with GC50.

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 this Term of Payment, "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

8.1 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.

GC1 Interpretation

1.1 In the contract

1.1.1 where reference is made to a part of the contract by means of numbers preceded 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 "Engineer" means the officer or employee of 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;

1.1.5 "material" includes all commodities, articles and things required to be furnished by or for the Contractor under the contract for incorporation into the work;

1.1.6 "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 purpose of the contract;

1.1.7 "person" includes, unless the context otherwise requires, a partnership, proprietorship, firm, joint venture, consortium and a corporation;

1.1.8 "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;

1.1.9 "subcontractor" means a person to whom the Contractor has, subject to GC4, subcontracted the whole or any part of the work;

1.1.10 "superintendent" means the employee of the Contractor who is designated by the Contractor to act pursuant to GC19;

1.1.11 "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 In interpreting the Plans and Specifications, in the event of discrepancies or conflicts between

1.4.1 the Plans and the Specifications, the Specifications govern;

1.4.2 the Plans, the Plans drawn with the largest scale govern; and

1.4.3 figured dimensions and scaled dimensions, the figured dimensions govern.

GC2 Successors and Assigns

2.1 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

3.1 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 Engineer 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 Engineer may, within six days of receipt by him of a notification referred to in GC4.2, object to the intended subcontracting.

4.5 If the Engineer 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 Engineer, 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 Engineer'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.

GC5 Amendments

5.1 No amendment or change in any of the provisions of the contract shall have any force or effect until it is reduced to writing.

GC6 No Implied Obligations

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.

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.

GC7 Time of Essence

7.1 Time is of the essence of the contract.

GC8 Indemnification by Contractor

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.

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.

GC9 Indemnification by Her Majesty

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

9.1.1 lack of or a defect in Her Majesty's title to the work site whether real or alleged; or

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.

GC10 Members of House of Commons Not to Benefit

10.1 As required by the *Senate and House of Commons Act*, it is an express condition of the contract that no member of the House of Commons shall be admitted to any share or part of the contract or to any benefit arising therefrom.

GC11 Notices to Contractor

11.1 Notices for the purposes of GC38.1.1, GC40 and GC41 shall be in writing and shall be given

11.1.1 by delivering the notice to the Contractor in person or, if the Contractor is a partnership, firm, joint venture, consortium or corporation, to a senior administrative or executive officer thereof, or

11.1.2 by mailing the notice to the Contractor at his address set out in the Articles of Agreement.

11.2 A notice referred to in GC11.1 shall be deemed to have been received by the Contractor

11.2.1 if it was delivered pursuant to GC11.1.1, on the day that it was delivered, and

11.2.2 if it was sent by mail pursuant to GC11.1.2, on the earlier of the day it was received by the Contractor and the sixth day after it was mailed.

11.3 Any notice, consent, order, direction, decision or other communication, other than a notice referred to in GC11.1, that may be given to the Contractor pursuant to the contract may be given in any manner, but it shall be deemed to have been received by the Contractor, if it is in writing,

11.3.1 on the day that it was delivered to the superintendent, or

11.3.2 on the sixth day after it was mailed to the Contractor at his address set out in the Articles of Agreement.

11.4 Where the postal service is disrupted by a strike, a notice, consent, order, direction, decision or other communication may be given to the Contractor by telex or telegram and shall be deemed to have been received by the Contractor twenty-four hours after it was transmitted.

GC12 Material, Plant and Real Property Supplied by Her Majesty

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.

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.

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.

12.4 When 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 Engineer, the Engineer 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 Engineer from time to time requires and shall satisfy the Engineer, 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 All material and plant and the interest of the Contractor in all real property, licences, powers and privileges acquired, used or provided by him for the contract shall, from the time of their acquisition, use or provision, be 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 Engineer 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, licences, powers and privileges, until the Engineer 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 Engineer.

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 Municipal Permits

14.1 The Contractor shall, within 30 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.

14.2 Within 10 days of making a tender pursuant to GC14.1, the Contractor shall notify the Engineer 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 6 days after the time stipulated in GC 4.2.

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.

GC15 Performance of Work under Direction of Engineer

15.1 The Contractor shall

15.1.1 permit the Engineer to have access to the work and its site at all times during the performance of the contract;

15.1.2 furnish the Engineer with such information respecting the performance of the contract as he may require; and

15.1.3 give the Engineer every possible assistance to enable the Engineer 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 Engineer under the contract.

GC16 Cooperation with Other Contractors

16.1 Where, in the opinion of the Engineer, 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 Engineer, allow them access and cooperate with them in the carrying out of their duties and obligations.

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,

16.2.2 the Contractor incurs, in the opinion of the Engineer, extra expense in complying with GC16.1, and

16.2.3 the Contractor has given the Engineer written notice of his claim for the extra expense referred to in GC16.2.2 within 30 days of the date that the other contractors or workers were sent onto the work or its site,

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.

GC17 Examination of Work

17.1 If, at any time after the commencement of the work but prior to the expiry of the warranty or guarantee period, the Engineer has reason to believe that the work or any part thereof has not been performed in accordance with the contract, the Engineer may have that work examined by an expert of his choice.

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.

GC18 Clearing of Site

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 Engineer.

18.2 Before the issue of an interim certificate 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.

18.3 Before the issue of a final certificate 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.

18.4 The Contractor's obligations described in GC18.1 to GC18.3 do not extend to waste material and other debris caused by Her Majesty's servants or contractors and workers referred to in GC16.1.

GC19 Contractor's Superintendent

19.1 The Contractor shall, forthwith upon the award of the contract, designate a superintendent.

19.2 The Contractor shall forthwith notify the Engineer of the name, address and telephone number of a superintendent designated pursuant to GC19.1.

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.

19.4 The Contractor shall, until the work has been completed, keep a competent superintendent at the work site during working hours.

19.5 The Contractor shall, upon the request of the Engineer, remove any superintendent who, in the opinion of the Engineer, is incompetent or has been conducting himself improperly and shall forthwith designate another superintendent who is acceptable to the Engineer.

19.6 Subject to GC19.5, the Contractor shall not substitute a superintendent without the written consent of the Engineer.

19.7 A breach by the Contractor of GC19.6 entitles the Engineer 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 Engineer has been substituted.

GC20 National Security

20.1 If the Minister is of the opinion that the work is of a class or kind that involves the national security, he may order the Contractor

20.1.1 to provide him with any information concerning persons employed or to be employed by him for purposes of the contract; and

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

21.1 The Contractor shall, upon the request of the Engineer, remove any person employed by him for purposes of the contract who, in the opinion of the Engineer, 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

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 the wage rates set out in or prescribed pursuant to the Labour Conditions.

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 in a tax imposed under the *Excise Act*, the *Excise Tax Act*, the *Old Age Security Act*, the *Customs Act* or the *Customs Tariff*

22.2.1 occurs after the date of the submission by the Contractor of his tender for the contract,

22.2.2 applies to material, and

22.2.3 affects the cost to the Contractor of that material.

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.

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 Minister of Finance before that date, the change shall be deemed to have occurred before the date of submission of the tender.

GC23 Canadian Labour and Material

23.1 The Contractor shall use Canadian labour and material in the performance of the work to the full extent to which they are procurable, consistent with proper economy and the expeditious carrying out of the work.

23.2 Subject to GC23.1, the Contactor shall, in the performance of the work, employ labour from the locality where the work is being performed to the extent to which it is available, and shall use the offices of the Canada Employment Centres for the recruitment of workers wherever practicable.

23.3 Subject to GC23.1 and GC23.2, the Contractor shall, in the performance of the work, employ a reasonable proportion of persons who have been on active service with the armed forces of Canada and have been honourably discharged therefrom.

GC24 Protection of Work and Documents

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.

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 Engineer to be taken to ensure the maintenance of the degree of security that is ascribed to that rating.

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.

24.4 The Engineer may direct the Contractor to do such things and to perform such additional work as the Engineer considers reasonable and necessary to ensure compliance with or to remedy a breach of GC24.1 to GC24.3.

GC25 Public Ceremonies and Signs

25.1 The Contractor shall not permit any public ceremony in connection with the work without the prior consent of the Minister.

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 consent of the Engineer.

GC26 Precautions against Damage, Infringement of Rights, Fire, and Other Hazards

26.1 The Contractor shall, at his own expense, do whatever is necessary to ensure that

26.1.1 no person, property, right, easement or privilege is injured, damaged or infringed by reason of the Contractor's activities in performing the contract;

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;

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 Engineer, any fire is promptly extinguished;

26.1.4 the health and safety of all persons employed in the performance of the work is not endangered by the method or means of its performance;

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;

26.1.6 adequate sanitation measures are taken in respect of the work and its site; and

26.1.7 all stakes, buoys and marks placed on the work or its site by or under the authority of the Engineer are protected and are not removed, defaced, altered or destroyed.

26.2 The Engineer may direct the Contractor to do such things and to perform such additional work as the Engineer 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 Engineer made under GC26.2.

GC27 Insurance

27.1 The Contractor shall, at his own expense, maintain insurance contracts in respect of the work

27.1.1 with insurance companies approved by the Minister, and

27.1.2 that are in a form, of the nature, in the amounts, for the periods and containing the terms and conditions, if any, specified in the Insurance Conditions.

27.2 All insurance contracts maintained by the Contractor pursuant to GC27.1 shall provide that the proceeds thereof are payable to Her Majesty.

27.3 The Contactor shall obtain and deliver the originals or certified true copies of all insurance contracts maintained by the Contractor pursuant to GC27.1 to the Engineer, and the Contractor shall, when required by the Engineer, submit proof satisfactory to him that the insurance contracts are in force.

27.4 The Engineer may waive the Contractor's compliance with GC27.2 and GC27.3 upon application by the Contractor.

27.5 The Contractor shall do such things and execute such additional documents as are necessary to effect payment of the proceeds of insurance contracts to Her Majesty.

GC28 Insurance Proceeds

28.1 If the work or any part thereof is lost, damaged or destroyed and monies are paid to Her Majesty in respect of that loss, damage or destruction under an insurance contract maintained by the Contractor pursuant to GC27, the monies shall be held by Her Majesty for the purposes of the contract.

28.2 The Minister may, on behalf of Her Majesty, elect to retain the monies referred to in GC28.1 and in that event the monies belong to Her Majesty absolutely.

28.3 If an election is made pursuant to GC28.2, 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

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 GC 28.2, and

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.

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.

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 GC28.2, 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.

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 thereunto extend.

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 100% of the amount claimed notwithstanding TP4.4.1 and TP4.4.2.

GC29 Contract Security

29.1 The Contractor shall obtain and deliver contract security to the Engineer in accordance with the provisions of the Contract Security Conditions.

29.2 If the whole or a part of the contract security referred to in GC29.1 is in the form of a security deposit, it shall be held and disposed of in accordance with GC43 and GC45.

29.3 If a part of the contract security referred to in GC29.1 is in the form of a labour and material payment bond, the Contractor shall post a copy of that bond on the work site.

GC30 Changes in the Work

30.1 Subject to GC5, the Engineer may, at any time before he issues his Final Certificate of Completion,

30.1.1 order work or material in addition to that provided for in the Plans and Specifications; and

30.1.2 dispense with 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, dispensation, or change is, in his opinion, consistent with the general intent of the original contract.

30.2 The Contractor shall perform the work in accordance with such orders, dispensations and changes that are made by the Engineer pursuant to GC30.1 from time to time as if they had appeared in and been part of the Plans and Specifications.

30.3 The Engineer shall determine whether or not anything done or omitted by the Contractor pursuant to an order, dispensation or change referred to in GC30.1 increased or decreased the cost of the work to the Contractor.

30.4 If the Engineer 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 of the labour, plant and material that he necessarily incurred calculated in accordance with GC48 to GC50.

30.5 If the Engineer determines pursuant to GC30.3 that the cost of the work to the Contractor has been decreased, Her Majesty may reduce the amount payable to the Contractor under the contract by an amount equal to the decrease in the cost of the labour, plant and material that was incurred calculated in accordance with GC48 to GC50.

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.

30.7 An order, dispensation or change referred to in GC30.1 shall be in writing, signed by the Engineer and given to the Contractor in accordance with GC11.2.

GC31 Interpretation of Contract by Engineer

31.1 If, at any time before the Engineer 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 whether or not the labour, plant or material provided by the Contractor for performing 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 Engineer 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 Engineer that are made under GC31.1 and in accordance with any consequential directions given by the Engineer.

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, rectify and make good any defect or fault that appears in the work or comes to the attention of the Minister within 12 months from the date of the Final Certificate of Completion referred to in GC44.1

32.2 The Engineer may direct the Contractor to rectify and make good any defect or fault referred to in GC32.1 or covered by any other expressed or implied warranty or guarantee.

32.3 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 GC11.3.

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 Engineer pursuant to GC18, GC24, GC26, GC31 or GC32, the Engineer 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 Engineer pursuant to GC33.1.

GC34 Protesting Engineer's Decisions

34.1 The Contractor may, within ten days after the communication to him of any decision or direction referred to in 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 Engineer.

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 lawful 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 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 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 expressly requires 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 days of the date that an event described in GC35.2.1 or GC35.2.2 occurred, give the Engineer written notice of the event and 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 Engineer a written claim for extra expense or loss or damage within 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 Engineer to determine whether or not the claim is justified and the Contractor shall supply such further and other information for that purpose as the Engineer requires from time to time.

35.5 If the Engineer determines that a claim referred to in GC35.3 is justified, Her Majesty may 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 Engineer, an occurrence described in GC35.2.1 results in a saving 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 GC50.

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 Engineer 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 his opinion, causes beyond the control of the Contractor have delayed its completion.

36.2 An application referred to in GC36.1 shall be accompanied by the written consent of the bonding company whose bond forms part of the contract security.

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 Articles of Agreement 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 Engineer, 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.

GC38 Taking the Work Out of the Contractor's Hands

38.1 The Minister may, at his sole discretion, 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 days after receiving notice given by the Minister or the Engineer in accordance with GC11.1, remedied any delay in the commencement or any default in the diligent performance of the work to the satisfaction of the Engineer;

38.1.2 has defaulted in the completion of any part of the work within the time fixed for its completion by the contract;

38.1.3 has become insolvent;

38.1.4 has committed an act of bankruptcy;

38.1.5 has abandoned the work;

38.1.6 has made an assignment of the contract without the consent required by GC3.1; or

38.1.7 has otherwise failed to observe or perform any of the provisions of the contract.

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 due 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 Engineer shall determine the amount, if any, of a 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 may 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

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.

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, used or provided by the Contractor under the contract shall continue to be the property of Her Majesty without compensation to the Contractor.

39.3 When the Engineer 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.

GC40 Suspension of Work by Minister

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 to the Contractor in accordance with GC11.1.

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 Engineer, are necessary for the care and preservation of the work, plant and material.

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 consent of the Engineer.

40.4 If a period of suspension is 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.

40.5 If, upon the expiration of a period of suspension of more than 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.

40.6 If, upon the expiration of a period of suspension of more than 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.

GC41 Termination of Contract

41.1 The Minister may terminate the contract at any time by giving a notice of termination to the Contractor in accordance with GC11.1.

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

41.3.2 the lesser of

41.3.2.1 an amount, calculated in accordance with the Terms of Payment, that would have been payable to the Contractor had he completed the work, and

41.3.2.2 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 lawful 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.

42.2 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 an amount payable to the Contractor under the contract.

42.3 To the extent that the circumstances of the work being performed for Her Majesty permit, the Contractor shall comply with all laws in force in the province where the work is being performed relating to payment periods, mandatory holdbacks, and creation and enforcement of mechanics' liens or, in respect of the Province of Quebec, the law relating to privileges.

42.4 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.

42.5 The Contractor shall, whenever requested to do so by the Engineer, make a statutory declaration deposing to the existence and condition of any obligations and claims referred to in GC42.4.

42.6 GC42.1 shall only apply to claims and obligations that have been received by the Engineer in writing before payment to the Contractor pursuant to TP4.10 and within 120 days after a claimant

42.6.1 should have been paid in full under his contract with the Contractor or subcontractor where the claim is for money that was lawfully required to be held back from the claimant; or

42.6.2 performed the last of the service, work or labour, or furnished the last of the material pursuant to his contract with the Contractor or subcontractor, where the claim is not for money referred to in GC42.6.1.

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,

Her Majesty may convert the security deposit, if any, to Her own use.

43.2 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.

43.3 Any balance of an amount referred to in GC43.2 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 Engineer, it is not required for the purposes of the contract.

GC44 Engineer'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 Engineer, he shall issue a Final Certificate of Completion to the Contractor.

44.2 If the Engineer is satisfied that the work is sufficiently complete to be acceptable for use by Her Majesty, he may, at any time before he issues a certificate referred to in GC44.1, issue an Interim Certificate of Completion to the Contractor.

44.3 An Interim Certificate of Completion referred to in GC44.2 shall describe the parts of the work not completed to the satisfaction of the Engineer and all things that must be done by the Contractor before a certificate referred to in GC44.1 will be issued.

44.4 The Engineer 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 completion of the work.

44.5 If the contract or a part thereof is subject to a Unit Price Arrangement, the Engineer 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.

44.6 The Contractor shall assist and co-operate with the Engineer in the performance of his duties referred to in GC44.5 and shall be entitled to inspect any record made by the Engineer pursuant to GC44.5.

44.7 After the Engineer has issued a Final Certificate of Completion referred to in GC44.1, he shall, if GC44.5 applies, issue a Final Certificate of Measurement.

44.8 A Final Certificate of Measurement referred to in GC44.7 shall

44.8.1 contain the aggregate of all measurements of quantities referred to in GC44.5, and

44.8.2 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 Engineer, 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 may, subject to the *Financial Administration Act*, pay interest thereon to the Contractor.

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 Articles of Agreement, 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 Engineer 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 a Final Certificate of Measurement referred to in GC44.7 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, amend a price per unit set out in the Unit Price Table for any class of labour, plant or material included therein if an estimated quantity is set out therein for that class of labour, plant or material, and a Final Certificate of Measurement referred to in GC44.7 shows or is expected to show that the total quantity of that class of labour, plant or material actually performed, used or supplied by the Contractor in performing the work is

47.1.2.1 less than 85% of that estimated quantity; or

47.1.2.2 in excess of 115% of that estimated quantity.

47.2 An amendment that is made necessary by GC47.1.2.2 shall apply only to the quantities that are in excess of 115%.

47.3 If the Engineer and the Contractor do not agree as contemplated in GC47.1, the Engineer shall determine the class and the unit of measurement of the labour, plant or material and the price per unit therefor shall be determined in accordance with GC50.

GC48 Determination of Cost – Unit Price Table

48.1 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 set out in column 3 of the Unit Price Table by the price of that unit set out in column 4 of the Unit Price Table.

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 Engineer.

49.2 For the purpose of GC49.1, the Contractor, when requested by the Engineer, shall submit a detailed statement of the cost to him of the labour, plant and material referred to in GC49.1 to the Engineer.

GC50 Determination of Cost – Failing Negotiation

50.1 If the parties or 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 or material that falls within one of the classes of expenditure described in GC50.2 that are directly attributable to the performance of the contract, and

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 expense, but not including those referred to in GC50.1.1 or of a class referred to in GC50.2, in an amount that is equal to 10% of the sum of the expenses referred to in GC50.1.1.

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 Engineer;

50.2.3 assessments payable under any statutory authority relating to workmen's compensation, unemployment insurance, pension plan or holidays with pay;

50.2.4 rent that is paid for plant or an allowance for depreciation of plant owned by the Contractor that is necessary for and used in the performance of the work, if that rent or allowance is reasonable and use of that plant has been approved by the Engineer;

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 Engineer, are necessary for 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;

50.2.8 any other payments made by the Contractor with the approval of the Engineer 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 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.

Labour Canada / Travail Canada

LABOUR CONDITIONS
CONDITIONS DE TRAVAIL

Interpretation

1. In these conditions

(a) "Act" means the *Fair Wages and Hours of Labour Act;*

(b) "Regulations" means the Fair Wages and Hours of Labour Regulations made pursuant to the Act;

(c) "contract" means the contract to which these Labour Conditions are attached;

(d) "contracting authority" means the department of Government or Corporation that is an agent of Her Majesty with whom the contract is made;

(e) "contractor" means the person who has entered into the contract with the contracting authority;

(f) "Director" means a regional director of the Department of Labour located at Moncton, Montreal, Toronto, Winnipeg and Vancouver."

(g) "fair wage officer" means the officer of the Canada Department of Labour designated by the Minister of Labour;

(h) "Minister" means the Canada Minister of Labour;

(i) "persons" means those workers employed by the contractor, subcontractor or any other person doing or contracting to do the whole or any part of the work contemplated by the contract.

(j) "road, sewer and watermain construction" means clearing and preparing a right of way, excavation and subgrading, laying a granular base, grading and asphalt and concrete paving and includes

(a) the operation of on-site plants to service such construction,
(b) the installation of drainage,
(c) landscaping,
(d) the demolition of structures within or affected by a right of way, and
(e) all other work involved in
(i) the construction, reconstruction and maintenance of roads, highways, streets, sidewalks, curbs, parking lots, driveways, airport runways, airport taxi strips and aircraft parking aprons, and

(ii) the installation, reinstallation and maintenance of sewers and watermains.

Wage Rates

2.

(a) All persons, in the employ of the contractor, sub-contractor, or any other person doing or contracting to do the whole or any part of the work contemplated by the contract shall during the continuance of the work be paid fair wages: that is, such wages as are generally accepted as current for competent workers in the district in which the work is being performed for the character or class of work in which such

Interprétation

1. Dans ces conditions

a) "Loi" désigne la *Loi sur les justes salaires et les heures de travail;*

b) "Règlement" désigne le Règlement sur les justes salaires et les heures de travail établi en application de la Loi;

c) "contrat" désigne le contrat auquel sont annexées les présentes conditions de travail;

d) "adjudicateur" désigne le ministère du gouvernement ou la société qui est un agent de Sa Majesté avec lequel le contrat a été passé;

e) "entrepreneur" désigne la personne qui a passé le contrat avec l'adjudicateur;

f) "directeur" désigne un directeur régional du ministère du Travail en poste à Moncton, Montréal, Toronto, Winnipeg et Vancouver."

g) "agent des justes salaires" désigne l'agent du ministère du Travail du Canada désigné par le ministre du Travail;

h) "Ministre" désigne le ministre du Travail du Canada;

i) "personnes" désigne les travailleurs employés par l'entrepreneur, le sous-traitant ou toute autre personne exécutant ou s'engageant par contrat à exécuter la totalité ou une partie quelconque des travaux prévus dans le contrat.

j) "construction des routes, égouts et canalisations d'eau" désigne le défrichement et la préparation de l'emprise, les travaux de déblai, l'exécution de la sous-couche et de la couche de base en granulats, le nivellement, le revêtement de surface en liants bitumineux ou en béton de ciment, y compris

a) les installations de chantier nécessaires aux travaux susmentionnés,
b) le drainage,
c) l'aménagement paysager,
d) la démolition des structures empiétant sur l'emprise ou affectées par celle-ci et
e) tous les travaux connexes intéressant
(i) la construction, la réfection ou l'entretien des routes, autoroutes, rues, trottoirs, bordures, terrains de stationnement et allées pour automobiles, des pistes d'envol, pistes de circulation et aires de stationnement des aéroports, et

(ii) la construction, la réinstallation et l'entretien des égouts et des canalisations d'eau.

Taux de salaire

2.

a) A toutes les personnes employées par l'entrepreneur, le sous-traitant ou toute autre personne exécutant ou s'engageant par contrat à exécuter la totalité ou une partie quelconque des travaux prévus dans le contrat, il sera payé, tant que dureront les travaux, des justes salaires, c'est-à-dire les salaires généralement reconnus comme salaires courants pour les travailleurs qualifiés dans la région où les travaux sont exécutés, selon la nature ou la catégorie du travail auquel ces travailleurs sont respectivement

workers are respectively engaged; the wage rates paid for each classification of work shall be no less than those set out in Appendix A to these Labour Conditions, and in no case shall the wage rates paid be less than the minimum hourly rate of pay prescribed by or pursuant to Part III of the Canada Labour Code (Labour Standards).

(b) The Director may determine at any time and from time to time what are the current or fair and reasonable rates of wages for the purpose of the contract, and may revise the wage rates in Appendix A attached to these Labour Conditions during the term of the contract.

The contractor agrees that where during the term of the contract he receives from the contracting authority a copy of any change in the wage rates referred to in the above paragraph, the contractor will pay not less than the wage rates as changed commencing with the first day following the receipt by him of the copy of the changed wage rates.

(c) The contractor agrees that where during the term of the contract any question arises as to the proper classification of employment of work for the purpose of the payment of fair wages, the classification shall be determined by the Director. Immediately upon receipt of notice of any decision of the Director hereunder the contractor agrees to adjust the wages and classification of work of the persons affected commencing with the first day following the receipt by him of such notice.

Hours of Work

3. (a) Except as provided in paragraph (d) and Section 13, the working hours of persons employed in the execution of the contract shall not exceed 8 hours in a day or 48 hours in a week except where longer daily or weekly hours are authorized by the Minister in cases of exceptional circumstances.

(b) Except as provided in Section 13, all persons shall be paid for hours worked in excess of 8 hours in a day or 40 hours in a week at an overtime rate at least one and one-half times the wage rates required to be paid under these Labour Conditions, as set out in Section 2(a).

(c) Except as provided in Section 13, all applications for permission to exceed 8 hours in a day or 48 hours in a week shall be made to the contracting authority for reference to the Minister.

(d) The daily or weekly hours of work set out in paragraph (a) or Section 13, or authorized by the Minister under paragraph (a) or Section 13, may be exceeded where there is serious interference with the ordinary carrying out of the work contemplated by the contract by reason of:

(i) an accident involving injury to a worker,

(ii) a breakdown of or damage to machinery or equipment, or

(iii) other unforeseen, unpreventable or emergent circumstances,

but only to the extent necessary to prevent such serious interference.

(e) Where because of serious interference referred to in paragraph (d) the working hours of any worker exceeded the weekly hours of work set out in paragraph (a) or Section 13, or authorized by the Minister under paragraph (a) or Section 13, the contractor shall report in writing to the Director, within fifteen days after the end of the week in which such hours of work were exceeded, setting forth:

(i) the nature of the serious interference,

(ii) the names of all workers who worked in excess of weekly hours of work set out in paragraph (a) or Section 13 or authorized by the Minister under paragraph (a) or Section 13, and

(iii) the number of hours each worker worked in excess of the weekly hours of work referred to in subparagraph (ii).

affectés; les taux de salaire prévus pour chaque catégorie de travail ne devront pas être inférieurs aux taux indiqués dans l'Annexe A aux présentes conditions de travail et, dans aucun cas, les taux de salaire accordés ne devront être inférieurs au taux horaire minimum prescrit par la Partie III du Code canadien du travail (Normes du travail).

b) Le Directeur pourra en tout temps et à l'occasion déterminer quels sont les taux de salaire courants ou justes et raisonnables, pour les fins du contrat, et pourra revoir les taux de salaire indiqués dans l'Annexe A jointe aux présentes conditions de travail pendant la durée du contrat.

L'entrepreneur convient que s'il reçoit de l'adjudicateur, pendant la durée du contrat, un exemplaire de toute modification aux taux de salaire mentionnés dans l'alinéa ci-dessus, il ne paiera pas moins que les taux de salaire modifiés, à compter du premier jour qui suit la réception par lui, d'un exemplaire des taux de salaire modifiés.

c) L'entrepreneur convient que s'il surgit quelque doute, pendant la durée du contrat, quant à la catégorie appropriée d'emploi ou de travail aux fins du paiement des justes salaires, il appartiendra au Directeur de déterminer la catégorie. Dès réception de l'avis de toute décision du Directeur, en vertu des présentes, l'entrepreneur s'engage à rajuster le salaire et la catégorie de travail des personnes touchées, à compter du premier jour qui suit la réception, par lui, dudit avis.

Durée du travail

3. a) Sauf dispositions contraires à l'alinéa d) et à l'article 13, la durée du travail des personnes employées à l'exécution du contrat ne devra pas dépasser 8 heures par jour ni 48 heures par semaine, sauf lorsqu'une journée ou une semaine de travail plus longue a été autorisée par le Ministre en raison de circonstances exceptionnelles.

b) Sauf dispositions contraires à l'article 13, toutes les personnes seront rémunérées, pour les heures de travail effectuées en sus de 8 par jour ou de 40 par semaine, à des taux majorés au moins égaux à une fois et demie les taux de salaire exigés, dans les présentes conditions de travail, tel que défini à l'article 2a).

c) Sauf dispositions contraires à l'article 13, toutes les demandes d'autorisation de travail au-delà de 8 heures par jour ou de 48 heures par semaine devront être adressées à l'adjudicateur pour être transmises au Ministre.

d) La durée journalière ou hebdomadaire du travail énoncée dans l'alinéa a) ou l'article 13, ou autorisée par le Ministre, en vertu de l'alinéa a) ou de l'article 13, peut être dépassée en cas de danger d'entrave grave à la marche ordinaire des travaux prévus aux termes du contrat par suite:

(i) d'un accident ayant causé une lésion à un employé,
(ii) d'une panne ou de l'endommagement de l'outillage ou des appareils, ou
(iii) d'autres circonstances imprévues, inévitables ou fortuites,

mais uniquement dans la mesure nécessaire pour prévenir une telle entrave grave à la marche des travaux.

e) Lorsque, par suite du danger d'entrave grave à la marche des travaux mentionné dans l'alinéa d), la durée du travail d'un employé a dépassé la durée hebdomadaire du travail énoncée dans l'alinéa a) ou dans l'article 13, ou autorisée par le Ministre, en vertu de l'alinéa a) ou de l'article 13, l'entrepreneur doit adresser par écrit au Directeur, dans les quinze jours qui suivent la fin de la semaine au cours de laquelle la durée du travail a été dépassée, un rapport indiquant:

(i) la nature de l'entrave grave à la marche des travaux,

(ii) les noms de tous les employés qui ont fourni des heures supplémentaires en excédent de la durée hebdomadaire du travail énoncée dans l'alinéa a) ou dans l'article 13, ou autorisée par le Ministre en vertu de l'alinéa a) ou de l'article 13, et

(iii) le nombre d'heures supplémentaires fournies par chacun d'entre eux en excédent de la durée hebdomadaire du travail mentionnée dans le sous-alinéa (ii).

Labour Conditions to be Posted

4. For the protection of all persons the contractor agrees to post and keep posted, in a conspicuous place on the premises where work contemplated by the contract is being carried out or on premises occupied or used by persons engaged in carrying out such work, a copy of these Labour Conditions, and any authorization by the Minister to exceed the maximum hours specified in Section 3(a) or 13(a).

The Contractor to keep Records which are to be Kept open for Inspection

5. The contractor agrees to keep proper books and records showing the names, addresses and classifications of employment and work of all workers employed in work under the contract and the rate of wages, the wages paid and the daily hours worked by such workers.

The contractor also agrees to undertake that his books, records and premises will be open at all reasonable times for inspection by the Minister, a fair wage officer or any other person designated by the Minister.

The contractor also agrees to furnish the Minister, the contracting authority, the fair wage officer or other person designated by the Minister, on request, with such further information as is required to ascertain that the requirements of the Act, the Regulations and the contract with respect to wages, hours of work and other labour conditions have been complied with.

Departmental Requirements before Payments made to Contractor

6. The contractor agrees that he will not be entitled to payment of any money otherwise payable under the contract until he has filed with the contracting authority in support of his claim for payment a sworn statement;

(i) that he has kept the books and records required by these Regulations;
(ii) as to whether any wages in respect of work performed under the contract remain in arrears, and
(iii) that to his knowledge, all the conditions in the contract required by the Act and the Regulations have been complied with.

The contractor also agrees that, where the Minister informs the contracting authority and the contractor that fair wages and overtime rates have not been paid by the contractor to persons employed under the contract, the contracting authority will be entitled to withhold from any monies otherwise payable under the contract the amount the Minister indicates should be withheld until such time as the matter has been dealt with to the satisfaction of the Minister.

Authority to Pay Wages in the Event of Default by the Contractor

7. The contractor agrees that where he is in default of payment of wages to an employee the contractor will send to the Minister a cheque payable to the Receiver General for Canada for the amount determined by the Minister as being the amount the contractor is in default.

The contractor agrees that when he fails to comply with the preceding provision, the Minister may instruct the contracting authority to pay to the Receiver General for Canada, out of any monies otherwise payable to the contractor, the amount determined by the Minister as being the amount the contractor is in default.

Conditions of Subcontracting

8. The contractor agrees that in subcontracting any part of the work contemplated by the contract, he will place in the subcontract conditions respecting wages, hours of work and other labour conditions set out in the contract; and also that the contractor agrees that he will be responsible for the carrying out of these conditions.

Affichage des conditions de travail

4. Pour la protection de toutes les personnes, l'entrepreneur s'engage à afficher et à tenir affichés, bien à la vue, à l'endroit où les travaux prévus dans le contrat sont exécutés, ou dans les locaux occupés ou fréquentés par les personnes employées à l'exécution desdits travaux, un exemplaire des présentes conditions de travail, de même qu'un exemplaire de toute autorisation de prolongation de la durée du travail au-delà du seuil prescrit aux articles 3a) ou 13a) accordée par le Ministre.

L'entrepreneur s'engage à tenir des dossiers pour fins d'inspection

5. L'entrepreneur s'engage à tenir les registres et dossiers appropriés indiquant le nom, l'adresse et la catégorie d'emploi et de travail de tous les travailleurs employés à des travaux exécutés en vertu du contrat, de même que le taux de salaire, le salaire payé et la durée journalière du travail pour chacun de ces travailleurs.

L'entrepreneur s'engage également à faire en sorte que ses registres, ses dossiers et ses locaux soient accessibles en tout temps opportun, pour fins d'inspection par le Ministre, un agent des justes salaires ou toute autre personne désignée par le Ministre.

L'entrepreneur s'engage en outre à fournir, sur demande, au Ministre, à l'adjudicateur, à l'agent des justes salaires ou à toute autre personne désignée par le Ministre tous autres renseignements requis pour permettre de constater qu'on a satisfait aux exigences de la Loi, des règlements et du contrat en ce qui concerne les salaires, la durée du travail et les autres conditions de travail.

Exigences du ministère avant le versement des sommes dues à l'entrepreneur.

6. L'entrepreneur convient qu'il n'aura droit au paiement d'aucune somme qui autrement devrait lui être versée en vertu du contrat tant qu'il n'aura pas déposé auprès de l'adjudicateur, à l'appui de sa réclamation de paiement, une déclaration sous serment indiquant:

(i) qu'il a tenu les registres et dossiers requis par les présents règlements,
(ii) si des salaires à l'égard des travaux exécutés en vertu du contrat demeurent impayés et
(iii) qu'à sa connaissance, toutes les conditions du contrat exigées par la Loi et les règlements ont été observées.

L'entrepreneur convient en outre que si le Ministre fait savoir à l'adjudicateur et à l'entrepreneur que des justes salaires et des taux applicables aux heures supplémentaires n'ont pas été payés par l'entrepreneur à des personnes employées en vertu du contrat, l'adjudicateur sera autorisé à retenir de toute somme autrement payable en vertu du contrat le montant indiqué par le Ministre comme devant être retenu jusqu'à ce que la question ait été réglée à la satisfaction du Ministre.

Paiement des salaires par l'adjudicateur, si l'entrepreneur omet de le faire

7. L'entrepreneur convient qu'à défaut de paiement de salaire à un travailleur, de sa part, il devra envoyer au Ministre un chèque établi à l'ordre du Receveur général du Canada, au montant déterminé par le Ministre comme étant le montant que l'entrepreneur a omis de payer.

L'entrepreneur convient que s'il omet de se conformer à la disposition ci-dessus, le Ministre peut ordonner à l'adjudicateur de payer au Receveur général du Canada, à même les sommes autrement payables à l'entrepreneur, le montant déterminé par le Ministre comme étant le montant que l'entrepreneur a omis de payer.

Conditions imposées à un sous-traitant

8. L'entrepreneur convient que dans l'adjudication, à un sous-traitant, de toute partie des travaux prévus par le contrat, il devra insérer dans le sous-contrat les conditions concernant les salaires et la durée du travail et les autres conditions de travail indiquées dans le contrat; l'entrepreneur reconnaît en outre qu'il sera responsable de l'observation desdites conditions.

Workers to be Residents of Canada

9. The contractor agrees that all persons employed by him to do any work under the contract will be residents of Canada unless, in the opinion of the contracting authority at the time the work is to commence under the contract;

(a) persons resident in Canada are not available to do the work, or

(b) special circumstances exist whereby it would not be in the public interest to require that all such persons be residents of Canada.

Non-discrimination in Hiring and Employment of Labour

10. The contractor agrees that

(a) in the hiring and employment of workers to perform any work under the contract, the contractor will not refuse to employ and will not discriminate in any manner against any person because

(i) of that person's race, national origin, colour, religion, age, sex or marital status,

(ii) of the race, national origin, colour, religion, age, sex, or marital status of any person having any relationship or association with that person, or

(iii) a complaint has been made or information has been given by or in respect of that person relating to an alleged failure by the contractor to comply with subparagraph (i) or (ii);

(b) if any question arises as to whether the contractor has failed to comply with the provision described in paragraph (a), the Minister or any person designated by the Minister shall decide the question and his decision shall be final for the purposes of the contract; and

(c) failure to comply with the aforementioned clauses (a) and (b) regarding non-discrimination shall constitute a material breach of the contract.

Liquidated Damages

11. In the event of any default in carrying out any of the conditions set out in Sections 2, 3 and 13 of these Labour Conditions in respect of any employee, the contractor shall pay to Her Majesty as liquidated damages a sum of fifty dollars for every such default, and the Minister under whom the work contemplated by the contract is being executed may direct that the amount assessed as liquidated damages under this paragraph be deducted from any moneys payable to the contractor under the contract and be credited to the Consolidated Revenue Fund.

Schedule of Wage Rates

12. A schedule of minimum wage rates, authorized by the Canada Department of Labour, when attached to these Labour Conditions as Appendix A also becomes part of the contract.

Contracts exclusively for Road, Sewer and Watermain Construction.

13. In a contract which is EXCLUSIVELY for road, sewer and watermain construction:

(a) the working hours of persons shall not exceed 60 hours in a week except where longer weekly hours are authorized by the Minister under the Act.

(b) All persons shall be paid for hours worked in excess of 10 hours in a day or 50 hours in a week at an overtime rate at least one and one-half times the wage rates required to be paid under these Labour Conditions, as set out in Section 2(a).

(c) An application for authorization by the Minister to exceed the working hours specified in paragraph (a) shall be forwarded to him through the contracting authority.

Les travailleurs doivent résider au Canada

9. L'entrepreneur convient que toutes les personnes employées par lui pour exécuter un travail quelconque en vertu du contrat doivent résider au Canada, à moins que, de l'avis de l'adjudicateur, à la date prévue pour le début des travaux en vertu du contrat,

a) il ne se trouve pas de personnes résidant au Canada disponibles pour exécuter les travaux, ou

b) il existe des circonstances spéciales par suite desquelles il ne serait pas dans l'intérêt public d'exiger que toutes les personnes en question résident au Canada.

Non-discrimination dans l'embauchage et l'emploi de main-d'oeuvre

10. L'entrepreneur convient que

a) dans l'embauchage et l'emploi des travailleurs aux fins de l'exécution de tout travail en vertu du contrat, l'entrepreneur ne refusera pas d'employer une personne ou d'exercer de quelque façon que ce soit des distinctions injustes à l'endroit d'une personne à cause

(i) de la race, de l'origine nationale, de la couleur, de la religion, de l'âge, du sexe ou de l'état civil de cette personne,

(ii) de la race, de l'origine nationale, de la couleur, de la religion, de l'âge, du sexe ou de l'état civil de toute personne ayant un rapport ou une association avec la personne en question, ou parce que

(iii) cette dernière a porté plainte ou a fourni des renseignements ou parce qu'une plainte a été portée ou des renseignements ont été fournis en son nom relativement à toute prétendue omission de la part de l'entrepreneur de se conformer aux sous-alinéas (i) ou (ii);

b) en cas de doute sur la question de savoir si l'entrepreneur a négligé de se conformer aux dispositions de l'alinéa a), le Ministre ou toute autre personne désignée par le Ministre tranchera la question et sa décision sera sans appel aux fins du contrat;

c) toute omission de se conformer aux conditions a) et b) ci-dessus concernant la non-discrimination constituera un manquement grave au contrat.

Dommages-intérêts déterminés à l'avance

11. Advenant un manquement dans l'exécution de l'une ou l'autre des conditions énoncées dans les articles 2, 3 et 13 des présentes conditions de travail en ce qui concerne un employé quelconque, l'entrepreneur doit payer à Sa Majesté, au titre de dommages-intérêts fixés à l'avance, cinquante dollars pour chaque manquement, et le Ministre sous la juridiction de qui le travail prévu par le contrat est en voie d'exécution peut ordonner que le montant auquel ont été fixés les dommages-intérêts prédéterminés ainsi que le prévoit le présent alinéa soit déduit de toute somme payable à l'entrepreneur aux termes du contrat et soit crédité au Fonds du revenu consolidé.

Échelle de salaires

12. Une échelle de salaires minimums reconnue par le ministère du Travail du Canada, jointe aux présentes conditions de travail en tant qu'Annexe A, devient également partie intégrante du contrat.

Contrats adjugés exclusivement pour la construction de routes, d'égouts et de canalisations d'eau.

13. Dans un contrat adjugé EXCLUSIVEMENT pour la construction de routes, d'égouts et de canalisations d'eau:

a) la durée du travail des personnes ne doit pas dépasser 60 heures par semaine, sauf lorsqu'une semaine de travail plus longue a été autorisée par le Ministre en vertu de la Loi.

b) Toutes les personnes seront rémunérées, pour les heures de travail effectuées en sus de 10 par jour ou de 50 par semaine, à des taux majorés au moins égaux à une fois et demie les taux de salaire exigés dans les présentes conditions de travail, tel que défini à l'article 2a).

c) Une demande d'autorisation, par le Ministre, de travail au-delà des heures prescrites à l'alinéa a) devra être adressée au Ministre par l'entremise de l'adjudicateur.

Labour Canada / Travail Canada

LABOUR CONDITIONS – *CONDITIONS DE TRAVAIL*

APPENDIX A – ANNEXE A

WAGE SCHEDULE – *BARÈME DE SALAIRE*

DEPT. OF LABOUR REF. NO.
Nº DE RÉF. DU MINISTÈRE DU TRAVAIL :

DATE: JUNE 13, 1984

THIS SCHEDULE IS APPLICABLE TO THE FOLLOWING PROJECT
LE BARÈME CI-APRÈS S'APPLIQUE AU PROJET SUIVANT :

PARRY SOUND, ONTARIO
CANADA COAST GUARD, TRANSPORT CANADA
BASE RECONSTRUCTION

LOCALITY
ENDROIT :

CONTRACTING AUTHORITY
ADJUDICATEUR :

REF. NO.
Nº DE RÉF. :

CONSTRUCTION CONTRACTS – *CONTRATS DE CONSTRUCTION*

CLASSIFICATION OF LABOUR *CATÉGORIE DE MAIN-D'OEUVRE*	RATE OF WAGES PER HOUR NOT LESS THAN *TAUX HORAIRE DE SALAIRE NON INFÉRIEUR À*
Air Conditioning Mechanic *Mécanicien d'installation de climatisation*	$ 15.47
Asphalt or Concrete Spreader Operator *Conducteur d'épandeuse d'asphalte ou de béton*	BUILDING CONSTRUCTION/CONSTRUCTION DE BÂTIMENTS 8.95 OTHER CONSTRUCTION/AUTRE CONSTRUCTION 8.95
Asphalt Raker *Ratisseur d'asphalte*	8.15
Batchperson *Doseur*	10.67
Boilermaker (erection and repair) *Chaudronnier (montage et réparation)*	14.45
Bricklayer and Stonemason *Briqueteur et maçon*	14.20
Carpenter *Charpentier*	15.39
Cement Finisher (on building construction) *Cimentier – Applicateur (construction de bâtiments)*	12.93
Cement Finisher (on all other work) *Cimentier – Applicateur (tout autre travail)*	8.85
Compressor Operator *Conducteur de compresseur*	12.35
Concrete Floatperson (Puddleperson – Screedperson) *Bétonneur (régaleur – dameur)*	8.28
Concrete Mixer Operator *Conducteur de bétonnière*	12.35

THE CONTRACTOR SHOULD NOTE INFORMATION ON PAGE 4 OF THIS SCHEDULE.
L'ENTREPRENEUR DOIT PRENDRE CONNAISSANCE DES RENSEIGNEMENTS EN PAGE 4 DE LA PRÉSENTE ANNEXE.

CLASSIFICATION OF LABOUR *CATÉGORIE DE MAIN-D'OEUVRE*	RATE OF WAGES PER HOUR NOT LESS THAN *TAUX HORAIRE DE SALAIRE NON INFÉRIEUR À*
Crane Operator (overhead, climbing, skyway, or equiv.) *Grutier (surélevée, montante, grattе-ciel, ou l'équiv.)*	$ 13.95
Driller (air trac, wagon or similar drills) *Conducteur de foreuse (air comprimé, chariot ou foreuses du même genre)*	12.43
Drywall Applicator (incl. filling and taping) *Poseur de panneaux-mur sec (incl. remplissage et gaîon sur joint)*	15.39
Electrician *Électricien*	15.03
Elevator Mechanic *Mécanicien d'escenseur et monte-charge*	14.05
Equipment Operator (backhoe, dragline, gradall, pile driver, shovel, mobile crane) *Conducteur de machines (pelle à benne arrière, grue à benne traînante, gradall, sonnette, pelle, grue mobile)*	BUILDING CONSTRUCTION / CONSTRUCTION DE BÂTIMENTS 13.95 OTHER CONSTRUCTION / AUTRE CONSTRUCTION 9.65
Equipment Operator (bulldozer, tractor (D6 or equiv. and over); front end loader (over 1 cu. yd.) *Conducteur de machines (bélier mécanique, tracteur (D6 ou l'équiv. et plus); chargeuse avant (plus de 1 v. cu.)*	BUILDING CONSTRUCTION / CONSTRUCTION DE BÂTIMENTS 13.35 OTHER CONSTRUCTION / AUTRE CONSTRUCTION 8.95
Equipment Operator (bulldozer, tractor (under D6 or equiv.); front end loader (up to 1 cu. yd.) *Conducteur de machines (bélier mécanique, tracteur (moins de D6 ou l'équiv.); chargeuse avant (jusqu'à 1 v. cu.)*	BUILDING CONSTRUCTION / CONSTRUCTION DE BÂTIMENTS 13.35 OTHER CONSTRUCTION / AUTRE CONSTRUCTION 8.50
Flagperson *Signaleur*	6.75
Float Driver (under 25 tons) *Conducteur de ferdier (moins de 25 tonnes)*	11.58
Float Driver (25 tons or over) *Conducteur de ferdier (25 tonnes ou plus)*	11.58
Form Setter *Coffreur*	8.28
Glass & Metal Installer **GLAZIER ONLY** *Vitrier (poseur de verre)*	11.40
Grader Operator *Conducteur de niveleuse*	BUILDING CONSTRUCTION / CONSTRUCTION DE BÂTIMENTS 10.23 OTHER CONSTRUCTION / AUTRE CONSTRUCTION 8.25
Heavy Equipment Mechanic *Mécanicien de machines lourdes*	BUILDING CONSTRUCTION / CONSTRUCTION DE BÂTIMENTS 11.20 OTHER CONSTRUCTION / AUTRE CONSTRUCTION 8.35
Hoist Operator *Conducteur d'appareils de levage* 13.95	
Insulation Mechanic (heat and frost) *Installateur de matériel (thermique et frigorifique)*	14.53
Jackhammer Operator *Conducteur de marteau pneumatique*	12.38
Labourer (building construction) *Manoeuvre (construction de bâtiments)*	12.57
Labourer (heavy construction) *Manoeuvre (gros travaux de construction)*	12.13
Labourer (roads and paving construction) *Manoeuvre (construction de routes et asphaltage)*	7.80
Labourer (demolishing and wrecking) *Démolisseur*	12.13
Lather *Poseur de lattis*	15.39
Lineperson (electric) *Monteur de lignes électriques*	14.87
Marble Mason *Marbrier de bâtiment*	13.25

CLASSIFICATION OF LABOUR *CATÉGORIE DE MAIN-D'OEUVRE*	RATE OF WAGES PER HOUR NOT LESS THAN *TAUX HORAIRE DE SALAIRE NON INFÉRIEUR À*
Millwright *Mécanicien – ajusteur*	$ 13.79
Mortarperson *Gâcheur de mortier*	12.23
Ornamental and misc. Metal Erector *Monteur en métaux d'ornementation et métaux divers*	14.58
Painter (brush and roller) *Peintre (pinceau et rouleau)*	11.78
Painter (spray) *Peintre au pistolet*	12.78
Pipelayer (caulker and solderer) *Poseur de canalisations (mateur et soudeur)*	8.28
Plasterer *Plâtrier*	14.37
Plumber, Steamfitter and Welder (pipe) *Plombier, appareilleur à vapeur et soudeur en tuyauterie*	14.43
Powderperson *Préposé aux explosifs*	12.58
Pump Operator *Préposé au pompage*	12.35
Resilient Tile and Carpet Installer *Poseur de carreaux (matériaux élastiques) et de tapis*	13.08
Rodperson (Reinforced concrete) *Ferrailleur*	15.11
Roller Operator *Conducteur de rouleau compresseur*	BUILDING CONSTRUCTION/CONSTRUCTION DE BÂTIMENTS 10.05 OTHER CONSTRUCTION/AUTRE CONSTRUCTION 8.25
Roofer (built-up) *Couvreur (toit lamellaire)*	11.31
Roofer's Helper *Aide-couvreur*	10.05
Sheet Metal Mechanic *Tôlier*	14.67
Sprinkler Installer *Installateur d'extincteurs automatiques*	14.20
Structural Steel Erector *Monteur d'acier de structure*	14.58
Terrazzo Layer *Poseur de terrazzo*	13.25
Terrazzo Machine Operator (dry) *Conducteur de polisseuse de terrazzo (procédé sec)*	13.25
Terrazzo Machine Operator (wet) *Conducteur de polisseuse de terrazzo (procédé humide)*	13.25
Tile Setter (ceramic) *Carreleur (céramique)*	13.25
Truck Driver (service, 3 tons or under; dump, single axle) *Camionneur (camions, 3 tonnes ou moins; à bascule et à essieu simple)*	12.14
Truck Driver (fuel or lubricant tankers; A-frames under 5 tons (winch equipped) *Camionneur (camions-citernes à carbu[illegible]nt ou à lubrifiant; châssis entretoisés en A, moins de 5 tonnes (équipés d'un treuil)*	8.00
Truck Driver (dump, double axle) *Camionneur (camions à bascule et à double essieu)*	BUILDING CONSTRUCTION/CONSTRUCTION DE BÂTIMENTS 12.24 OTHER CONSTRUCTION/AUTRE CONSTRUCTION 8.00

CLASSIFICATION OF LABOUR *CATÉGORIE DE MAIN-D'OEUVRE*	RATE OF WAGES PER HOUR NOT LESS THAN *TAUX HORAIRE DE SALAIRE NON INFÉRIEUR À*
Truck Driver (A-frames, 5 tons or over (winch equipped) *Camionneur (camions à châssis entretoisés en A, de 5 tonnes ou plus (équipés d'un treuil)*	$ 8.97
Watchperson or Security Guard *Gardien ou agent de sécurité*	4.93
Welder-General (acetylene or electric) *Soudeur-général (acétylène ou électrique)*	14.38
Wharf and Dock Builder *Constructeur de quais et docks*	16.75

DEFINITIONS

IN THIS APPENDIX:

(1) **"BUILDING CONSTRUCTION"** means the construction, remodelling and repair of buildings.

(2) **"HEAVY CONSTRUCTION"** means such work as, but not limited to, site preparation, excavations, electric transmission lines, marine works, bridges, viaducts, tunnels and dams.

(3) **"ROAD, SEWER AND WATERMAIN CONSTRUCTION"** means clearing and preparing a right of way, excavation and subgrading, laying a granular base, grading and asphalt and concrete paving and includes

(a) the operation of on-site plants to service such construction,
(b) the installation of drainage,
(c) landscaping,
(d) the demolition of structures within or affected by a right of way, and
(e) all other work involved in
(i) the construction, reconstruction and maintenance of roads, highways, streets, sidewalks, curbs, parking lots, driveways, airport runways, airport taxi strips and aircraft parking aprons, and
(ii) the installation, reinstallation and maintenance of sewers and watermains.

(4) **"LABOURER (DEMOLISHING & WRECKING)"** means a labourer employed on a contract which is exclusively for the demolition, wrecking or razing of buildings or structures.

DÉFINITIONS

DANS L'ANNEXE:

1) **"CONSTRUCTION DE BÂTIMENTS"** signifie la construction, la rénovation et la réparation de bâtiments.

2) **"GROS TRAVAUX DE CONSTRUCTION"** signifie notamment, mais non exclusivement, l'aménagement de terrain, travaux d'excavation, lignes de transport d'énergie électrique, travaux maritimes, construction de ponts, viaducs, tunnels et barrages.

3) **"CONSTRUCTION DES ROUTES, ÉGOUTS ET CANALISATIONS D'EAU"** désigne le défrichement et la préparation de l'emprise, les travaux de déblai, l'exécution de la sous-couche et de la couche de base en granulats, le nivellement, le revêtement de surface en liants bitumineux ou en béton de ciment, y compris

a) les installations de chantier nécessaires aux travaux susmentionnés,
b) le drainage,
c) l'aménagement paysager,
d) la démolition des structures empiétant sur l'emprise ou affectées par celle-ci et
e) tous les travaux connexes intéressant
(i) la construction, la réfection ou l'entretien des routes, autoroutes, rues, trottoirs, bordures, terrains de stationnement et allées pour automobiles, des pistes d'envol, pistes de circulation et aires de stationnement des aéroports, et
(ii) la construction, la réinstallation et l'entretien des égouts et des canalisations d'eau

4) **"DÉMOLISSEUR"** signifie un manoeuvre employé sur un contrat qui consiste exclusivement à démolir ou à abattre des édifices ou des constructions.

THE CONTRACTOR SHOULD NOTE:

(a) THAT DURING THE TERM OF THIS CONTRACT, THE WAGE RATES LISTED HEREIN MAY BE REVISED IN ACCORDANCE WITH SECTION 2(b) OF THE LABOUR CONDITIONS, AND

(b) THAT IN CARRYING OUT ANY OF THE WORK CONTEMPLATED BY THIS CONTRACT, HE MAY ALSO BE SUBJECT TO PROVINCIAL LAWS AND REGULATIONS

L'ENTREPRENEUR DOIT NOTER:

a) QUE PENDANT LA DURÉE DE CE CONTRAT, LES TAUX DE SALAIRE ÉNUMÉRÉS DANS L'ANNEXE PEUVENT ÊTRE REVISÉS EN CONFORMITÉ AVEC LA SECTION 2(b) DES CONDITIONS DE TRAVAIL, ET

b) QUE, DANS L'EXÉCUTION DE TOUT TRAVAIL PRÉVU PAR LE CONTRAT, IL PEUT AUSSI ÊTRE ASSUJETTI AUX LOIS ET RÉGLEMENTS PROVINCIAUX.

Labour Canada / Travail Canada

March 25, 1982

Mr. A.C. Duffy
Chief, Contract Administration
Ontario Region
Public Works Canada
4900 Yonge Street
Willowdale, Ontario
M2N 6A6

Dear Mr. Duffy:

This refers to your letter of March 23, 1982 concerning the utilization of apprentice tradesmen on federal contracts.

As you know, wage rates listed on the Appendix A (Schedule of Wage Rates) issued by Labour Canada, apply to journeymen tradesmen. Rates for apprentices are not included. However, it has long been our policy to recognize the payment of lower rates for apprentices, based on the apprenticeship program in Ontario.

In order to apply the lower wage rate, the contractor must meet certain conditions, as follows:

1) The apprentice must be registered in a bonafide apprenticeship program, through the Ontario Ministry of Colleges and Universities.

2) The ratio of apprentices to journeyman, as provided in the apprenticeship program, must be respected.

3) The proper percentage of journeyman's rate must be paid, as provided by the apprenticeship program.

If you require further information, please let me know.

Yours truly,

G.R. McKnight
A/Area Operations Manager - East,
Great Lakes Region

This document is the document referred to as "Insurance Conditions" and marked "E" in the Articles of Agreement entered into on the _____ day of _____ 19__ between Her Majesty the Queen and _____

Signed: _____
Authorized Departmental Officer

_____
Contractor

1C1 INSURANCE CONTRACT

1.1 The Contractor, during the execution of the contract until the day of issue of the Engineer's Interim Certificate of Completion, or, if no such Interim Certificate of Completion is issued, until the day of Issue of the Final Certificate of Completion, will maintain an insurance contract of the type known and referred to by the Canadian Underwriters' Association as a Builders' Risk Policy, insuring the work for its full insurable value until the said day, and insuring for their full insurable value, all materials for the work delivered to property owned or leased by the Crown.

1.2 Within thirty (30) days after acceptance of the Contractor's tender, the Contractor shall deposit with the Engineer the original or certified true copy of a contract of insurance maintained by the Contractor pursuant to the requirements of these Insurance Conditions.

1C2 LOSS

2.1 Loss, if any, under the said Policy shall be payable to Her Majesty the Queen in Right of Canada.

2.2 The total Insurance under the said Policy shall not be reduced by the amount of any loss and in the event of a loss the amount payable in respect thereof shall be automatically reinstated.

1C3 CLAIM

3.1 Each claim under the said Policy may be made subject to a deductible amount of not more than one thousand dollars ($1,000.00).

1C4 INSURABLE VALUE

4.1 For the purpose of these Insurance Conditions, "Insurance Value" means the value of the work specified in the Plans and Specifications (Document "A").

CS1 Obligation to provide Contract Security

1.1 Where the contract amount referred to in the Articles of Agreement is

1.1.1 less than $25,000.00, the Engineer may require the Contractor to provide contract security prescribed in CS2; and

1.1.2 $25,000.00 or more, the Contractor shall, at his own expense, provide one or more of the forms of contract security prescribed in CS2.

1.2 If the Contractor is required to provide contract security pursuant to CS1.1, the security shall be delivered to the Engineer within 14 days after the date that the Contractor receives notice that his tender or offer was accepted by Her Majesty.

CS2 Prescription of Acceptable Contract Security

2.1 If the Contractor is required to provide contract security pursuant to CS1, Her Majesty shall accept from the Contractor one or more of the forms of security prescribed in CS2.2 to CS2.6.

2.2 A Contractor shall deliver to the Engineer

2.2.1 a performance bond and a labour and material payment bond each in an amount that is equal to not less than 50% of the contract amount referred to in the Articles of Agreement, or

2.2.2 a labour and material payment bond in an amount that is equal to not less than 50% of the contract amount referred to in the Articles of Agreement, and a security deposit in an amount that is equal to

2.2.2.1 not less than 10% of the contract amount referred to in the Articles of Agreement where that amount does not exceed $250,000.00, or

2.2.2.2 $25,000.00 plus 5% of the part of the contract amount referred to in the Articles of Agreement that exceeds $250,000.00, or

2.2.3 a security deposit in an amount prescribed by CS2.2.2 plus an additional amount that is equal to 10% of the contract amount referred to in the Articles of Agreement.

2.3 A performance bond and a labour and material payment bond referred to in CS2.2 shall be in a form and be issued by a bonding or surety company that is approved by Her Majesty.

2.4 The amount of a security deposit referred to in CS2.2.2 shall not exceed $250,000.00 regardless of the contract amount referred to in the Articles of Agreement.

2.5 A security deposit referred to in CS2.2.2 and CS2.2.3 shall be in the form of

2.5.1 a certified cheque payable to the Receiver General and drawn on a member of the Canadian Payments Association or a local cooperative credit society that is a member of a central cooperative credit society having membership in the Canadian Payments Association; or

2.5.2 bonds of or unconditionally guaranteed as to principal and interest by the Government of Canada.

2.6 A bond referred to in CS2.5.2 shall be

2.6.1 payable to bearer,

2.6.2 accompanied by a duly executed instrument of transfer to the Receiver General for Canada in the form prescribed by the *Domestic Bonds of Canada Regulations*, or

2.6.3 registered as to principal or as to principal and interest in the name of the Receiver General for Canada pursuant to the *Domestic Bonds of Canada Regulations*.

Project

Parry Sound, Ontario
Transport Canada
Canadian Coast Guard

Base Reconstruction

Project Number

095074/354604

Project Date

May 31, 1984

This document is the document referred to as "Plans and Specifications" and marked "A" in the Articles of Agreement entered into

on the .....day of .....19.....
Between Her Majesty the Queen

and .....

Signed .....
(Minister)

.....
(Contractor)

VOLUME ONE

* Soil Report and Drawings SK-1a, October, 1982

P.1

VOLUME ONE (continued)

VOLUME ONE (continued)

VOLUME TWO

VOLUME TWO (continued)

VOLUME TWO (continued)

VOLUME THREE

VOLUME THREE (Continued)

VOLUME FOUR

VOLUME FOUR (CONTINUED)

**********END**********

1 General
Description of Work

.1 Work under this Contract covers the staged reconstruction of the existing Canadian Coast Guard Base, Parry Sound, Ontario, located off Waubeek St., Parry Sound, as shown on site plan.

.2 Work not included in Contract comprises:
.1 Marine work in a previous contract including dredging, construction of wharves, marine railway, revetments, pier repairs, dredge fill and including concrete foundations for Winch House and construction of Compressor Shed on pier. Copies of various drawings with "MC-" designation are issued herewith for Contractor's reference only.
.2 Items indicated on contract documents as "not in contract", "by others", "by Canadian Coast Guard" or "by Engineer".

.3 Note that marine work under previous contract will be on-going during early stages of this contract.

2 Documents
Required

.1 Maintain at job site, one copy each of following:
.1 Contract drawings.
.2 Specifications.
.3 Addenda.
.4 Reviewed shop drawings.
.5 Change orders.
.6 Other modifications to Contract.
.7 Field test reports.
.8 Copy of approved work schedule.
.9 Manufacturers' installation and application instructions.
.10 Standards listed in Part 1 of Specification Sections under Reference Standards.

3 Staging of
Construction

.1 The existing Canadian Coast Guard facility will remain in operation during entire period of construction. Accordingly, schedule and carry out the work of the contract in stages as outlined herein. During all stages the contractor will maintain all electrical, water, gas, signals, drainage and other services to existing buildings and equipment being used by the Owners.

3 Staging of Construction (Cont'd)

.2 Stage 1: Complete construction of Winch House and of new Helicopter Hangar and adjacent fuel tanks and fueling facility, involving:

.1 Completion of hangar building to fully operational status permitting full occupancy by Canadian Coast Guard and evacuation and abandonment of existing helicopter hangar.

.2 Construction of adjacent concrete Helicopter fuel tank enclosure, including portion of new retaining wall forming part of enclosure. The installation of fuel tanks and refueling facility including pumps, connecting lines, electrical supply. Backfill of tanks and lines.

.3 Backfilling and rough grading around building and tanks to finished rough grade at building and blending with existing grades at perimeter of construction area.

.4 Installation of permanent concrete apron along south side of new Hangar as shown, including all granular fill under apron beyond that shown on MC-drawings issued for reference.

.5 Temporary electrical, plumbing, heating, and gas services including temporary 200 mm PVC storm sewer at east side of hangar building, temporary water supply from existing Yard Building to Hangar, and sanitary and oily wet well structure including temporary cover and pipe inserts.

.6 Except as specifically indicated otherwise, restrict work to area within limits defined by hoarding shown for Stage 1 on Drawing A-03.

.7 Construction of temporary paved helicopter landing area and access thereto.

.8 Complete construction of Winch House as soon as foundations have been installed under previous contract.

.9 Removal of hoarding enclosing Stage 1 construction, and erection of hoardings at temporary helicopter pad as shown.

.10 Before erecting hoarding for new Helicopter Hangar widen existing paved taxiway to west of new Hangar to permit continued use for access to existing hangars.

3. Staging of Construction (Cont'd)

.3 Stage 2: Complete construction of Shop Wing of Main Building and Flammable Liquids Storage Building, involving;

.1 Construction of new permanent helicopter landing facility to south of new hangar in indicated location including regrading, granular fill, concrete landing pad, and asphaltic concrete pavement surrounding pad. Consult with Engineer to determine a mutually satisfactory period for construction of permanent helicopter landing area, as use of temporary helicopter pad will prevent normal use of berthing facilities to the south.

.2 Demolition of existing Hangar Building Storage Shed and Furnace Building in vicinity of existing hangar and removal of trailer annex allowing 3 weeks time after interim completion and acceptance by the Engineer of Stage 1 for Owner to remove and transfer stored materials, equipment, fittings and fixtures to new hangar.

.3 Removal of existing oil tank and fuel tanks north of existing hangar, including concrete bases and buried lines, after connection of new fuel tanks to existing dispenser and interim completion and acceptance, Owner will remove and transfer fuel.

.4 Removal of existing concrete slabs, aprons, pads and building foundations within area of Stage 2 construction as defined on Drawings A-04.

.5 Prior to completing hoarding to north of Shop Wing and prior to laying out or excavating for north end of Shop Wing, carry out alteration to existing Marine Emergency Building and construct temporary access road, to permit Owner's continued use of Marine Emergency Building during Stage 2 construction. Carry out alterations to building as shown on Drawing A-5 and as follows:

.1 Remove existing overhead door, track and operating hardware. Remove existing man door and frame.

.2 Block existing door openings with wood stud framing. On exterior of studs apply building paper and 19 mm exterior grade sheathing plywood. Seal and trim openings to make weathertight.

.3 Insulate stud framing with 100 mm thickness of glass fibre insulation of friction fit type. On interior face of studs apply 4 mil polyethylene vapour barrier and 13 mm gypsum board, square edged, flush with existing gypsum board finish.

3. Staging of Construction (Cont'd)

.3 (Cont'd)
.5 (Cont'd)
.4 Cut and frame new openings for man door and opening for overhead door to indicated size. Trim new openings.
.5 Install removed mandoor, frame and hardware in new opening.
.6 Modify existing wood sectional overhead door, trackage, and operating hardware and install at new overhead door opening.
.7 Relocate existing electrical panel as required and carry out required mechanical and electrical work to keep building operational.
.8 Excavate fill and grade for temporary roadway. Remove topsoil and vegetation. Compact subgrade and all granular materials to 95% Standard Proctor Density with subgrade crowned to provide drainage to sides. Provide 300 mm compacted depth of Granular "B" with surface course of 150 mm of Granular "A".

.6 Removal of existing communications tower: give Engineer 3 week notice of intention to remove tower. During this period Owner will remove antennae, sensors, and the like. Remove tower structure, guy wires, concrete bases and anchors.
.7 Construction and placing into service of new hydro substation to serve new buildings.
.8 Backfilling and rough grading around new construction to finished rough grade adjacent to building and transformer station and blending with existing grades at perimeter of construction area.
.9 Installation of permanent concrete aprons to east, south and west of Shop Wing of Main Building including all granular fill under concrete apron, and granular base courses and concrete apron for receiving door at north of the building.
.10 Mechanical and electrical work required to make Shop Wing fully operational, including connections to new Helicopter Hangar.
.11 Except as specifically indicated or specified otherwise, restrict work to area within limits defined by hoarding shown on Drawing A-04.
.12 Removal of hoarding enclosing Stage 2 construction upon interim completion of Shop Wing and its acceptance by Engineer.
.13 All other site services not completed in Stage 1.

3 Staging of Construction (Cont'd)

.4 Stage 3: Completion of contract involving following:
.1 Remaining demolitions and removals subject to following restraints:
.1 Existing Administration Building shall not be demolished until 3 weeks after interim completion and acceptance by Engineer of new Administration Wing to enable removal of staff, equipment, supplies and fittings. Until that time keep all services to existing administration in functioning condition.
.2 Existing Carpentry Building will remain in Owner's use for a period of six weeks after interim completion and acceptance of Stage 2 of construction. Keep all services to this building functional until that time.
.3 Existing transformer building annexed to existing Storage Building north of new Administration Wing. Do not demolish until new hydro substation and electrical service are fully operational and connected. Give Engineer a minimum of 3 weeks notice of intention to demolish. Engineer will arrange for removal of existing transformers.
.2 Before demolishing existing shops and workshops, including Carpentry Shop, disconnect and unmount existing shop machines and equipment, transport to new locations in new Shop Wing, set and secure in designated positions ready for reconnection to new power sources by Owner.
.3 Construction of Guard House and installation of lighthouse lantern on roof, as supplied on site by Engineer.
.4 All work on north part of Owner's property including reconstruction of Staff and Visitors Parking Lot, roadways, and landscaping. Schedule work in parking lot so one-half of the area is available for parking at all times. Similarly schedule reconstruction of access road to permit vehicular access to Coast Guard Base at all times.
.5 All remaining work to complete contract.
.6 Schedule placing of concrete aprons and concrete base for southern most light standard along waterfront, including granular base for same, to take place no sooner than 22 months after Contract Date, except as otherwise specifically authorized by Engineer.

3 Staginbg of Construction (Cont'd)

.5 All references herein of notice to be given to the Engineer shall be from the date of the Interim Certificate of Completion issued by the Engineer for particular stage of construction.

4 Work Schedule

.1 Provide within 10 working days after Contract award, schedule showing anticipated progress stages and final completion of work within time period required by Contract Documents.

.2 Engineer will provide selected project milestones through to Contract completion date.

.3 In accordance with schedule and in form acceptable to Engineer, provide within 10 working days after Contract award, schedule showing dates for submission of shop drawings, material lists and samples.

.4 Interim reviews of work progress based on work schedule will be conducted as decided by Engineer and schedule updated by Contractor in conjunction with and to approval of Engineer.

5 Cost Breakdown

.1 Before submitting first progress claim submit breakdown of Contract price in detail as directed by Engineer and aggregate contract price. After review and acceptance by Engineer cost breakdown will be used as basis for progress payment.

6 Contractor's Use of Site

.1 Use of site: limited to areas within hoarding for each stage of construction as defined in Contract Documents for work and storage.

.2 Do not unreasonably encumber site with materials or equipment.

.3 Move stored products or equipment which interfere with operations of Engineer or other contractors.

.4 Obtain and pay for use of additional storage or work areas needed for operations.

6 Contractor's Use of Site

.5 Note that helicopter operations will be ongoing, from temporary or permanent landing pad locaions, during entire course of contract operations. Such helicopter operations can create horizontal windspeeds in the range of 100 km/hr at ground level in vicinity of landing pads. To prevent injury to persons and to avoid objects being sucked into rotor blades of helicopter, keep all loose materials and stockpiles of materials such as fill, sheet building materials, and the like, at least 30 metres from the helicopter pad then in use, except where material is protected by special hoarding specified in Paragraph 7.5 of Section 01500 of the Specification. Where protected by such hoardings keep height of stockpiles below height of hoarding.

7 Codes and Standards

.1 Perform work in accordance with National Building Code of Canada (NBC) 1980 and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.

.2 Meet or exceed requirements of contract documents, specified standards, codes and referenced documents.

8 Project Meetings

.1 Hold project meetings at times and locations approved by Engineer.

.2 Notify all parties concerned of meetings.

.3 Record minutes of meetings, and distribute to all parties within 7 days of meeting.

9 Setting Out of Work

.1 Set grades and lay out work in detail from control points and grades established by Engineer.

.2 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.3 Provide de needed to lay out and construct work.

.4 Supply such devices as straight edges, levels and templates required to facilitate Engineer's inspection of work.

.5 Supply stakes and other survey markers required for laying out work.

10 Location of Equipment and Fixtures

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Engineer of impending installation and obtain his approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Engineer.

11 Concealment

.1 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

12 Cutting, Fitting and Remedial Work

.1 Execute cutting including excavation, fitting and remedial work required to make work fit properly.

.2 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work.

.3 Obtain Engineer's approval before cutting, boring or sleeving load-bearing members.

.4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.5 Fit work airtight to pipes, sleeves, ducts and conduits.

.6 Use specialists in affected materials to execute cutting and remedial work.

13 Existing Services

.1 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to pedestrian and vehicular traffic.

.2 Before commencing work, establish location and extent of service lines in area of work and notify Engineer of findings.

13 Existing Services (Cont'd)

.3 Submit schedule to and obtain approval from Engineer for any shut-down or closure of active service or facility. Adhere to approved schedule and provide notice to affected parties.

.4 Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.

.5 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Engineer.

.6 Record locations of maintained, re-routed and abandoned service lines.

14 Alterations, Additions to Existing Building

.1 Execute work with least possible interference or disturbance to occupants, public and normal use of premises. Arrange with Engineer to facilitate execution of work.

.2 Where security has been reduced by work of Contract, provide temporary means to maintain security.

.3 Provide temporary dust screens, barriers, warning signs in locations where renovation and alteration work is adjacent to areas used by public or government staff.

15 Additional Drawings

.1 Engineer may furnish additional drawings to assist proper execution of work. These drawings will be issued for clarification only. Such drawings shall have same meaning and intent as if they were included with plans referred to in Contract documents.

16 Relics and Antiquities

.1 Relics and antiquities and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribedl tablets, and similar objects found on site or in buildings to be demolished, shall remain property of Department. Protect such articles and request directives from Engineer.

.2 Give immediate notice to Engineer if evidence of archeological finds are encountered during construction, and await his written instructions before proceeding with work in this area.

17 Taxes

.1 Pay applicable Federal, Provincial and Municipal taxes.

18 Fees, Permits and Certificates

.1 Provide authorities having jurisdiction with information requested.

.2 Pay fees and obtain certificates and permits required.

.3 Furnish certificates and permits when requested.

.4 Be responsible for submitting acceptable certificate stating that suspended ceiling systems provide adequate support for electrical fixtures, as required by current bulletin of Electrical Inspection Department of Ontario Hydro.

19 Examination

.1 Examine existing conditions and determine conditions affecting work.

.2 Attend mandatory Tenderers' pre-tender site inspection meeting at Site with Engineer and Owner's representative(s) present. No Tender will be considered in the event an officer of the bidding Company fails to attend the above Tenderers' site inspection meeting. Prospective bidders will be advised of location, date and time of mandatory pre-tender site meeting at time of tender call. Only one pre-tender site meeting will be held.

20 Energy Conservation

.1 The policy of the Government is to effectively conserve energy and non-renewable natural resources in the design, construction or alterations to buildings.

.2 The Contractor is encouraged to employ all reasonable means at his disposal to carryout an effective energy and natural resources conservation program and use energy saving construction techniques throughout the entire construction period.

20 Energy Conservation

.3 With due regard for necessary protection of the property the safety of workmen and public, and overriding by-laws and regulations, Contractor shall conserve energy and non-renewable natural resources, in such ways as:
.1 Switching off unnecessary lighting, particularly during inactive periods.
.2 Utilizing efficient methods, controls, equipment and enclosures to conserve temporary heating.
.3 Efficient use and control of cranes, hoists, etc.
.4 Any other construction activities which may result in saving of energy and natural resources.

21 Security

.1 Prior to starting work of this Contract, provide to the District Manager, Canadian Coast Guard Base, Parry Sound, names and trades of all persons who will be employed on the work, include subcontractor's personnel. Keep information updated as personnel employed on the work change, or are added to or reduced in number.

* 2.2 Work on Railway Right of Way
Pg. 2-3

* 2.3 Owners Use of Facilities Constructed under Contract
Pg. 3.

**********END**********

1 General

.1 Submit to Engineer, for review, shop drawings, product data and samples specified.

.2 Until submission is reviewed, work involving relevant product may not proceed.

2 Shop Drawings

.1 Drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate Sections.

.2 Identify details by reference to sheet and detail numbers shown on Contract Drawings. All dimensions in metric (SI) units.

.3 Maximum sheet size 860 x 1120 mm.

3 Product Data

.1 Certain specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings.

.2 Above will only be accepted if they conform to following:
.1 Delete information which is not applicable to project.
.2 Supplement standard information to provide additional information applicable to project.
.3 Show dimensions and clearances required.
.4 Show performance characteristics and capabilities.
.5 Show wiring diagrams and controls.

4 Samples

.1 Submit samples in sizes and quantities specified.

.2 Where colour, pattern or texture is criterion, submit full range of samples.

.3 Construct field samples and mock-ups at locations acceptable to Engineer.

.4 Reviewed samples will become standards of workmanship and material against which, installed work will be checked on project.

5 Coordination of Submissions

.1 Check and certify as correct shop drawings, product data and samples prior to submission.

.2 Verify:
.1 Field measurements.
.2 Field construction criteria.
.3 Catalogue numbers and similar data.

.3 Coordinate each submission with requirements of work and Contract documents. Individual shop drawings will not be reviewed until all related drawings are available.

.4 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.

.5 Contractor's responsibility for deviations in submission from requirements of Contract documents is not relieved by Engineer's review of submission, unless Engineer gives written acceptance of specified deviations.

.6 Notify Engineer, in writing at time of submission, of deviations from requirements of Contract documents.

.7 After Engineer's review, distribute copies.

6 Submission Requirements

.1 Issue submissions at least 15 working days before dates reviewed submissions will be needed.

.2 Submit one reproducible transparency of shop drawings, and number of copies of product data which Contractor requires for distribution plus 5 copies which will be retained by Engineer.

.3 Accompany submission with transmittal letter, in duplicate, containing:
.1 Date.
.2 Project title and number.
.3 Contractor's name and address.
.4 Number of each shop drawing, product data and sample submitted.
.5 Other pertinent data.

6 Submission Requirements

.4 Submissions shall include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name of:
  - .1 Contractor.
  - .2 Subcontractor.
  - .3 Supplier.
  - .4 Manufacturer.
  - .5 Separate detailer when pertinent.
- .4 Identification of product or material.
- .5 Relation to adjacent structure or materials.
- .6 Field dimensions, clearly identified as such.
- .7 Specification Section number.
- .8 Applicable standards, such as CSA or CGSB numbers.
- .9 Contractor's stamp, initialed or signed, certifying approval of submission, verification of field measurements and compliance with Contract documents.

**********END**********

1 General

.1 Provide construction photographs in accordance with procedures and submission requirements specified in this Section.

2 Progress Photographs

.1 Sizes: 200 x 250 mm.

.2 Finish: semi-matt colour with binding margin at one end.

.3 Paper: single weight, mounted.

.4 Number of prints required: 4 sets.

.5 Identification: typewritten name and number of project and date of exposure on 25 x 50 mm white patch in upper right hand corner.

.6 Number of viewpoints: two. Locations of viewpoints determined by Engineer.

.7 Frequency: monthly with progress statement.

3 Final Photographs

.1 Sizes: 200 x 250 mm.

.2 Finish: semi-matt colour with binding margin at one end.

.3 Paper: single weight, mounted.

.4 Number of prints required. 4 sets.

.5 Identification: typewritten name and number of project and date of exposure on 25 x 50 mm white patch in upper right hand corner.

.6 Number of viewpoints:
.1 Each side of buildings for total of 4 for each building.
.2 Interior of main rooms and finishes. Allow for 8 in each following:
.1 Helicopter Hangar
.2 Shop Wing
.3 Administration Wing
Allow for 1 interior viewpoint in other buildings.
.3 Other locations of viewpoints determined by Engineer.

4 Negatives

.1 Submit all negatives of coloured prints before final acceptance of building(s).

.2 Insert negatives in envelopes and identify with name and number of project. Indicate exposure dates and view points of each frame of 35 mm film strips.

**********END**********

1 Related Requirements Specified Elsewhere

.1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Engineer are specified under various sections.

2 Appointment and Payment

.1 Engineer will appoint and pay for services of testing laboratory except for the following:
.1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
.2 Inspection and testing performed exclusively for Contractor's convenience.
.3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
.4 Mill tests and certificates of compliance.
.5 Tests specified to be carried out by Contractor under the supervision of Engineer.
.6 Additional tests specified in paragraph 2.2.

.2 Where tests or inspections by designated testing laboratory reveal work not in accordance with contract requirements, contractor shall pay costs for additional tests or inspections as Engineer may require to verify acceptability of corrected work.

3 Contractor's Responsibilities

.1 Furnish labour and facilities to:
.1 Provide access to work to be inspected and tested.
.2 Facilitate inspections and tests.
.3 Make good work disturbed by inspection and test.
.4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

.2 Notify Engineer sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.

.3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.

.4 Pay costs for uncovering and making good work that is covered before required inspection or testing is completed and approved by Engineer.

**********END**********

PART 1 - GENERAL

1 Access

.1 Provide and maintain adequate access to project site for various stages of construction.

.2 Build and maintain temporary roads where indicated or directed and provide snow removal during period of work.

.3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads. Restrict construction.

2 Contractor's Site Office

.1 Provide office heated to 22 deg C, lighted 750 Lx and ventilated, or sufficient size to accommodate site meetings and furnished with drawing laydown table and telephone, pay telephone not acceptable.

3 Engineer's Site Office

.1 Provide temporary office for Engineer as a separate, individual building.

.2 Inside dimensions minimum 3.6 m long x 3 m wide x 2.4 m high, with floor 0.3 m above grade, complete with 4 50% opening windows and one lockable door.

.3 Insulate building and provide heating system to maintain 22 deg C inside temperature at -20 deg C outside temperature.

.4 Finish inside walls and ceiling with plywood, hardboard or wallboard and paint in selected colours. finish floor with 19 mm thick plywood.

.5 Install electrical lighting system to provide minimum 750 Lx using surface mounted, shielded commercial fixtures with 10% upward light component.

.6 Arrange and pay for telephone in Engineer's office for his exclusive use. Long distance calls placed on this phone will be paid by Engineer.

.7 Provide private washroom facilities adjacent to office complete with flush or chemical type toilet, lavatory and mirror and maintain supply of paper towels and toilet tissue.

3 Engineer's Site Office (Cont'd)

.8 Equip office with 1 x 2 m table, 4 chairs, 6 m of shelving 300 mm wide, one 3 drawer filing cabinet, one plan rack and one coat rack and shelf.

.9 Maintain in clean condition.

4 Storage Sheds

.1 Provide adequate weathertight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.

5 Sanitary Facilities

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

.3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Engineer.

6 Parking

.1 Make provisions for off-site parking for construction forces. Pay all associated costs. Maintain area.

.2 On site parking will not be available except within hoardings for particular stage of construction and shall be limited to vehicles immediately required for work at hand.

7 Site Enclosures

.1 Except as indicated otherwise in vicinity of existing helicopter pad, erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA 0121-M1978.

.2 Apply plywood panels vertically flush and butt jointed.

.3 Provide indicated lockable truck entrance gates and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.

7 Site Enclosures (Cont'd)

.4 Paint public side of site enclosure in selected colours with one coat primer to CGSB 1-GP-55e+Amdt-Oct-73 and one coat exterior paint to CGSB 1-GP-59M. Maintain public side of enclosure in clean condition.

.5 For limited height enclosure in vicinity of existing helicopter landing pad, south of new Helicopter Hangar, employ the services of a Professional Engineer, licensed in Ontario, to design hoarding to withstand horizontal wind forces resulting from helicopters landing and taking off, and in accordance with requirements of the Department of Transport, Canada. Prior to erection submit shop drawings, bearing stamp of the Registered Engineer, in accordance with Section 01340.

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8 Enclosure of Structure

.1 Provide temporary weathertight enclosures and protection for exterior openings until permanently enclosed.

.2 Erect enclosures to allow access for installation of materials and working inside enclosure.

.3 Design enclosures to withstand wind pressure and snow loading.

9 Power

.1 Arrange, pay for and maintain temporary electrical power supply in accordance with governing regulations and ordinances.

.2 Install temporary facilities for power such as pole lines and underground cables to approval of local power supply authority.

.3 Electrical power and lighting systems installed under this Contract may be used for construction requirements with prior approval of Engineer provided that guarantees are not affected. Make good damage. Replace lamps which have been used over period of 3 months.

10 Water Supply

.1 Water supply is available on site and will be provided for construction usage at no cost, upon arrangements being made with Engineer.

10 Water Supply (Cont'd)

.2 Make connections to existing service lines at locations approved by Engineer. Provide, pay for, and maintain hose hydrants, temporary lines, hoses.

.3 Permanent water supply system installed under this Contract may be used for construction requirements with prior approval of Engineer provided that guarantees are not affected. Make good damage.

11 Heating and Ventilating

.1 Pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel, operation, maintenance and removal of equipment. Use of direct-fired heaters discharging waste products into work areas will not be permitted unless prior approval is given by Engineer.

.2 Provide temporary heat and ventilation in enclosed areas as required to:
.1 Facilitate progress of work.
.2 Protect work and products against dampness and cold.
.3 Prevent moisture condensation on surfaces.
.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
.5 Provide adequate ventilation to meet health regulations for safe working environment.

.3 Maintain minimum temperature of 10 deg C or higher where specified as soon as finishing work is commenced and maintain until acceptance of structure by Engineer.
.1 Maintain ambient temperature and humidity levels as required for comfort of office personnel.

.4 Ventilating:
.1 Prevent hazardous accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
.4 Ventilate storage spaces containing hazardous or volatile materials.
.5 Ventilate temporary sanitary facilities.
.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful elements.

11 Heating and Ventilating (Cont'd)

.5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
.1 Conform with applicable codes and standards.
.2 Enforce safe practices.
.3 Prevent abuse of services.
.4 Prevent damage to finishes.
.5 Vent direct-fired combustion units to outside.

.6 The use of new systems for temporary heating, ventilating, or air conditioning may be permitted upon prior approval by Engineer.

.7 Activate radiation systems under direction of Engineer to provide temporary heat, after each building is closed in. Finally flush system and treat water, under direction of Engineer, as specified in Section 15602.

.8 Activate air systems under direction of Engineer to provide temporary heat, after Engineer is satisfied that system will not be damaged by freezing. Protect ducting system by filters 50% effective NDS inspected daily and replaced weekly or more frequently as necessary. Finally vacuum clean entire ducting system and renew filters.

.9 Refer to Section 01710 for replacement of filters at time of final acceptance of work.

12 Drainage

.1 Refer to Section 01560 for site drainage and pumping requirements.

13 Site Signs and Notices

.1 Only Project Identification and Consultant/Contractor signboards and notices for safety or instruction are permitted on site.

.2 Format, location and quantity of site signs and notices to be approved by Engineer.

.3 Signs and notices for safety or instruction to be in French and English language, or commonly understood graphic symbols.

.4 Maintain signboards, signs and notices for duration of project. Remove and dispose of signs off site on completion of project when directed by Engineer.

13 Site Signs and Notices (Cont'd)

.5 Project identification signboards:
.1 Comply with Municipal regulations governing locations of signs.
.2 Provide foundation, framing and one 1200 x 2400 mm signboard in location as directed by Engineer as follows:
.1 Foundations: 15 MPa concrete to CSA CAN3-A23.1-M77.
.2 Framework and battens: select structural White Spruce, Douglas Fir or Western Red Cedar, dressed four sides.
.3 Signboard: 19 mm Douglas Fir plywood to CSA 0121-M1978, standard construction, medium density overlaid one side.
.4 Paint: alkyd type, without silicone additives. Primer to CGSB 1-GP-189M, enamel to CGSB 1-GP-59M.
.5 Fasteners: aluminum or hot-dip galvanized steel nails; hot-dip galvanized or cadmium coated steel screws.
.6 Vinyl sign face: printed project identification, self adhesive, vinyl film overlay, supplied by Engineer.
.3 Install concrete foundation, framework, and attach signboard to framing as indicated.
.4 Make weathertight seal on signboard panel edges using wood filler and paint or aluminum edge moulding cover.
.5 Paint signboard and framing with one coat primer and two coats enamel. Colour white on signboard face, black on other surfaces.
.6 Apply vinyl sign face overlay to painted signboard face. Conform to installation instructions supplied.

.6 Consultant/Contractor signboard identifying Consultants, Prime Contractors and subcontractors to be erected and paid for by consultant and contractor, and shall conform in size, appearance, format and construction to Project Identification Signboard. All information to be in both official languages, with colours, lettering and format as directed by Consultant. Sign subject to approval by Engineer prior to fabrication and erection.

14 Scaffolding

.1 Construct and maintain scaffolding in rigid, secure and safe manner.

.2 Erect scaffolding independent on walls. Remove promptly when no longer required. Refer to Section 01545 for safety requirements for scaffolding.

15 Removal of Temporary Facilities

.1 Remove temporary facilities from site when directed by Engineer.

16 Construction Camp

.1 The Engineer has obtained permission from the Town of Parry Sound allowing for the Contractor's use of Town property immediately west of Canadian Coast Guard's waterfront property. Present permission is limited to following:
.1 Hoarding for Stage 1 Fuel Tanks, and along west side of Stage 2 may be erected up to 1800 mm to west of property line to enable removal of existing retaining wall and construction of new retaining wall.
.2 Contractor may supply and emplace on property four to six 12 metre (40 ft) construction trailers. Siting of trailers subject to Town approval and direction.
.3 Contractor to be responsible for construction and maintenance of access roads, located to Town approval. Temporary services to be at Contractor's cost.

.2 The use of this property for purposes other than above such as parking, storage, and the like is not to be assumed as permissible, but shall be subject to the Contractor obtaining approval from the Town of Parry Sound in direct negotiation.

.3 Maintain property to prevent nuisance and unsightliness. Do not dispose of garbage, debris, surplus materials, on property.

.4 Upon completion of contract remove all temporary trailers and facilities and leave site in "as found" condition satisfactory to Town.

**********END**********

13 Site Signs and Notices (Cont'd)

.5 Project identification signboards:

.1 Comply with Municipal regulations governing locations of signs.

.2 Provide foundation, framing and one 1200 x 2400 mm signboard in location as directed by Engineer as follows:

.1 Foundations: 15 MPa concrete to CSA CAN3-A23.1-M77.

.2 Framework and battens: select structural White Spruce, Douglas Fir or Western Red Cedar, dressed four sides.

.3 Signboard: 19 mm Douglas Fir plywood to CSA 0121-M1978, standard construction, medium density overlaid one side.

.4 Paint: alkyd type, without silicone additives. Primer to CGSB 1-GP-189M, enamel to CGSB 1-GP-59M.

.5 Fasteners: aluminum or hot-dip galvanized steel nails; hot-dip galvanized or cadmium coated steel screws.

.6 Vinyl sign face: printed project identification, self adhesive, vinyl film overlay, supplied by Engineer.

.3 Install concrete foundation, framework, and attach signboard to framing as indicated.

.4 Make weathertight seal on signboard panel edges using wood filler and paint or aluminum edge moulding cover.

.5 Paint signboard and framing with one coat primer and two coats enamel. Colour white on signboard face, black on other surfaces.

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.4 Upon completion of contract remove all temporary trailers and facilities and leave site in "as found" condition satisfactory to Town.

**********END**********

1 Construction Safety Measures

.1 Observe and enforce construction safety measures required by National Building Code 1980 Part 8, Canadian Construction Safety Code, 1977, Occupational Health and Safety Act 1980, and regulations for Construction Projects, Revised Statutes of Ontario 1980, Chapter 321, Revised Regulations of Ontario 1980, Regulation 691. Workmen's Compensation Board and municipal statutes and authorities.

.2 In event of conflict between any provisions of above authorities the most stringent provision will apply.

.3 Where applicable the Contractor shall be designated the "Constructor", as defined by Ontario Act.

P.4 * Addendum #1

.4 As an additional requirement, employ a qualified Professional Engineer, licensed in the Province of Ontario, to design hoarding on south side of new Helicopter Hangar, facing helicopter pad, to withstand horizontal wind force of 100 k.p.h. Limit height of this hoarding to 1200 mm. In accordance with Section 01340 submit shop drawings of this hoarding, bearing engineer consultant's professional stamp and showing details of construction.

2 Fire Safety Requirements

.1 Comply with requirements of standard for Construction Operations FCC No. 301-June 1982, issued by Fire Commissioner of Canada.

.2 Copies of this standard may be obtained from:

Fire Commissioner of Canada,
Sir Charles Tupper Building,
Riverside Drive,
Ottawa, Canada, K1A OM2

3 Overloading

.1 Ensure no part of Work is subjected to a load which will endanger its safety or will cause permanent deformation.

4 Falsework

.1 Design and construct falsework in accordance with CSA S269.1-1975.

5 Scaffolding

.1 Design and construct scaffolding in accordance with CSA S269.2-M1980.

6 Safety Clothing for Visitors

.1 Keep a minimum of 15 construction safety hats on site and available for use of official visitors.

.2 Regular visitors to site are expected to provide their own safety boots.

7 Aircraft Safety and Temporary Obstruction Lights

.1 Helicopter operations will be on going, day and night, from existing facilities. Be responsible for maintaining clearances and marking obstruction in accordance with Transport Canada requirements to permit such operations to be carried out safely.

.2 Keep all construction equipment and materials out of area between existing helicopter pad and hoarding south of new Helicopter Hangar and out of required radius around pad.

.3 Lower booms on pile drives, cranes, booms, at end of working day. Alternately provide and maintain obstruction lights as specified hereinafter.

.4 Provide and maintain in operation temporary obstruction lights to Transport Canada requirements in following locations.
.1 On high points of steel frame of new Helipcopter Hangar at corners nearest helicopter landing pad.
.2 On equipment towers on new Helicopter Hangar, and on communication tower on Administration Wing until permanent obstruction lights are in operation.
.3 On any equipment boom not lowered at end of work day, or in use during hours of dusk or darkness.

**********END**********

1 Fires

.1 Fires and burning of rubbish on site is not permitted.

2 Disposal of Wastes

.1 Do not bury rubbish and waste materials on site unless approved by Engineer.

.2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

.3 Dispose of wastes in compliance with Ontario Ministry of the Environment regulations.

3 Drainage

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

4 Plant Protection

.1 Protect trees and plants on site and adjacent properties where indicated.

.2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

5 Work Adjacent to Waterways

.1 Do not operate construction equipment in waterways.

.2 Do not use waterway beds for borrow material.

.3 Do not dump excavated fill, waste material or debris in waterways.

.4 Do not skid logs or construction materials across waterways.

6 Pollution Control

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authorities emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

**********END**********

1 General

.1 Use new material and equipment unless otherwise specified.

.2 Within 7 days of written request by Engineer, submit following information for any or all materials and products proposed for supply:
.1 name and address of manufacturer,
.2 trade name, model and catalogue number,
.3 performance, descriptive and test data,
.4 manufacturer's installation or application instructions,
.5 evidence of arrangements to procure.

.3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.

.4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.

2 Manufacturers' Instructions

.1 Unless otherwise specified, comply with manufacturers' latest printed instructions for materials and installation methods.

.2 Notify Engineer in writing of any conflict between these specifications and manufacturers' instructions. Engineer will designate which document is to be followed.

3 Fastenings General

.1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work.

.2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood plugs not acceptable.

.3 Keep exposed fastenings to minimum, space evenly and lay out neatly.

.4 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

.5 Obtain Engineer's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166-1975.

4 Fastenings Equipment

.1 Use fastenings of standard commercial sizes and patterns with materials and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur and resilient washers with stainless steel.

5 Delivery and Storage

.1 Deliver, store and maintain packaged material and equipment with manufacturer's seals and labels intact.

.2 Prevent damage, adulteration and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected material and equipment from site.

.3 Store material and equipment in accordance with suppliers' instructions.

.4 Touch-up damaged factory finished surfaces to Engineer's satisfaction. Use primer or enamel to match original. Do not paint over name plates.

6 Conformance

.1 When material or equipment is specified by standard or performance specifications, upon request of Engineer, obtain from manufacturer an independent testing laboratory report, stating that material or equipment meets or exceeds specified requirements.

7 Metric Sized Materials

.1 SI metric units of measurement are used exclusively on the drawings and in the specifications for this project.

.2 The Contractor is required to provide metric products in the sizes called for in the Contract Documents except whsere a valid claim can be made that a particular product is not available on the Canadian market.

7 Metric Sized Materials (Cont'd)

.3 Claims for exemptions from use of metric sized products shall be in writing and fully substantiated with supportive documentation. Promptly submit application to Engineer for consideration and ruling. Non-metric sized products may not be used unless Contractor's application has been approved in writing by Public Works Canada.

.4 Difficulties caused by the Contractor's lack of planning and effort to obtain modular metric sized products which are available on the Canadian market will not be considered sufficient reasons for claiming that they cannot be provided.

.5 Claims for additional costs due to provision of specified modular metric sized products will not be considered.

8 Construction Equipment and Plant

.1 On request, prove to the satisfaction of Engineer that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.

.2 Maintain construction equipment and plant in good operating order.

**********END**********

1 General

.1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

.2 Store volatile wastes in covered metal containers, and remove from premises daily.

.3 Prevent accumulation of wastes which create hazardous conditions.

.4 Provide adequate ventilation during use of volatile or noxious substances.

2 Materials

.1 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

3 Cleaning During Construction

.1 On a daily bases maintain premises including roofs, free from debris and waste material.

.2 Maintain project site, and public properties free from accumulations of waste materials and rubbish.

.3 Provide on-site containers for collection of waste materials, and rubbish. Remove containers on a regular basis or arrange with commercial operator for supply of dump containers and the removal of contents on a scheduled basis.

.4 Remove waste materials, and rubbish from site. Refer to Section 01560.

.5 Vacuum clean interior building areas when ready to receive finish painting, and continue vacuum cleaning on an as-needed basis until building is ready for substantial completion or occupancy.

.6 Schedule cleaning operations so that resulting dust and other contaminants will not fall on wet, newly painted surfaces.

4 Final Cleaning

.1 In preparation for substantial completion or occupancy, conduct inspection of sight-exposed interior and exterior surfaces.

.2 Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior and exterior finished surfaces including glass and other polished surfaces.

4 Final Cleaning (Cont'd)

.3 Clean lighting reflectors, lenses, and other lighting surfaces.

.4 Broom clean paved surfaces; rake clean other surfaces of grounds.

.5 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.6 Remove snow and ice from access to building.

.7 Replace heating, ventilating and air conditioning filters if units were operated during construction.

**********END**********

1 Record Drawings

.1 Engineer will provide two sets of full size white prints for record drawing purposes.

.2 Maintain project "as-built" record drawings and record accurately significant deviations from Contract drawings caused by site conditions and changes ordered by Engineer.

.3 Mark "as-built" changes in red, on one set of white prints.

.4 Record following significant deviations:
.1 Depths of various elements of foundation in relation to Elevation 179 900.
.2 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
.3 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
.4 Field changes of dimensions.
.5 Other significant deviations which are concealed in construction and can not be identified by visual inspection.

.5 At completion of project and prior to final inspection, neatly transfer "as-built" records to second set of white prints using fine, red marker. Neatly print lettering and numbers in size to match original. Lines may be drawn free-hand but shall be neat and accurate. Add at each drawing title block note: "AS-BUILT RECORD". Also, circle on List of Drawings each title and number of drawing marked with "as-built" records.

.6 Submit this set of "as-built" record drawings to Engineer.

.7 If project is completed without significant deviations from Contract drawings, declare this in writing and submit to Engineer in lieu of record drawings.

**********END**********

1 Maintenance Manual

.1 On completion of project submit to Engineer 3 copies of Operating and Maintenance Data in English made up as follows:
.1 Bind data in three vinyl hard covered, 3 ring loose leaf binders for 215 x 280 mm size paper.
.2 Enclose title sheet, labelled "Operating and Maintenance Data Manual", project name, date and list of contents.
.3 Organize contents into applicable sections of work to parallel project specification break-down. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.

.2 Include following information plus data specified.
.1 Maintenance instruction for finished surface and materials.
.2 Copy of hardware and paint schedules.
.3 Description, operation and maintenance instructions for equipment and systems, including complete list of equipment and parts list. Indicate nameplate informatin such as make, size, capacity, serial number.
.4 Names, addresses and phone numbers of sub-contractors and suppliers.
.5 Guarantees, warranties and bonds showing:
.1 Name and address of projects.
.2 Guarantee commencement date (date of Final Certificate of Completion).
.3 Duration of guarantee.
.4 Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
.5 Signature and seal of Contractor.
.6 Additional material used in project listed under various Sections showing name of manufacturer and source of supply.

.3 Neatly type lists and notes. Use clear drawings, diagrams or manufacturers' literature.

.4 Include one complete set of reviewed shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.

2 Maintenance Materials

.1 Where supply of maintenance materials are specified, deliver to Engineer as follows:
.1 Use unbroken cartons, or if not supplied in cartons, they shall be strongly packaged.
.2 Clearly mark as to content.
.3 If applicable give colour, room No. or area where material used.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Drainage of open basements or excavations: Section 01560

.2 Site enclosure and public safety: Section 01500

.3 Safety barricades and lights: Section 01545

1.2 Existing Conditions

.1 Take over structures to be demolished at times set out in Paragraph 3, Staging of Construction, of Section 01005, based on the condition of structures at such dates.

.2 The Engineer reserves the right to remove from structures to be demolished any or all furniture, built-in cabinets, fixtures, fittings and the like, prior to such structure being taken over for demolition.

.3 Demolition of structures involving materials with an asbestos content can be hazardous to health. Carry out demolition work and removal of asbestos containing materials in conformity with requirements set out in Section 13570 of the Specifications. Refer also to Appendix 1 to Section 13570.

1.3 Protection

.1 Prevent movement, settlement or damage of adjacent structures, services, walks, roadways, and supporting grades, which are to remain in use during any stage of construction. Provide bracing, shoring and underpinning required. Make good damage and be liable for injury caused by demolition.

.2 Take precautions to support structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify Engineer.

.3 Prevent debris from blocking surface drainage inlets and system and mechanical and electrical systems which must remain in operation, and from encumbering sidewalks, roadways and access routes.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.1 Work

.1 Dispose of demolished materials except where noted otherwise.

.2 Carefully remove existing chain link fence and gates along west side of south (waterfront) portin of Owner's property and along north side of parking lot on north portion of Owner's property, including posts and post foundations as follows:
.1 Remove fence fabric, roll and store for reuse.
.2 Remove gates, gate hardware, rails, post caps, tension bars, wire arms, tension rods, and all accessory fitting. Salvage and store for reuse in rebuilt fences.
.3 Dispose of posts and concrete bases.

3.2 Safety Code

.1 Unless otherwise specified, carry out demolition work in accordance with Section 01545 and CSA S350-M1980.

3.3 Preparation

.1 Disconnect electrical and telephone service lines entering buildings to be demolished as per rules and regulations of authorities having jurisdiction. Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.

.2 Disconnect and cap mechanical services in accordance with requirements of local authority having jurisdiction.
.1 Arrange for existing natural gas supply lines to be removed or rerouted by gas company.
.2 Remove sewer and water lines and cap to prevent leakage.
.3 Remove and cap other existing underground services.

.3 Do not disrupt active or energized utilities traversing premises.

.4 Maintain, replace, or reroute services to structures which are to remain for Owners' use during construction period.

3.4 Demolition

.1 Demolish complete structures as scheduled.

.2 Demolish and remove foundation walls and footings, and concrete floors below or on grade concrete bases, tanks, within areas of new construction, including roadways, aprons, paved areas and regraded areas.

.3 At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling.

.4 Demolish in a manner to minimize dusting. Keep dusty materials wetted.

.5 Demolish masonry and concrete walls in small sections. Carefully remove and lower structural framing and other heavy or large objects.

.6 Selling or burning materials on site is not permitted.

.7 Remove contaminated or dangerous materials from site and dispose of in safe manner to minimize danger at site or at any time during disposal.

.8 Employ rodent and vermin exterminators to comply with health regulations.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Tree and plant temporary protection: Section 01560

.2 Tree pruning: Section 02112

.3 Site grading: Section 02210

.4 Excavating and backfilling: Section 02220

.5 Finish grading: Section 02260

PART 2 - PRODUCTS

2.1 Materials

.1 Fertilizer: Complete commercial fertilizer (10-6-4 or approved type) with 50% of elements derived from organic sources.

.2 Wound dressing: horticulturally accepted non-toxic, non-hardening emulsion.

PART 3 - EXECUTION

3.1 Fertilizing Existing Trees

.1 Apply fertilizer at rate of 50g/mm of caliper to existing trees to be retained. Take caliper measurement 0.3 m above grade. Apply once early in growing season.

.2 Distribute fertilizer equally into holes drilled 200-250 mm deep, spaced 600-750 mm apart and located in circular pattern between 2/3 and limit of each tree's branch spread for isolated trees. For trees in groups or forested area distribute fertilizer in a 2.0m x 2.0m grid throughout area. Water thoroughly after fertilizer applied.

.3 Water retained trees 3 times during summer. Soak area immediately below tree crown sufficiently deep to reach feeder roots.

3.2 Lowering Grade around Existing Trees

.1 Cut slope from edge of branch spread to new grade level at degree indicated. Build dyke of topsoil for each tree at periphery of branch spread to hold water where required.

3.2 Lowering Grade around Existing Trees (Cont'd)

.2 If excavation through roots is required, excavate by hand and cut roots with sharp axe, tree lopper or saw. Seal cut edges 10mm in diameter and larger with wound dressing.

.3 Apply fertilizer after grading is completed. Do not permit root system to dry out at any time.

3.3 Pruning

.1 Selectively remove 1/3 of tree branches to reduce transpiration and compensate for dieback of roots in fill conditions and damage to root system in cut condition.

.2 Prune in accordance with Section 02112.

END

PART 1 - GENERAL

1.1 Related Work

.1 Environmental protection: Section 01560

.2 Shrub and tree preservation: Section 02104

.3 Demolition: Section 02050

.4 Rock removal: Section 02211

1.2 Protection

.1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing septic and fuel tanks, existing pavements, utility lines, site appertenances, water courses, buried mechanical and electrical services which are to remain either permanently or for an interim period during construction. Make good damage.

.2 Protect root systems of trees to remain.

PART 2 - PRODUCTS

Not applicable to work of this Section.

PART 3 - EXECUTION

3.1 Clearing and Grubbing

.1 Carry out following clearing and grubbing on site areas which are to receive new buildings, road ways and driveways, concrete slabs on grade, landscaped areas, regraded and removed parking lot, drainage swales, and areas to be regraded:
.1 Clear existing plant growth except trees and shrubs marked for preservation as indicated.
.2 Grub out stumps, roots, rubbish and other non-perishable material over 50 mm to minimum depth of 900 mm below indicated finish grade from cleared areas. Remove embedded rocks less than 0.25 cu. m encountered during clearing operations.
.3 Remove existing topsoil except from areas to be regraded and landscaped.
.4 Dispose of cleared and grubbed material by hauling away from site.

**********END**********

PART 1 - GENERAL

1.1 Qualifications

.1 Show 3 examples of past performance to indicate acceptable expertise.
.1 Indicate size of job, location and references.

1.2 Scheduling of Work

.1 Schedule timing of operations as directed.

.2 Notify Engineer at least 7 days in advance of starting operations.

.3 Review work with Engineer on site prior to starting work.

.4 Start no work until sample pruning has been completed to satisfaction of Engineer.

PART 2 - PRODUCTS

2.1 Materials

.1 Wound dressing: Horticulturally accepted, non-hardening bituminous emulsion, free of materials toxic to callus formation, containing disinfectant for fungal and other diseased.

PART 3 - EXECUTION

3.1 Pruning

.1 Remove dead, dying, diseased, interfering, objectionable, and weak growth in order to promote healthy growth suitable to purpose for which plant material grown.

.2 Prune in accordance with Agriculture Canada Publications 1505-1977, The Pruning Manual.

.3 Carry out work under direct on-site supervision of arborist.

.4 Use clean sharp tools. Make cuts flush with main branch, smooth and sloping to prevent accumulation of water. Do not leave projecting stumps on trunks or main branches. Do not damage lead branches unless requested by Engineer.

3.1 Pruning (Cont'd)

.5 On trees known to be diseased, disinfect tools with alcohol after each cut and between trees, where danger exists of transmitting disease. Immediately remove from site pruned wood from diseased trees.

.6 Notify Engineer of type of disease encountered and recommend remedial measures in writing.

.7 Remove one of crossed or rubbing branches where practical.

.8 Treat girdling roots visible to eye as follows:
1. Cut root at either end.
2. Notch root in center with chisel.
3. Remove entire root without injury to bark or parent stem.
4. Report girdling roots to Engineer.

.9 Report structural weakness, decayed trunk or branches, split crotches.

.10 Remove from old 'leggy' shrubs 25% of old branches. Cut close to ground to encourage production of new shoots from base.

.11 Collect and dispose of debris or excess material daily.

3.2 Repair and Protection

.1 Repair cuts and old scars in accordance with Agriculture Canada Publication 1505-1977, The Pruning Manual.

.2 Paint old and new cuts 20mm in diameter and over with wound dressing.

END

PART 1 - GENERAL

1.1 Related Work

.1 Tree and plant temporary protection: Section 01560

.2 Clearing and grubbing: Section 02110

.3 Rock removal: Section 02211

.4 Topsoil and finish grading: Section 02260

.5 Environmental protection: Section 01560

1.2 Site Condition

.1 Subsurface investigation report is available for inspection at 255 Larch Street, Sudbury, Ontario.

.2 Establish location of underground and surface utility lines before beginning work of this Section.

1.3 Protection

.1 Prevent damage to fencing, trees, bench marks, existing buildings, surface or underground utility lines which are to remain. Make good any damage.

PART 2 - PRODUCTS

2.1 Materials

.1 Fill material: Type 3 in accordance with Part 2 of Section 02220.

.2 Excavated or graded material to be approved before use as fill for grading work. Protect such approved material from contamination.

PART 3 - EXECUTION

3.1 Removal of Topsoil

.1 Remove topsoil from areas to be excavated, and paved. Strip topsoil when dry enough to prevent contamination with sub grade material.

.2 Do not handle topsoil in wet or frozen condition.

.3 Stockpile topsoil suitable for reuse on site where directed.
.1 Piles not to exceed 12 m in height.

3.2 Grading

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Slope rough grade away from building 1:50 minimum.

.3 Grade ditches to depth as indicated.

.4 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Moisture content of fill and existing surface to be approximately the same to facilitate bonding.

.5 Compact filled and disturbed areas to Standard Proctor Density to ASTM D698-78 as follows:
.1 85% under landscaped areas.
.2 95% under paved and walk areas.

.6 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 Testing

.1 Inspection and testing of soil compaction will be carried out by laboratory designated by Engineer.

.2 Costs of tests will be paid by Engineer. Refer to Section 01410.

3.4 Surplus Material

.1 Remove surplus material from site.

.2 Remove material unsuitable for fill, grading or landscaping from site.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Safety barricades and lights: Section 01545

.2 Excavation to rock: Section 02220

1.2 Definition

.1 Rock is defined as any solid material in excess of 0.4 cu m which cannot be removed by means of mechanical excavating equipment having a 1.15 cu m bucket. Frozen material not classified as rock.

1.3 Qualifications

.1 Retain licensed explosives expert to supervise and program work, and to determine precautions, preparation and blasting techniques.

.2 Conform with blasting requirements of Canadian Construction Safety Code 1977 and local and provincial codes requirements of authority having jurisdiction.

1.4 Site Conditions

.1 Sub-surface investigation report is available for inspection at 255 Larch Street, Sudbury, Ontario.

1.5 Protection

.1 Prevent damage to surroundings and injury to persons. Post guards, sound warnings and display signs when blasting to take place.

PART 2 - PRODUCTS

Not applicable to work of this Section.

PART 3 - EXECUTION

3.1 Rock Removal

.1 Excavate rock to alignments, profiles and cross sections as indicated.

.2 Correct unauthorized rock removal at no extra cost, in accordance with backfilling requirements specified in Section 02220.

.3 Excavate rock for basement of Guardhouse, for buried services, for buried tanks, and other indicated locations.

3.1 Rock Removal (Cont'd)

.4 Excavated rock bed to be level, sound, unshattered bearing surface, free of loose rocks or fragments, earth or debris.

.5 Remove boulders and fragments which may slide or roll into excavated areas.

.6 Excavate trenches to lines and grades shown to minimum of 150 mm below pipe invert. Trim and shape trench bottoms and leave free of irregularities. Provide recesses for bell and spigot pipe to ensure bearing will occur along barrel of pipe.

.7 Cut trenches 300 mm wider than maximum pipe diameter.

3.3 Additional Excavation

.1 Rock excavation exceeding that indicated, if authorized in writing by Engineer, will be paid as extra to Contract price in accordance with General Conditions. Quantities will be taken from cross section showing original rock surface and actual grade line set by Engineer, except that minimum depth of rock required to be excavated shall be considered as 300 mm.

3.4 Surplus Material

.1 Dispose of surplus excavated rock from site.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Safety barricades and lights:	Section 01545
	.2	Environmental protection:	Section 01560
	.3	Clearing and grubbing:	Section 02110
	.4	Site grading, removal of topsoil and cut or fill for walks and paving:	Section 02210
	.5	Rock removal:	Section 02211
	.6	Finish grading:	Section 02260
	.7	Foundation drainage:	Section 02411
	.8	Treated plank cable protection:	Section 16106
	.9	Asphaltic concrete paving:	Section 02508

1.2 Site Conditions

.1 Sub-surface investigation report is available for inspection at 255 Larch Street, Sudbury, Ontario.

.2 Marine work carried out under a previous contract comprises dredging, construction of wharves, marine railway, revetments, pier repairs, dredge fill, foundation for Winch House, and various subgrade fills of crushed stone, Granular "B", and filter stone in area of previous contract. Copies of various drawings, designated "MC-", from previous contract are issued herewith for Contractor's reference.

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1.3 Samples

.1 Submit 25 kg samples of each type fill specified for analysis by testing laboratory. In the case of coarse gravelly soil or coarse crushed stone, submit 70 kg samples.

.2 Ship samples prepaid to testing laboratory designated by Engineer, in tightly closed containers to prevent contamination.

1.4 Shop Drawings

.1 Submit shop drawings of shoring and bracing, and timbering required in connection with excavation, in accordance with Section 01340. Drawings to show clearly procedural sequence to be followed.

.2 Drawings shall bear signature and stamp of a professional Engineer with a demonstrated competence in this type of work.

1.5 Shoring, Bracing and Timbering

.1 Prevent movement or settlement, safeguard and maintain integrity of adjacent structures, earth, bench marks, services, walks, paving, bearing piles, adjacent grades. Provide bracing, shoring required.

.2 Shore and brace excavations to prevent failure in accordance with Canadian Construction Safety Code 1977 and applicable local regulations.

.3 Make good and pay for any damage and be liable for any injury resulting from inadequate shoring, bracing or underpinning.

.4 Design and construct close sheeting to prevent adjacent soil from entering excavations and to control water infiltration.

1.6 Utility Lines

.1 Before commencing work notify all Public Utilities who will locate and mark individual buried services and extent of underground utility lines in area of excavation. Notify Engineer of findings.

.2 Size, depth, and location of known underground and surface utility lines are indicated on drawings for guidance only. No guarantee is given of completeness or accuracy.

.3 Maintain or relocate existing lines in area of excavation which must remain active in order to maintain services to existing buildings which are to continue in use during various stages of construction. Pay costs for this work.

.4 Remove abandoned utility lines to distance of 2000 mm from foundations. Cap or otherwise seal lines at cut-off points.

.5 Record locations of maintained, rerouted and abandoned underground utility lines.

1.6 Utility Lines (Cont'd)

.6 Make good and pay for damage to existing utility lines resulting from work.

1.7 Protection

.1 Protect bottoms of excavations from softening. Should softening occur, remove softened soil and replace with footing concrete.

.2 Protect bottoms of excavations from freezing.

.3 Construct banks in accordance with local by laws.

.4 Provide adequate protection around bench markers, layout markers, survey markers, and geodetic monuments.

.5 Provide protection to ensure no damage to existing facilities and equipment situated on site.

.6 Effect approved measures to minimize dust as result of this work.

.7 Do not stockpile excavated material to interfere with site operation or drainage.

.8 Provide temporary drainage and pumping as necessary to keep excavations free of water.

.9 Carry out excvations for site services so as to avoid or minimize interference with existing access roads, driveways, and access to existing buildings.

1.8 Compaction Densities

.1 Compaction densities are percentages of maximum densities obtainable from ASTM D698-70 and corrected as noted in 3.4.4.

1.9 Excavation and Backfilling Required by Other Sections

.1 Excavation and backfilling for site services, mechanical and electrical work except for bedding of lines is included in this Section and shall be carried out in accordance with provisions specified herein and indicated. This work to be laid out and supervised by trade concerned.

PART 2 - PRODUCTS

2.1 Materials

.1 Granular A fill: to Ontario Ministry of Transportation and Communications Form 1010, January 1980, for Granular A aggregate. Maximum size 37.5 mm.

.2 Granular B fill: to Ontario Ministry of Transportation and Communications Form 1010, January 1980, for Granular B aggregate. Maximum size 106 mm.

.3 Crushed stone fill: screened crushed stone, or crushed gravel, graded uniformly between maximum size of 19 mm and minimum size of 6 mm, with not more than 5% undersize particles.

.4 Sand fill: clean, washed, coarse bank or river sand free of clay, shale, and organic matter.

.5 Stone topping: screened crushed granite meeting following gradation:

Metric Sieve Size	Per Cent Passing
38.5 mm	100
25 mm	70 - 90
18 mm	10

.6 Earth fill: excavated or imported soil, free from roots, rocks larger than 75 mm and building debris. Excavated material shall be approved by Engineer before used as fill. If unsuitable, substitute with acceptable imported material.

.7 Formvoid (shearmat): honeycomb type bio-degradable cardboard 150 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

.8 Materials for subgrade drainage of parking lot:
.1 Weeping tile: 100 mm nominal inside diameter. Polyvinyl chloride weeping tile with filter fabric to CSA B.182.1-M1977, as applicable. Complete with unperforated connecting lines and all fittings.
.2 Pea gravel: to CAN3-A23.1-M77, Table 3, Group 1, 19.0 to 4.75 mm.

2.1 Materials (Cont'd)

.9 Rigid insulation for buried exterior service lines: expanded polystyrene: to CGSB 41-GP-14a, Type 4, minimum compressive strength 240 kPa, water absorption (% by volume) ASTM D2842 0.70 maximum, thermal resistance ASTM C518-70 R = 0.87, square edges. Only polystyrene insulations listed on CGSB Qualified Products List (GP-41) are acceptable for use on this Project.

.10 Filter fabric:
.1 Synthetic fibre: rot proof, unaffected by action of oil or salt water and not subject to attack by insects or rodents.
.2 Fabric: non-woven construction supplied in rolls of minimum 3.5 m width 91.5 m length, minimum thickness of 0.45 mm and minimum weight of 375 g/square metre.
.3 Physical properties:
.1 Breaking load and elongation: to ASTM D1682-64(1975) Grab Test Method 25 mm square jaws, constant rate of travel 300 mm per minute.
.1 Stronger principal direction. 690 N.
.2 Elongation maximum 70-100 per cent at break.
.2 Bursting strength: to ASTM D751-79, using Diaphragm Bursting Testing 2.2.
.3 Permeability: 0.1 mm/s.
.4 Equivalent opening size (EOS): ASTM sieve size 0.150 mm.

.11 Materials for Rock Filled Gabions:
.1 Gabions: Prefabricated to size(s) shown on Drawings, of 2.9 mm diameter, zinc-coated wire, with 75 mm x 100 mm openings. Zinc coating to a minimum of 2.6 g/100 sq. cm.
.2 Boulders or blast rock graded in size from 150 mm to 200 mm in size. Hand place in gabions to prevent deformation and to present neat appearance.

2.2 Stockpiling

.1 Stockpile materials in areas designated by Engineer. Stockpile granular materials in manner to prevent segregation. Protect stockpiled fill material from freezing when its use as backfill is imminent.

.2 Protect fill materials from contamination.

PART 3 - EXECUTION

3.1 Excavating

.1 Excavate to elevations and dimensions indicated for installation, construction and inspection of work specified.

.2 Excavate to well defined lines to minimize quantity of fill material required.

.3 Earth bottoms of excavations to be dry undisturbed soil, level, free from loose or organic matter.

.4 Excavation must not interfere with normal 45 deg splay of bearing from bottom of any footing.

.5 When complete, have Engineer inspect excavations to verify soil bearing capacity, depths and dimensions.

.6 Unless otherwise authorized by Engineer do not excavate site service trenches more than 30 metres in advance of installation operations and do not leave open more than 15 metres at end of a day's operations.

.7 Stockpile excavated materials suitable for trench backfill and site grading in locations directed by Engineer.

.8 Correct unauthorized excavation at no extra cost as follows:
.1 Fill under bearing surfaces and footings with concrete specified for footings.
.2 Fill under other areas with Type 2 fill compacted to 100% density inside buildings and 95% for areas outside buildings.

.9 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw. Seal cuts with approved tree wound dressing.

.10 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered in course of excavation.

.11 Excavate trenches to lines and grades shown to a minimum of 150 mm below underside of pipe, conduit, cable. Provide recesses for bell and spigot pipe to ensure bearing will occur along barrell of pipe. Supply and place fabric in trenches in dredge fill areas where bottom of trench is within 1 m of dredge fill. Refer to Drawing SS-3.

3.1 Excavating (Cont'd)

.12 Cut trenches 300 mm wider than maximum pipe, conduit, cable diameter or width. Trim and shape trench bottoms and leave free of irregularities, lumps or projections.

.13 Excavate ditches to grades and profiles indicated.

.14 Refer to "MC-" drawings issued for reference. Note that some grade elevations established in previous contract will require regrading and recompaction in order to achieve grades and elevations required in this Contract.

3.2 Backfilling

.1 Do not commence backfilling until areas of work to be backfilled have been inspected, pipe and conduit joints tested and approved by Engineer.

.2 Areas to be backfilled shall be free from debris, snow, ice, water or frozen ground. Backfill material shall not be frozen or contain ice, snow or debris.

.3 Prior to placing fill under slabs on grade, compact existing subgrade to obtain same compaction as specified for fill. Remove "soft" material and fill with approved material.

.4 Prior to installation of foundations, compact existing subgrade to obtain required bearing capacity. Remove "soft" material and fill with approved material.

.5 Backfill simultaneously each side of walls and other structures to equalize soil pressures.

.6 Obtain Engineer's approval prior to placing backfill against basement walls.

.7 Where temporary unbalanced earth pressures are liable to develop on walls or other structures, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Engineer.

.8 Place and compact fill materials in continuous horizontal layers not exceeding 150 mm loose depth except where otherwise specified or indicated. Use methods to prevent disturbing or damaging buried services, foundation drainage system, waterproofing perimeter insulation. Make good any damage.

.9 Do not place backfill in freezing weather or into frozen excavations.

3.2 Backfilling (Cont'd)

.10 Backfilling site services installations.
.1 Place surround material as shown on drawings.
.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing.
.3 Place layers simultaneously on both sides of installed work to equalize loading.
.4 Place material by hand around and over installations until 600 mm of cover is provided. Dumping material directly on installations will not be permitted.

.11 Backfilling of shored, sheeted, braced excavations:
.1 Unless otherwise indicated, or directed by Engineer, remove sheeting and shoring from trench during backfilling operations.
.2 Do not remove bracing until backfilling has reached level of bracing.
.3 Pull sheeting in 150 mm increments until clear of installations, simultaneously placing and compacting backfill to fill voids left by pulled sheeting.
.4 Pull sheeting thereafter in increments that will ensure backfill is maintained at an elevation at least 450 mm above toe of sheeting.
.5 When sheeting is to remain in place, but off tops at elevations indicated or directed.

.12 Provide granular topping at drainage ditches as indicated.

3.3 Placing Insulation

.1 Coordinate placing of insulation with other backfilling and compaction operations. Place insulation only after backfill under insulation has been compacted, levelled, tested and approved.

.2 Butt joints tightly. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints. Lay boards on level compacted fill.

.3 Place backfill over insulation by hand and compact in manner to prevent damage to or displacement of insulation.

3.4 Fill Types and Compaction

.1 Dimensions specified in following paragraphs are minimum dimensions of fill after compaction.

.2 Exterior side of perimeter walls: use Granular "B" fill to subgrade level. Compact to 95% density.

.3 Within building areas: use Granular "B" to underside of base courses for concrete slabs, with minimum depth of 200 mm, compacted to 100% density. Over Granular "B" place base course of crushed stone with minimum depth of 200 mm topped with 50 mm sand fill and compacted to 100% density.

.4 Under exterior concrete slabs, excluding concrete aprons adjacent to waterfront and concrete aprons to south of new Helicopter Hangar: use Granular "B" to underside of slab compacted to 95% density. Place 150 mm thick formvoid (shearmat) adjacent to building walls in indicated locations.

.5 Under concrete aprons adjacent to waterfront and south of new Helicopter Hangar: use crushed stone with minimum depth of 300 mm over previously placed subgrade. Bring to underside of slab. Allow for an additional 100 mm compacted depth of crush stone to accommodate interim settlement of subgrade. Compact to 95% density Schedule placing of crushed stone base course for concrete aprons within 15 metres of waterfront to take place no earlier than 22 months after Contract Date.

.6 Backside of retaining walls: use Granular "B" compacted to 95% density.

.7 Fuel tanks: use Granular "B" to indicated depths. Compact to 95% density.

.8 Asphalt paved areas:
.1 Heavy duty pavement (140 mm thick) over subgrade placed in previous contract. Over subgrade by others use minimum of 300 mm of crushed stone compacted to 95% density. Allow for an additional 100 mm compacted depth of crush stone to accommodate settlement between time of subgrade placing and work of this section.
.2 Heavy duty pavement in other areas: use Granular "B" to underside of base course for pavement. Minimum depth of Granular "B": 450 mm compacted to 95% density. Over Granular "B" place base course of Granular "A" with minimum depth of 150 mm, compacted to 95% density.

3.4 Fill Types and Compaction (Cont'd)

.8 (cont'd)

.3 Medium duty pavement (75 mm thick): use Granular "B" to underside of base course for pavement. Minimum depth of Granular "B": 300 mm compacted to 95% density. Over Granular "B" place base course of Granular "A" with minimum depth of 150 mm compacted to 95% density.

.4 For temporary helicopter pad and access path thereto build upsubgrade placed in previous contract with Granular "A" fill, compacted to 95% density, to receive 38 mm asphaltic concrete pavement to indicated finished elevations. Minimum thickness of Granular "A": 50 mm.

.9 Excavations for site services: use Granular "B" to subgrade levels, compacted to 95% density.

.10 If, during progress of work, tests indicate fills do not meet specified requirements, remove defective fills, replace and retest at no extra cost.

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3.5 Reconstruction of Existing Parking Lot

.1 Break up and remove existing asphalt pavement.

.2 Regrade existing granular base. Remove contaminated material, eliminate soft spots by removal of material and replacement with new granular compacted fill.

.3 Excavate to subgrade and install weeping tile lines placing a minimum of 150 mm of pea gravel under tile and at sides, and a minimum of 300 mm above tile. Slope tile not less than 1:100 to drainage.

.4 Shape and compact existing subgrade to 95% density. Prevent damage to or displacement of weeping tile.

.5 Use Granular "B" to bring existing subgrade to underside of 150 mm base course and 75 mm pavement. Shape and compact to provide indicated finished elevations and drainage slopes. Compact to 95% density. Minimum depth of Granular "B" at any point: 300 mm including existing granular base.

.6 Over Granular "B" place base course for pavement consisting of a minimum of 150 mm of Granular "A" compacted to 95% denisty. Leave ready to receive asphalt paving.

.7 Schedule and carry out work in two stages so that one-half of the area is available for parking at all times.

3.6 Reconstruction of Existing Access Road from Waubeek Street to New Roads South of Railways

.1 Remove existing pavement, and reshape and build up existing granular subgrade as specified in Paragraph 3.5 for Parking lot, but omitting subgrade drainage. Minimum depth of Granular "B" subgrade, including existing granular subgrade not less than 450 mm. Saw cut existing pavement to a straight line at junction of new and remaining existing pavement.

.2 Shape and compact so finished pavement will be crowned in centre to drain both ways.

.3 Note that roadway across railway is not to be reconstructed for extent of railway right-of-way.

.4 Schedule work so as to permit vehicular access to Coast Guard Base at all times.

3.7 Stone Topping

.1 Over subgrade placed in previous contract place topping of crushed granite topping of gradation specified in Paragraph 2.1.5 of this Section. Finished topping to be flush with top of adjacent concrete pavement and asphalt paved areas with a minimum compacted depth of 450 mm. Proof roll to level graded surface. Allow for additional 100 mm of topping to accommodate settlement of subgrade between time of subgrade placing and work of this Section.

3.8 Drainage Ditch

.1 Excavate, shape, and grade subgrade to indicated profiles and slopes. Compact to 90% density.

.2 Over subgrade place continuous layer of filter cloth to extend up slopes as indicated. Overlap joints in direction of water flow with minimum of 600 mm. Toe into subgrade by 300 mm at upper edges of slope. Hold in place with wire staples or temporary weights until stone topping is placed.

.3 Over filter cloth place 150 mm layer of stone topping to ditch profile. Place progressively as filter cloth is laid. Avoid vehicle traffic over filter cloth.

3.9 Inspection and Testing

.1 Testing of materials and compaction will be carried out by testing laboratory designated by Engineer.

.2 Engineer will pay costs for inspection and testing. Refer to Section 01410.

.3 Sieve analysis: proposed fill materials will be tested to confirm suitability for intended use and conformity with specifications.

.4 Density test: tests will be conducted on compacted fill to ASTM D698-70. Tests on crushed stone or crushed gravel to be corrected for material retained on the 4.75 mm sieve according to following formula:

$$D = \frac{Pf \times D}{100} \text{ Plus } \frac{Pt \times 0.90 \times 62.4G}{100}$$

Where D = corrected maximum dry density in kg/cu m for total sample.
Pf = per cent of total sample pass 4.75 mm sieve.
Df = maximum dry density in kg/cu m (from ASTM D698-70) for material passing 4.75 mm sieve.
Pt = per cent of total sample retained 4.75 mm sieve.
G = bulk specific gravity (dry basis) of material retained on the 4.75 mm sieve (from ASTM C127-77).

In-place tests are to ASTM D1556-74, ASTM D2167-72.

.5 Frequency of Tests
.1 Excavated surfaces: when undisturbed excavated surface is being prepared, make a series of 3 tests of surface for each 500 sq m area.
.2 Fills under floor or other slabs on grade: make 3 tests for every 2 lifts of compacted fill for each 500 sq m area.
.3 Backfill structural walls: test each different material for approximately each 50 m of wall being backfilled at depth increments of 600 mm.

3.10 Surplus Material

.1 Dispose of surplus material not required for backfill, grading or landscaping, from site.

.2 Dispose of material unsuitable for fill, grading or landscaping from site.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Shrub and tree preservation: Section 02104

.2 Site Grading: Section 02210

.3 Seeding: Section 02489

.4 Sodding: Section 02487

.5 Trees, shrubs and ground cover: Section 02490

1.2 Testing

.1 Obtain Engineer's initial approval of topsoil at source.

.2 Test topsoil from source prior to stripping and stock-piling, for NPK, Mg, soluble salt content, organic matter and pH value.

1. Use 25 mm diameter sampling tube or spade and take 25 samples per hectare to full depth of top soil at random across entire area to be stripped. Mix samples thoroughly before submitting for testing.
2. Submit 0.5 kg sample of topsoil to testing laboratory and indicate intended use, type of mulches to be applied, type of subsoil and quality of drainage. Prepare and ship sample according to provincial regulations.
3. Determine required lime or sulphur treatment to bring pH value of soil 5.5 to 7.5 level.
4. Submit two copies of soil analysis and recommendations for corrections to Architect.

1.3 Samples

.1 Submit samples of soil in accordance with section 01340.

.2 Submit to the Engineer samples of the following materials:

1. Fertilizer: 1 kg
2. Agricultural limestone: 1 kg
3. Sulphur: 0.5 kg
4. Peatmoss: 1 kg
5. Bonemeal: 1 kg

1.4 Scheduling of Work

.1 Schedule placing of topsoil and finish grading to permit sodding or seeding operations within 6 d.

PART 2 - PRODUCTS

2.1 Materials

.1 Imported topsoil: friable, neither heavy clay nor of very light sandy nature containing minimum of 4% organic matter for clay loams and 2% for sandy loams to maximum of 20% by volume. Free from subsoil, roots, grass, weeds, toxic materials, stones, foreign object and with an acidity range (pH) of 5.5 to 7.5. Topsoil containing crabgrass, couchgrass or noxious weeds is not acceptable.

.2 Peatmoss: decomposed plant material, fairly elastic and homogenous, free of decomposed colloidal residue, wood, sulphur and iron containing minimum 60% organic matter by weight and moisture content not exceeding 15% . Shredded particles may not exceed 6 mm in size. Minimum pH value of peat 4.5, maximum 6.0.

.3 Fertilizer:
1. Complete commercial synthetic slow release fertilizer with maximum 35% water soluble nitrogen, formulation as per soil analysis recommendation.

.4 Lime:
1. Ground agricultural limestone containing minimum 85% of total carbonates.
2. Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 125 micrimetre sieve.
3. Use lime as indicated by acidity analysis of topsoil to bring pH to required level.

.5 Bonemeal: raw bonemeal, finely ground with a minimum analysis of 3% nitrogen and 20% phosphoric acid.

.6 Sand: hard, granular sharp sand to CSA, A82.56-M1976, well washed and free of impurities, chemical or organic matter.

.7 Sulphur: finely crushed agricultural elemental sulphur, free of impurities.

.8 Insulation for planters: polystyrene board to CGSB 41 - GP - 14a, type 3, thickness 50 mm.

2.2 Soil Mixtures for Planting

.1 Planting soil:
1. For planting of trees, shrubs, and vines, mix topsoil with 20% peatmoss loose by volume.
2. Incorporate bonemeal into planting soil at rate of 3 kg/m^3 of soil mixture.

.2 Soil mix for planters:
1. Use mixture of 6 parts topsoil to 3 parts peatmoss and 1 part of sand thoroughly mixed.
2. Incorporate bonemeal into soil at rate of 3 kg/m^3 of soil mixture.
3. Incorporate fertilizer as required by soil analysis.

PART 3 - EXECUTION

3.1 Preparation

.1 Grade subgrade, eliminating uneven areas and low spots, ensuring positive drainage. Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials. Remove subsoil that has been contaminated with oil, gasoline or calcium chloride. Dispose of removed materials as directed.

.2 Cultivate entire area which is to receive topsoil to depth of 100 mm. Repeat cultivation in those areas where equipment used for hauling and spreading has compacted subgrade.

.3 Grade subgrade for hydro-seeding to uniform surface and remove vegetation which may interfere with seeding operations. Loosen soil to depth of minimum 25 mm and remove stones and foreign material which protude more than 75 mm above surface.

3.2 Spreading of Topsoil

.1 Do not spread topsoil until Architect has inspected and approved subgrade.

.2 Spread topsoil with adequate moisture in uniform layers during dry weather over approved, dry, unfrozen subgrade, where seeding, sodding, planting is indicated.

.3 Keep topsoil 15 mm below finished grade for sodded areas; elsewhere bring topsoil up to finished grade.

3.2 Spreading of Topsoil (Cont'd)

.4 Apply topsoil to the following minimum depths:
100 mm for seeded areas
135 mm for sodded areas
500 mm for shrub beds

.5 Remove stones, roots, grass, weeds, construction materials, debris and foreign non-organic objects from topsoil.

.6 Manually spread topsoil around trees and plants.

3.3 Soil Amendments

.1 Apply lime, sulphur or other soil amendment at rate determined from soil sample test.

.2 Mix soil amendment well into full depth of topsoil by cultivating or roto-tilling prior to application of fertilizer.

3.4 Application of Fertilizer

.1 Apply fertilizer at least one week after lime application and at least 6 d before sodding or seeding.

.2 Spread fertilizer with mechanical spreaders over entire area of topsoil at rate determined on basis of soil sample test.

.3 Mix fertilizer thoroughly into upper 50 mm of topsoil.

3.5 Finish Grading

.1 Fine grade mechanically or manually entire topsoiled area to contours and elevations as indicated. Eliminate rough spots and low areas to ensure positive drainage.

.2 Fine grade and loosen top soil prior to sodding. Eliminate rough spots and low areas to ensure positive drainage. Prepare loose friable sod bed by means of discing and subsequent raking. Roll lightly and rake wherever topsoil is too loose.

.3 Roll topsoil with 50 kg roller, minimum 900 mm wide, to compact and retain surface.

.4 Leave surface smooth, uniform, firm against deep foot printing, with a fine loose texture.

3.6 Preparation of Planters

.1 Install insulation inside planters as indicated.

.2 Install soil mix in compacted layers of 150 mm.

3.7 Surplus Material

.1 Dispose of surplus topsoil not required for fine grading and landscaping where directed.

END

PART 1 - GENERAL

1.1 Related Work

.1 Pile Installation General: Section 02360

.2 Steel pipe piles: Section 02363

1.2 Reference Standards

.1 Do compressive pile tests in accordance with ASTM D1143-81, except where specified otherwise.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340. Clearly indicate the following items:
.1 Amount of loading.
.2 Type of material to be used as ballast.
.3 How ballast will be supported by piles.

1.4 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

1.5 Load Testing. By a Addendum #1.

PART 2 - PRODUCTS

Not applicable

PART 3 - EXECUTION

3.1 General

.1 Engineer designates type of test. Carry out load tests on piles, selected by Engineer, at any time during performance of work.

.2 Supply and erect equipment, and temporary structures necessary for making tests. Supply a qualified operator to operate jacks and maintain test loads throughout duration of tests.

.3 Provide suitable enclosure over test platform to provide weather protection for personnel conducting tests. Provide necessary lights to carry out testing operation at night.

.4 Compression tests may begin once piles have been driven to refusal.

.5 Carry out pile testing and record readings during tests under supervision of Engineer.

3.2 Compression Tests

.1 Apply a compressive test load of 1740 kN to each pile tested to ASTM D1143-81.

3.3 Test Evaluation

.1 Engineer will be sole judge of test result.

.2 Test pile shall fail test when rate of progressive settlement is greater than .2 mm in 1 h or when net settlement is more than 12 mm. In latter case, pile may be acceptable, provided that design load is reduced to one half of that for 12 mm net settlement

.3 If pile fails to sustain test load, carry out additional load tests on additional piles as directed by Engineer.

PART 1 - GENERAL

1.1 Related Work

.1 Excavation and backfilling: Section 02220

.2 Pile Tests: Section 02353

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.3 Steel Pipe Piles: Section 02363

1.2 Existing Sub-surface Conditions

.1 Sub-surface investigation report must be read before submitting tender.

.2 Portion of site, outlined on drawings, has 2500 to 3000 mm deep layer of 100 to 300 mm rock fill. Piling contractor is responsible for method required to advance piles through this layer to bedrock.

1.3 Protection

.1 Protect all persons, adjacent structures and work of other sections from hazards attributable to pile driving operations.

1.4 Scheduling of Work

.1 Drive piles in accordance with construction stages indicated.

1.5 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

PART 2 - PRODUCTS

2.1 Materials

.1 For material requirements, refer to Section 02363.

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.2 Supply or fabricate full length piles and provide equipment of sufficient capacity to handle full length piles without cutting and splicing.

.3 Pile lengths indicated are based on lengths estimated to remain in completed structure.

.4 Do not splice piles without written permission of Engineer.

.5 When approved, splice piles in accordance with details indicated or specified.

PART 3 - EXECUTION

3.1 Equipment Requirements

.1 Equipment information: prior to commencement of pile installation operation, submit to Engineer for review, details of all equipment for installation of piles to refusal. For impact hammers, give manufacturer's name, type, rated energy per blow at normal working rate, mass of striking parts of hammer and mass of driving cap. For non-impact methods of installation such as augering, jacking, vibratory hammers or other means, give full details of characteristics necessary to evaluate performance.

.2 Use equipment capable of driving piles to refusal with normal speed blows.

3.2 Preparation

.1 Ensure that ground conditions at pile locations are adequate to support pile driving operation. Make provision for access and support of piling equipment during performance of work.

.2 Do not drive piles until excavation has been completed.

.3 Do not drive piles within embankments until embankment has been placed and thoroughly compacted to at least bottom elevation of pile cap.

3.3 Field Measurement

.1 Representative of Inspection and Testing Company (Inspector) shall be on site full time during driving of piles and shall maintain accurate records of driving for each pile, including:

.1 Type and make of hammer, stroke or related energy.
.2 Other driving equipment including water jet, driving cap, cushion.
.3 Pile size and length, location of pile in pile group, location or designation of pile group.
.4 Sequence of driving piles in group.
.5 Number of blows per metre for entire length of pile and number of blows per 10 mm for last 70 mm.
.6 Final tip and cut-off elevations.
.7 Distances from actual ℄ of piles to given ℄ of piles at cut off elevation.

3.3 Field Measurement (Continued)

.8 Other pertinent information such as interruption of continuous driving, pile damage.

.9 Record elevation taken on adjacent piles during driving of each pile

.10 Record location of all splices in piles. Approve splices before driving continues.

.2 Provide Engineer with three copies of records.

3.4 Driving

.1 Prevent damage to top of piles with driving caps. Replace cushion when material has been reduced to 25% of its original thickness.

.2 Hold piles securely and accurately in position while driving.

.3 Deliver hammer blows in direct axis of pile.

.4 Reinforce pile heads if necessary.

.5 Do not drive piles within a radius of 8 m of concrete which has been in place less than 3 days.

.6 Exercise care when driving piles adjacent to existing structures to ensure no contact between pile and structure takes place.

.7 Redrive piles which heave during driving of adjacent piles.

.8 Remove loose and displaced material from around piles after completion of driving, and leave clean, solid surfaces to receive pile cap concrete.

.9 Cut off piles neatly and squarely at elevations indicated. Provide sufficient length above cut-off elevation so that part damaged during driving is cut off.

.10 Remove cut-off lengths from site on completion of work.

3.5 Bearing Capacity

.1 Required bearing capacity of each pile at working load is 870 kN.

3.5 Bearing Capacity (Continued)

.2 Installation of each pile will be subject to approval of Inspector. Inspector will be sole judge of acceptability of each pile with respect to final driving resistance, depth of penetration or other criteria used to determine bearing capacity and shall approve final driving of each pile prior to removal of pile driving rig.

.3 Drive each pile to practical refusal in bedrock. Do not overdrive to cause damage to piles in bedrock. Engineer will determine refusal criteria for piles driven to rock based on type of pile and driving equipment.

.4 Drive each pile to minimum penetration of pile to elevation required for refusal.

3.6 Driving Tolerances

.1 Pile heads to be within 150 mm of locations indicated.

.2 Piles not to be more than 4% of length out of alignment.

.3 Cut off elevation within 75 mm of required elevation.

3.7 Load Testing

.1 Provide load test on piles selected by Engineer at any time during performance of work.

.2 Perform load testing in accordance with Section 02353.

.3 Failure of nominated pile to pass loading test may result, at discretion of Engineer, in load testing of additional piles driven to that date, or driving of additional piles.

3.8 Damaged or Defective Piles

.1 Leave rejected pile in place and cut off as directed.

.2 Leave rejected pile in place and place adjacent pile as directed.

.3 Leave rejected pile in place, bearing a reduced load as determined by Engineer.

3.8 Damaged or Defective Piles (Continued)

.4 No extra compensation will be made for removing and replacing or other work made necessary through rejection of a defective pile, damaged due to faulty workmanship.

.5 Where piles are damaged or caused to drift outside specified tolerance due to obstructions or other causes beyond Contractor's control, the remedial measures adopted, including pilecap redesign, will be paid by the Engineer at the Contract Unit Price or in accordance with the General Conditions if no unit prices apply.

3.9 Concreting

.1 After piles driven to refusal, all piles which were spliced and any others deemed necessary by Inspector shall be examined from inside.

.2 Upon approval of Inspection, fill pipe piles with concrete.

PART 1 - GENERAL

1.1 Related Work

.1 Pile Installation, General: Section 02360

.2 Pile Tests: Section 02353

.3 Concrete - fill in piles: Section 03300

1.2 Test Reports

.1 Prior to fabrication, and if requested, provide Engineer with two copies of steel producer's certificates in accordance with ASTM A252-81.

1.3 Measurement for Payment

.1 Base tender on number and lengths of piles indicated. (See table drawing S-1.)

.2 Actual number and lengths of piles installed will be established by Engineer from piling records.

.3 Adjustments in contract price due to changes in number and lengths of piles will be based on unit prices established in Contract.

.4 Unit of measurement for piles will be per metre measured from tip elevation to cut-off elevation at pile cap.

.5 Consider items such as shear rings, pile tip reinforcement, splices, pile shoes and pile caps, as incidental to supply of piles.

.6 Mobilization of equipment will be paid as a single fixed item.

1.4 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

1.5 Pile Injector ips

.1 All pipe piles must have rock injector points, suitable for seating piles on steeply sloping rock and sized for piles specified.

.6 Shop Drawing

.1 Submit shop drawings in accordance with Section 01340 to Engineer for review.

.2 Provide details of rock injector tip, splices, caps and any other fabrication required.

PART 2 - PRODUCTS

2.1 Materials

.1 Seamless steel pipe piles of sizes and wall thicknesses indicated on drawings to ASTM A252 grade 3 minimum.

.2 Chemical composition: to CSA Z245.1-M1982.

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.1 One charpy v-notch test required per heat and results reported to Engineer by manufacturer.

.3 Allowable tolerances:

.1 Deviation from straight lines, specified diameter, wall thickness and out-of-roundness on body of pipe and at pipe ends to conform to API 5L-75 and API-75. Check pipe for deviations before leaving mill.

.4 Deliver piles in lengths as required.

.5 Pipe Tip Reinforcement - rock injector type - designed to prevent pile tip sliding off line, consisting of chisel like point on tip of cone, fabricated from ASTM-A27 Steel.

.6 Pile driving shoes: to CAN3-G40.21-M81 Grade 300W.

.7 Steel pile caps: to CAN3-G40.21 M81, Grade 300W.

.8 Welding electrodes to CSA W48 series.

2.2 Fabrication

.1 Fabricate full length piles to eliminate splicing during installation wherever possible.

.2 Full length piles may be fabricated from piling material by splicing lengths together. Use complete joint penetration groove welds.

.3 Submit details of planned use of pile material stock to Engineer for approval prior to start of fabrication. Re-use cut-off lengths as directed by Engineer.

.4 Allowable tolerance on axial alignment to be 0.25% as measured by a 3 m straight edge.

.5 Allowable deviation from a straight line over total length of fabricated pile to be 25 mm.

.6 Install pile injector tip, driving shoe or other item indicated on reviewed shop drawings.

2.2 Fabrication (Continued)

.7 Repair defective welds, only on authority of Engineer, to CSA W59.82. Welds which show evidence of having been repaired without authorization may be rejected.

.8 Do welding to 3.2.1.

PART 3 - EXECUTION

3.1 Installation

.1 Install piling in accordance with Section 02360.

.2 If permitted, splice piles in place during installation by welding. To prevent distortion, tack opposite points first and then weld opposite sections. Ensure top member is held in perfect alignment during splicing operation. Make splice by complete joint penetration groove welds.

.3 Install pile caps as indicated.

.4 Driving shoes may be installed during shop fabrication or as part of field work.

.5 Perform internal visual inspection of steel pipe, joints and base prior to placing of concrete. Ensure pipe inside is free from foreign matter.

.6 Fill steel pipe pile with concrete in even batches using 150 mm diameter drop pile. Ensure adequate vibration to completely fill cross section of pipe after each placement.

.7 Install concrete in accordance with Section 03300.

.8 Provide anchorage to pile cap.

3.2 Welding

.1 Weld in accordance with CSA W59-1982. Welding certification of companies in accordance with CSA W47.1-1973.

PART 1 - GENERAL

1.1 Related Work

.1 Site grading: Section 02210

.2 Excavating and backfilling except as specified herein: Section 02220

.3 Topsoil and finish grading: Section 02260

1.2 Site Conditions

.1 Examine sub-surface investigation report available for inspection at 255 Larch Street, Sudbury, Ontario.

PART 2 - PRODUCTS

2.1 Materials

.1 Coarse filter aggregate: to CAN3-A23.1-M77, Table 3, Group 1, 19.0 to 4.75 mm.

.2 Fine filter aggregate: to CAN3-A23.1-M77, Table 1.

.3 Plastic pipe and fittings: to CGSB 41-GP-29M, Type 1 unperforated, Type 2 perforated, nominal inside diameter 100 mm.

PART 3 - EXECUTION

3.1 Inspection

.1 Ensure graded subgrade conforms with required drainage pattern before placing filter bed material.

.2 Report to Engineer improper slopes, unstable areas, areas requiring additional compaction or other unsatisfactory conditions.

.3 Begin installation of foundation drainage after deficiencies have been corrected.

.4 Ensure foundation wall waterproofing have been inspected and accepted.

3.2 Installation

.1 Pipe bedding: cut trenches in compacted sub-base and place 100 mm thickness minimum of coarse filter aggregate and tamp to grade.

.2 Pipe laying:
.1 Ensure pipe interior and coupling surfaces are clean before laying.
.2 Lay perforated pipe to slope of 1:100. Face perforations and coupling slots downward.
.3 Lay non-perforated pipe to slope of 1:100, from perforated pipe to disposal source. Make joints watertight.
.4 Do not use shims to establish pipe slope.
.5 Use fittings recommended by manufacturer.
.6 Install end plugs at ends of collector drains.
.7 Protect pipe ends from damage and ingress of foreign material.
.8 Connect pipe to storm drain and sump pits by appropriate adapters manufactured for this purpose.

.3 Filter bed backfill:
.1 Place filter bed backfill after pipe installation is approved.
.2 Place minimum of 150 mm thickness coarse filter aggregate on each side of perforated pipe and minimum of 300 mm thickness coarse filter aggregate over perforated pipe at perimeter drain lines and 150 mm thickness for under slab drainage.
.3 Extend coarse filter aggregate to and along foundation wall minimum 300 mm above top of pipe at walls. Place 150 mm thickness of fine filter aggregate over coarse filter aggregate at walls.
.4 Place minimum of 150 mm thickness clean sand on each side and over non-perforated pipe.
.5 Place filter bed by hand, in 150 mm lifts. Consolidate by hand tamping lightly. Prevent displacement of pipe.
.6 Place top seal of polyethylene or building paper to prevent surface infiltration of fine materials into coarse filter material, thereby blocking ground water infiltration.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Removal of existing fence and gates and salvage of materials to be reused: Section 02050

.2 Concrete retaining wall and post foundations: Section 02528

1.2 Reference Standards

.1 Erect fencing and gates to CAN2-138.3-M80.

1.3 General Description

.1 Along west property line of south (waterfront) portion of Owner's property provide all new line posts and gate posts to be set in top of new concrete retaining wall and as required to provide fence extension around west and north sides of new outdoor high-voltage (hydro) substation as shown.

.2 Along north property line of north (parking lot) portion of Owner's property provide all new line posts.

.3 Reinstall salvaged existing fabric, top rails, brace rails, brace wires, extension arms, barbed wire, post caps, gates and hardware, and miscellaneous fittings. Supply new fabric fasteners and new galvanized bolts for fittings and hardware.

.4 Provide new materials of type listed in Paragraph 1.3.3 above as required by modifications around substation and as required to carry barrier into water as indicated.

PART 2 - PRODUCTS

2.1 Materials

.1 New fabric: to CAN2-138.1-M80 and matching existing in mesh size, gauge, and finish.

.2 New line posts, gate posts, rails, caps, extension arms, miscellaneous fittings: to CAN2-138.2-M80 and to match reused existing.

.3 New barbed wire: to CSA G42-1964. Galvanized three strand, 2.6 mm diameter, 4 point barbs at 150 mm centres.

2.1 Materials (Cont'd)

.4 Steel angle water barrier frame: as indicated of 100 x 100 x 6 mm steel angle to CAN3-G40.21-M81, Type 300 W. Welded connections to CSA W59-1982. Drill for barb wire attachment. Hot dip galvanize after fabrication, with minimum zinc coating of 600 g/sq. m. to CSA G164-M1981.

PART 3 - EXECUTION

3.1 Installation

.1 Lay out all lines and levels and locate all post locations required to provide concrete bases and to set posts in new retaining wall. Coordinate work with that of Section 02528.

.2 Space posts to maximize reuse of existing components.

.3 Reinstall existing gate in location directed by Engineer along west property line of water front portion of site.

.4 Allow concrete to cure for at least 14 days before installing fabric. Ensure post bases are backfilled and that fill is compacted before stretching fabric.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Site grading: Section 02210

.2 Topsoil and finish grading: Section 02260

.3 Seeding: Section 02489

1.2 Source Quality Control

.1 Obtain approval of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization.

1.3 Samples

.1 Submit one metre of sample sod in accordance with Section 01340.

1.4 Delivery and Storage

.1 Schedule deliveries in order to keep storage at job site to minimum without causing delays.

.2 Deliver, unload and store sod on pallets.

.3 Deliver sod to site within 24 h of being lifted and lay sod within 36 h of being lifted.

.4 Do not deliver small, irregular or broken pieces of sod.

.5 During wet weather allow sod to dry sufficiently to prevent tearing during lifting and handling.

.6 During dry weather protect sod from drying and water sod as necessary to ensure its vitality and prevent dropping of soil in handling. Dry sod will be rejected.

1.5 Scheduling

.1 Schedule sod laying to coincide with topsoil operations.

PART 2 - PRODUCTS

2.1 Materials

.1 Nursery sod: Quality and source to comply with standards outlined in 'Guide Specification for Nursery Stock', Section 17, 1978 edition, published by Canadian Nursery Trades Association.

1. Number one Kentucky Bluegrass/Fescue Sod: sod grown from minimum 40% Kentucky Bluegrass, 30% Creeping Red Fescue.

2.1 Materials (Cont'd)

.2 Wire mesh: 40 mm agricultural (chicken wire) mesh.

.3 Wooden pegs: (17 x 17 x 200) mm or approved 200 mm long steel staples.

.4 Water: potable.

.5 Fertilizer: complete synthetic slow release fertilizer with maximum 35% water soluble nitrogen.

PART 3 - EXECUTION

3.1 Workmanship

.1 Keep site well drained.

.2 Clean up immediatley soil or debris spilled onto pavement and dispose of deleterious materials.

3.2 Laying of Sod

.1 Obtain approval of topsoil grade and depth before starting sodding.

.2 Lay sod during growing season. Sodding during dry summer period, at freezing temperatures or over frozen soil is not acceptable.

.3 Lay sod in rows, perpendicular to slope, smooth and even with adjoining areas, and with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.

.4 Provide close contact between sod and soil by means of light roller. Heavy rolling to correct irregularities in grade is not permitted.

.5 Water immediately after sod laying to obtain moisture penetration through sod into top 100 mm of topsoil.

.6 Provide adequate protection of sodded areas against erosion and mechanical damage. Remove protection after lawn areas have been accepted.

3.3 Laying of Sod on Slopes Greater Than 3:1 (Run/Rise)

.1 Place wire mesh on top of topsoil of slopes steeper than 3:1. Secure mesh in place with wooden pegs or staples at maximum intervals of 1000 mm. Cover mesh lightly with topsoil.

3.3 Laying of Sod on Slopes Greater than 3:1 (Run/Rise) (Cont'd)

.2 Lay sod sections at right angles to slopes and secure with wooden pegs. Place pegs 3 per m^2, 100 mm below top edge to prevent shifting of sod and drive pegs flush with top of sod soil.

3.4 Maintenance

.1 Ensure maintenance equipment suitable to Engineer.

.2 Water sodded areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist for depth of 75 to 100 mm.

.3 Cut grass first time to 40 mm when it reaches height of 60 mm. Remove clippings which will smother grassed areas.

.4 Apply herbicide when broad-leaf weeds start developing in competition with grass. When sod is top dressed and seeded apply herbicide only after new grass is well established and resistant to herbicide. Apply herbicide in accordance with manufacturer's instructions when winds are less than 10 km/h, when air temperature is above $10^{\circ}C$.

1. Use 2,4-D amine herbicide for susceptible broad-leaf weeds.
2. Use 2,4-D plus mecoprop mixtures herbicide for 2,4-D resistant plants. Prevent drifting of spray, repair damage to grass and plants.
3. Avoid use of dicamba solutions near trees and shrubs.

.5 Fertilize sodded areas one month after sodding with 2:1:1 ratio fertilizer. Spread evenly at rate of 0.5 kg of nitrogen/100 m^2 and water in well. Postpone fertilizing until next spring if application falls within four week period prior to expected end of growth season in locality.

3.5 Acceptance

.1 Sodded areas will be accepted at final inspection provided that:

1. Sodded areas are properly established.
2. Sod is free of bare and dead spots and without weeds.
3. No surface soil is visible when grass has been cut to height of 40 mm.
4. Sodded areas have been cut minimum 2 times.

.2 Lawns sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

END

PART 1 - GENERAL

1.1 Related Work

.1 Site grading: Section 02210

.2 Topsoil and finish grading: Section 02260

1.2 Delivery and Storage

.1 Deliver grass seed in original containers showing:
1. Analysis of seed mixture
2. Percentage of pure seed
3. Year of production
4. Net mass
5. Date when tagged and location
6. Percentage germination
7. Name and address of distributor.

.2 Deliver wood fibre mulch in moisture-proof containers indicating manufacturer, content and net air-dry mass.

.3 Deliver erosion control agent in moisture-proof containers showing manufacturer, content and net mass.

PART 2 - PRODUCTS

2.1 Materials

.1 Grass seed: Certified Canada No. 1 Grade to Government of Canada, Seeds Regulations and having minimum germination of 75% and minimum purity of 97%.

.2 Mulch
1. Fibre: wood or wood cellulose fibre free of germination or growth-inhibiting ingredients and forming blotter like ground cover allowing absorption and percolation of water.

.3 Erosion Control Agent: water dilutable liquid dispersion containing thermoplastic resin (Curasol AH).

.4 Water: potable, free of impurities that would inhibit germination.

.5 Fertilizer: complete synthetic, slow release fertilizer with maximum 35% water soluble nitrogen. Apply fertilizer at rates based on soil analysis.

2.2 Grass Seed Mixture

.1 60% Kentucky Bluegrass
30% Creeping Red Fescue
10% Perennial Ryegrass
Seed at rate of 150 kg/ha

PART 3 - EXECUTION

3.1 Workmanship

.1 Keep site well drained.

.2 Clean up immediately, soil, mulch, or other debris spilled onto pavement, dispose of deleterious materials.

.3 Take reasonable care to prevent contamination by seeding slurry of structures, signs, guiderails, fences and utilities.

.4 Where contamination occurs remove seeding slurry to satisfaction of, and by means approved by Consultant.

3.2 Preparation of Surfaces

.1 Cultivate areas to be seeded to a depth of 25 mm. Fine grade free of humps and hollows and free of deleterious and refuse material.

.2 Obtain Engineer's approval of topsoil grade and depth before starting seeding.

3.3 Seeding

.1 Seed area during early spring or after 15th of August to within 2 weeks of freeze-up.

.2 Apply when winds less than 10 km/h using equipment suitable for area involved to the approval of the Engineer.

.3 Measure quantities of material by mass of mass-calibrated volume measurement to satisfaction of Engineer.

.4 Charge seeder with water, mulch, seed, fertilizer and mix thoroughly. Add material into seeder under agitation. Pulverize and add material slowly into seeder under agitation.

3.3 Seeding (Cont'd)

.5 Add erosion control agent, into seeder and mix thoroughly to complete seeding slurry.

.6 Complete slurry to be applied per hectare:

1.	Seed (mixture as specified)	150 kg
2.	Mulch	1000 kg
3.	Erosion Control Agent	300 kg
4.	Water, minimum	10,000 L

.7 Blend applications into existing, adjacent grass areas or sodded areas.

3.4 Maintenance

.1 Ensure maintenance equipment suitable to Engineer.

.2 Keep soil moist during germination period and adequately water grassed areas until accepted by Engineer.

.3 Apply water to ensure moisture penetration of 75 to 100 mm. Control sprinkling to prevent wash-outs.

.4 Cut grass when it reaches height of 60 mm and cut to height of 40 to 50 mm. Remove clippings which exceed 10 mm in depth .

.5 Maintain grassed areas free of pests and disease.

.6 Apply herbicide when it will not cause damage to new grass or other plants.
1. Avoid use of dicambal and picloram solutions near trees and shrubs.

.7 Fertilize seeded areas one month after seeding. Spread evenly and water in well. Postpose fertilizing until next spring if application falls within four week period prior to expected end of growing season in locality.

3.5 Acceptance

.1 Areas will be accepted by Engineer provided that:
1. Seeded areas are properly established.
2. Turf is free of eroded, bare or dead spots and 98% free of weeds.
3. No surface soil is visible when grass has been cut to height of 40 mm.
4. Seeded areas have been cut at least twice, the last cut being carried out within 24 h of acceptance.

.2 Areas seeded in fall will be accepted in following spring spring one month after start of growing season provided acceptence conditions are fulfilled.

END

PART 1 - GENERAL

1.1 Related Work

.1 Shrub and tree preservation: Section 02104

.2 Site grading: Section 02210

.3 Topsoil and finish grading: Section 02260

1.2 Source Quality Control

.1 Obtain approval of plant material at source.

.2 Notify Engineer of source of material at least 7 days in advance of shipment. No work under this Section is to proceed without approval.

.3 Acceptance of plant material at its source does not prevent rejection on site prior to or after planting operations..

.4 Imported plant material must be accompanied with necessary permits and import licenses. Conform to federal and provincial regulations.

1.3 Shipment and Pre-Planting Care

.1 Co-ordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.

.2 Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire which would damage bark, break branches or destroy natural shape of plant. Give full support to root ball of large trees during lifting.

.3 Cover plant foliage with tarpaulin, and protect bare roots by means of dampened straw, peatmoss, saw dust or other acceptable material to prevent loss of moisture during transit and storage.

.4 Remove broken and damaged roots with sharp pruning shears. Make clean cut and cover cuts over 10 mm diameter with wound dressing.

1.3 Shipment and Pre-Planting Care (Cont'd)

.5 Keep roots moist and protected from sun and wind. Heel-in trees and shrubs, which cannot be planted immediately, in shaded areas and water well.

1.4 Guarantee

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.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that the plant material as itemized on plant list is guaranteed against defects for a period of 2 years from the date of Interim Completion of entire contract.

.2 End-of-warranty inspection will be conducted.

.3 Engineer reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

1.5 Replacements

.1 During warranty period, remove from site any plant material that has died or failed to grow satisfactorily as determined by Engineer.

.2 Replace plant material in the next planting season.

.3 Extend warranty on replacement plant material for a period equal to the original warranty period.

.4 Continue such replacement and warranty until plant material is acceptable.

PART 2 - PRODUCTS

2.1 Materials

.1 Water: potable and free of minerals which may be detrimental to plant growth.

.2 Stakes: T-bar steel stakes 40 x 40 x 5 x 2440 mm or wood 38 x 38 x 2440 mm.

.3 Cables and accessories: factory galvanized, cables, wire tighteners, Use approved horticultural guy wire tightener.

.4 Edging strip: 150 mm x 2 mm galvanized metal edging with rigid galvanized metal stakes 450 mm long at 1.500 mm o.c.. Submit sample for Engineer's approval.

2.1 Materials (Cont'd)

.5 Guy wires: steel wire strand to CSA G4-M1977 at following sizes:
1. Shrubs and trees under 75 mm caliper use 2.5 mm wire.
2. Trees 75 to 150 mm caliper use 3 mm wire.

.6 Tree rings: fabricated from 3 mm galvanized wire encased in two ply reinforced 12 mm diameter rubber garden hose or equivalent.

.7 Root ball burlap: 150 g Hessian burlap.

.8 Tree wrapping material: new, clean, plain burlap strips minimum 2.5 kg/m^2 mass and 150 mm wide.

.9 Anchors: Underground 100 mm diameter steel disc, screw-in type or T-bar steel stakes 40 x 40 x 5 x 500 mm long or wood stakes 38 x 38 x 500 mm long.

.10 Mulch: submit sample prior to shipping to site:
1. Wood chip mulch: chips, free of bark, small branches, leaves and varying in size from 50 to 75 mm and 5 to 20 mm thick.

.11 Anti-dessicant: wax-like emulsion to provide film over plant surfaces reducing evaporation but permeable enough to permit transpiration.

.12 Wound dressing: horticulturally accepted non-toxic, non-hardening emulsion.

2.2 Plant Material

.1 Quality and source: comply with Guide Specification for Nursery Stock, 1978 Edition of Canadian Nursery Trades Association referring to size and development of plant material and root ball. Measure plants when branches are in their natural position. Height and spread dimensions refer to main body of plant and not from branch tip to branch tip. Use trees and shrubs of No. 1 grade.

.2 Additional plant material qualifications:
1. Plant material obtained from areas with milder climatic conditions from those of site acceptable only when moved to site prior to the breaking of buds in their original location and heeled-in, in a protected area until conditions suitable for planting.

2.2 Plant Materials (Cont'd)

.2 Additional plant material qualifications:
2. Use trees and shrubs with strong fibrous root system free of disease, insects, defects or injuries and structurally sound. Use trees with straight trunks, well and characteristically branched for species. Plants must have been root pruned regularly, but not later than one growing season prior to arrival on site.
3. Large trees must have been half root pruned during each of two successive growing seasons, the latter at least one growing season prior to arrival on site.
4. Plant material that has come out of dormant stage and is too far advanced will not be accepted unless prior approval obtained.

.3 Cold storage: approval required for plant material which has been held in cold storage.

.4 Container-grown stock: acceptable if containers large enough for root development. Trees and shrubs must have grown in container for minimum of one growing season but not longer than two. Root system must be able to "hold" soil when removed from container. Plants that have become root bound are not acceptable. Container stock must have been fertilized with slow releasing fertilizer.

.5 Balled and burlapped: coniferous and broad-leafed evergreens over 500 mm tall must be dug with soil ball. Deciduous trees in excess of 3 m height must have been dug with large firm ball. Root balls must include 75% of fibrous and feeder root system. This excludes use of native trees grown in light sandy or rocky soil. Secure root balls with burlap, heavy twine and rope. For large trees: wrap ball in double layer of burlap and drum lace with minimum 10 mm diameter rope. Protect root balls against sudden changes in temperature and exposure to heavy rainfall.

.6 Tree spade dug material: dig plant material with mechanized digging equipment of hydraulic spade or clam-shell type. Root balls to satisfy CNTA standards. Lift root ball from hole, place in wire basket designed for purpose and line with burlap. Replace root ball and tie basket to ball with heavy rope. Take care not to injure truck of tree with wire basket ties or rope.

2.2 Plant Material (Cont'd)

.7 Substitutions to plant material as indicated on planting plan not permitted unless written approval has been obtained as to type, variety and size. Plant substitutions must be of similar species and of equal size as those originally specified.

PART 3 - EXECUTION

3.1 Workmanship

.1 Stake out location of trees and planting beds as per planting plan. Obtain approval prior to excavating.

.2 Apply anti-dessicant in accordance with material manufacturer's instructions.

.3 Co-ordinate operations. Keep site clean and planting holes drained. Immediately remove soil or debris spilled onto pavement.

3.2 Planting Time

.1 Plant deciduous plant material during dormant period before buds have broken. Plant material noted for spring planting only, must be planted in dormant period.

.2 Plant material imported from region with warmer climatic conditions may only be planted in early spring.

.3 When permission has been obtained to plant deciduous plant material after buds have broken, spray plants with anti-dessicant to slow down transpiration prior to transplanting.

.4 Plant evergreens in spring before bud break. Planting of such stock with root balls may start after middle of August. Apply anti-dessicant to evergreens before digging.

.5 When permission has been obtained, trees, shrubs and ground covers growing in containers may be planted throughout growing season.

.6 Plant only under conditions that are conducive to health and physical conditions of plants.

.7 Provide planting schedule. Extending planting operations over long period using limited crew will not be accepted.

3.3 Excavation

.1 Shrub beds: excavate to minimum depth of 500 mm.

.2 Individual shrubs: excavate planting holes 500 mm deep and at least 500 mm wide.

.3 Small trees (up to 3.0 m): excavate holes 600 mm deep with diameter of 300 mm greater than root spread or root ball.

.4 Large trees: excavate to depth of at least 200 mm deeper than height of root ball, with width of 750 mm greater than diameter of root ball. In heavy soils, increase planting holes by 50 mm for each 100 mm of root ball diameter.

.5 Provide drainage for planting holes in heavy soil if natural drainage does not exist. Have method approved.

.6 Protect bottom of excavation against freezing.

.7 Remove water which enters excavations prior to planting. Ensure source of water is not ground water.

3.4 Planting

.1 Loosen bottom of planting hole to depth of 150 to 200 mm. Cover bottom of each excavation with minimum of 150 mm of topsoil mixture.

.2 Plant trees and shrubs vertically with roots placed straight out in hole. Orient plant material to give best appearance in relation to structure, roads and walks.

.3 Place plant material to depth equal to depth they were originally growing in nursery.

.4 With balled and burlapped root balls, loosen burlap and cut away minimum top 1/3 without disturbing root ball. Do not pull burlap or rope from under root ball. With container stock, remove entire container without disturbing root ball. Non bio-degradable wrappings must be removed.

.5 With frozen ball material, mulch planting pit to prevent freezing.

3.4 Planting (Cont'd)

.6 Tree spade excavated material:
1. Dig tree pit with same mechanical equipment as used to dig plant material. Ensure hole dug is upright as possible. Place in hole a mixture of 40 L of planting soil and fertilizer mixed with water to soupy consistency. This will be forced up sides of ball as root ball is placed in hole.
2. In heavy clay soil, dig planting pit as specified for excavation of large trees. Pit preparation: Loosen bottom of planting hole to depth of 150 to 200 mm. Cover bottom of each excavation with minimum 150 mm topsoil mixture.

.7 During planting of bare-rooted stock, first shake backfill of planting soil among the roots.

.8 Tamp planting soil around root system in layers of 150 mm eliminating air voids. Frozen or saturated planting soil is unacceptable. When 2/3 of planting soil has been placed, fill hole with water. After water has completely penetrated into soil, complete backfilling.

.9 Build 100 mm deep saucer around outer edge of hole to assist with maintenance watering.

.10 When planting is completed, give surface of planting saucer dressing of organic 10-6-4 fertilizer at rate of 12 kg/100m^2 for shrub beds or 40 to 50 g/mm of caliper for trees. Mix fertilizer thoroughly with top layer planting soil and water in well.

3.5 Tree Support

.1 Staking for trees up to 3 m and evergreens up to 2 m in height: Backfill planting hole 2/3, drive T-rail stake 900 mm into bottom of pit, taking care not to damage main roots. Place stake or anchor 150 mm away from trunk on side of prevailing wind. Fasten trunk to stake or anchor with tree-ring. Different methods of fastening tree trunk to stake or anchor are acceptable if no damage to bark of tree will occur. Obtain approval prior to using other methods.

.2 Guy wires for trees up to 150 mm caliper:
1. For deciduous trees taller than 3 m and evergreens taller than 2 m, fasten three wires to tree where a branch will prevent slipping down. Use tree rings to

3.5 Tree Support (Cont'd)

.2 1. prevent abrasion of bark.
2. Fasten guy wires to anchors at distance from tree base equal to height of where wire is attached to trunk. Break wires, install wire tighteners and tighten slightly.
3. Where guy wires are used close to pedestrian traffic ways, fasten metal flags to wires to make them clearly visible.
4. Use sufficient number of guy wires to support large shrubs.

3.6 Wrapping

.1 Wrap deciduous trees, whose caliper is 50 to 150 mm, spirally from ground up, to height of second branches. Treat trunk with paste of long residual insecticide, lindane or equivalent before applying wrapping. Secure burlap with binder twine wound in opposite direction to burlap at 100 mm intervals. Place wrapping neatly and snugly with 40 mm overlap.

3.7 Pruning

.1 Prune trees and shrubs after planting, as indicated, to compensate for loss of roots suffered during transplanting. Postpone pruning, of those trees where heavy bleeding may occur, until in full leaf. Employ clean sharp tools and make cuts flush with main branch, smooth and sloping as to prevent accumulation of water. Remove projecting stumps on trunks or main branches. Remove dead and injured branches and branches that rub causing damage to bark. Trim out crown of trees and shrubs without changing their natural shape. Do not damage lead branches or remove smaller twigs along main branches. Treat cuts in excess of 20 mm diameter and damaged parts with application of wound dressing.

3.8 Mulching

.1 Obtain approval of planting before mulching material is applied. Loosen soil in planting beds and pits and remove debris and weeds. Spread mulch to minimum thickness of 50 mm. Mulch material susceptible to blowing must be moistened and mixed with topsoil before applying. When mulching is placed in fall, place immediately after planting. When mulch is placed in spring, wait until soil has warmed up.

3.9 Maintenance

.1 Water once a week for first 4 weeks and then sufficiently thereafter to maintain optimum growing conditions. Ensure adequate moisture in root zone at freeze-up.

.2 Keep soil, within confines of planting saucer around trees and planting beds, shallowly cultivated and free from weeds.

.3 Spray plants to combat pests and diseases. Do not use DDT or sprays prohibited by Agriculture Canada.

.4 Keep tree guards and guy wires in proper repair.

.5 Provide adequate protection against winter damage including damage caused by rodents.

.6 Maintain plant material from date of planting up to end of warranty period.

.7 Remove trunk wrapping, tree stakes and guy wires at end of warranty period.

.8 Submit monthly written report outlining:
1. Growth and development of plant material.
2. Preventive or correctove measures required which are outside Contractor's responsibility.

END

PART 1 - GENERAL

1.1 Related Work

.1 Site Grading: Section 02210

.2 Preparation of granular subgrade and base course to receive pavement: Section 02220

.3 Pavement Marking: Section 02618

.4 Concrete walks, curbs and gutters: Section 02528

1.2 Source Sampling

.1 At least 4 weeks prior to commencing work submit samples of following materials proposed for use:
.1 One 5 L container of asphalt cement.

.2 If materials have been tested by an independent testing laboratory within previous 2 months and have successfully passed tests equal to requirements of this specification, and submit test certificates from testing laboratory showing suitability of materials for this project.

1.3 Protection

.1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38 deg C. Do not permit stationary loads on pavement until 24 hours after placement.

.2 Provide access to building at all times. Arrange paving schedule so as not to interfere with normal use of premises.

PART 2 - PRODUCTS

2.1 Materials

.1 Primer: Emulsified asphalt to MTC Form 1103 October 1977.

.2 Asphalt Base Course: to MTC Form 1150 August 1981 (Metric) for type H.L. 8. Maximum size aggregate 19.0 mm.

.3 Asphalt Surface Course: to MTC Form 1150 August 1981 (Metric) for type H.L. 4. Maximum size aggregate 13.2 mm.

PART 3 - EXECUTION

3.1 Sub-grade Inspection

.1 Verify prepared granular base course and other items set in paving area for conformity with elevations and sections before placing asphalt pavement.

3.2 Granular Base

.1 Proof roll graded subgrade surface with weight and type of roller approved by Engineer.
.1 Check for unstable areas.
.2 Check for areas requiring additional compaction.
.3 Notify Engineer of unsatisfactory conditions.

.2 Finished base surface to be within 10 mm of specified grade, but not uniformly high or low.

3.3 Asphalt Primer

.1 Primer:
.1 Apply primer at minimum rate of 1.8 L/sq m, but do not exceed 5 L/sq m.
.2 Apply on damp surface unless otherwise directed.

.2 Do not apply primer when air temperature is less than 5 deg C or when rain is forecast within 2 hours.

3.4 Asphalt Concrete Paving

.1 Place asphalt mixtures only when base or lower course is dry and air temperature is above 5 deg C.

.2 Place asphalt concrete in compacted layers not exceeding 50 mm to following total thicknesses:
.1 Areas designated to receive heavy-duty pavement:
.1 Asphalt binder course: 2 compacted layers of H.L. 8 each 50 mm thick.
.2 Asphalt surface course: 40 mm compacted layer of H.L. 4.
.3 Total thickness of asphalt concrete: 140 mm.
.2 Areas designated to receive medium duty pavement including parking lot, access roadway, permanent helicopter pad area.
.1 Asphalt binder course: 50 mm compacted layer of H.L. 8.
.2 Asphalt surface course: 25 mm compacted layer of H.L. 4.
.3 Total thickness of asphalt concrete: 75 mm.
.3 Temporary helicopter pad and access: 38 mm compacted thickness of H.L.4.

.3 Minimum 120 deg C mixture temperature required when spreading.

.4 Maximum 160 deg C mixture temperature permitted at any time.

3.4 Asphalt Concrete Paving (Cont'd)

.5 Compact each course with roller as soon as it can support roller weight without undue cracking or displacement.

.6 Roller, power driven, minimum mass of 4.5 tonnes, minimum wheel width 600 mm.

.7 Roll until roller marks are eliminated. Compact to a density not less than 97% of density obtained with Marshall specimens prepared in accordance with ASTM D1559-76 from samples of mixtures being used.

.8 Keep roller speedd slow enough to avoid mixture displacement and do not stop roller on fresh pavement.

.9 Moisten roller wheels with water to prevent mixture adhesion.

.10 Compact mixture with hot tampers or other approved equipment in areas inaccessible to roller.

.11 Finish surface smooth, true to grade to within 10 mm and with no irregularities greater than 10 mm in 4.5 m.

3.5 Joints

.1 Cut back bituminous course to full depth in straight or curved lines as required to expose fresh vertical surfaces. Remove broken or loose material.

.2 Paint exposed vertical edge of asphaltic joints, edges of manholes and catch basin frames, curbs and similar items with hot asphalt cement or emulsified asphalt primer prior to placing asphalt courses.

.3 Where paving comprises two courses, overlap longitudinal joints minimum 150 mm.

.4 Carefully place and compact hot asphaltic material against joints.

3.6 Testing

.1 Inspection and testing of asphalt pavement will be carried out by designated testing laboratory.

.2 Costs of tests will be paid by Engineer.

3.7 Existing Parking Lot

.1 Schedule and carry out work in existing parking lot so that one-half of the area is available for parking at all times.

.2 Similarly schedule and carry out work on existing access road so as to allow vehicular access to Coast Guard Base at all times.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Stone topping: Section 02220

.2 Asphalt concrete pavement: Section 02508

.3 Concrete walks, curbs, exterior concrete aprons: Section 02528

PART 2 - PRODUCTS

2.1 Materials

.1 Cement: to CAN3-A5-M77, type 10 grey.

.2 Water and aggregates: to CAN3-A23.1-M77.

.3 Air entraining admixture: to CAN3-A266.1-M78.

.4 Reinforcing steel: to CSA G30.12-M1977, deformed, Grade 40, unless indicated otherwise.

.5 Concrete: to CAN3-A23.1-M77, minimum 30 MPa compressive strength at 28 days, for class A exposure.

.6 Non-shrink grout: premixed compound of non-metallic aggregate, cement, water, reducing and plasticizing agents, minimum strength 30 MPa.

.7 Curb anchors: steel dowels or pins to CSA G30.12-M1977, minimum 15 mm diameter x 600 mm length.

2.2 Fabrication

.1 Fabricate to CAN3-A23.4-M78, precast reinforced concrete curbs 300 wide x 200 high x 2400 long as indicated.

.2 Finish to be commercial grade.

.3 Fabricate minimum 2 holes per unit to permit securing with curb anchors.

PART 3 - EXECUTION

3.1 Installation

.1 Install curbs as indicated.

.2 Secure curbs in position by driving curb anchors through pavement. Predrill pavement as required to prevent cracking.

.3 Rejected damaged or defective units shall be replaced with sound units.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Concrete marine slipway, foundations for Winch House, concrete cope beams: Previous contract.

.2 Excavating and backfilling: Section 02220

.3 Site Grading: Section 02210

Pg. 8 * Addendum #1

.4 Concrete encasement for electric ductbanks, and concrete electrical manholes: Section 16105

.5 Asphalt concrete pavement: Section 02508

.6 Concrete formwork: Section 03100

.7 Concrete accessories: Section 03250

.8 Concrete reinforcement: Section 03200

.9 Cast-in-Place concrete: Section 03300

Pg. 8 * Addendum #1.

.10 Concrete work in connection with buried mechanical site services, as follows:

- .1 Manholes and catch basins: Section 02601
- .2 Storm sewers: Section 02701
- .3 Sanitary and oily water sewers: Section 02702
- .4 Water mains: Section 02713
- .5 Sewage force mains: Section 02724

Pg. 8 Addendum #1. *

.11 Concrete bases for high voltage outdoor (hydro) substation: Section 16118

.12 Buried concrete flammable liquids catchment tank: Division 15

Pg. 8 * Addendum #1

.13 Concrete bases for exterior light standards: Division 16

PART 2 - PRODUCTS

2.1 Materials

.1 Formwork, form release agents, form ties, to Section 03100 except where indicated otherwise.

.2 Concrete reinforcement to Section 03200.

.3 Joint filler to Section 03250 to thicknesses and depths indicated. For expansion joints to be finished with sealant provide non-bituminous joint filler.

.4 Concrete materials to Section 03300.

.5 Concrete mixes: to general requirements set out in Section 03300.

.1 Use 30 MPa concrete, air-entrained to 6% +/- 1%, with water-reducing admixture, minimum cement content of 320 kg/cubic m, Class A exposure, 20 mm nominal coarse aggregate, for following items:

- .1 Concrete curbs and spillways
- .2 exterior concrete aprons and washdown basin.
- .3 retaining wall and tank enclosures
- .4 planting boxes
- .5 bases and saddles for propane tanks
- .6 base for flagpole and for posts for chain link fencing.

Addendum #1

.2 For concrete hold-down slabs for buried tanks use mix specified for wall beams in Paragraph 2.2.3 of Section 03300.

.3 For interior concrete bases for mechanical equipment use mix specified in Paragraph 2.2.2 of Section 03300.

.4 For exterior concrete sidewalk use 30 MPa concrete, air-entrained to 6% +/- 1%, but with aggregate mix such that retarded surface will be a minimum of 75% exposed aggregate varying from 6 mm to 13 mm in size, with exposed aggregate consisting of water worn aggregate.

.5 For concrete fill at treads of metal stairs use 30 MPa concrete with maximum aggregate size of 16 mm.

.6 Surface retarding agent: Shake-on powder type or liquid type. Apply in accordance with manufacturer's directions to expose 4 mm depth of surface aggregate.

.7 Control joint forms for exterior concrete slabs and aprons: purpose made, keyed joint form fabricated of galvanized steel with minimum base metal thickness of 0.5 mm, with 22 mm knock-outs at 150 mm centres.

2.1 Materials (Cont'd)

.8 Sealant for exterior horizontal expansion joints and control joints in concrete aprons and slabs: 2 part polytremdyne terpolymer sealant to CGSB 19-GP-19.24-M80.

.9 Boiled linseed oil: to CGSB 1-GP-2M.

.10 Galvanized metal cap for end of reinforcing dowels at expansion joints in concrete aprons: Of 2275 galganized sheet steel with base metal thickness of 1 mm. Closed end with soldered or lock joint to form sliding fit on dowel. Refer to Detail 27/07/011 on Drawing A-011.

.11 Non-slip material for strips on concrete stair treads: fine alundum oxide and epoxy cement mixture in colour selected by Engineer.

.12 Bonding agent: purpose made latex-type liquid bonding agent.

PART 3 - EXECUTION

3.1 Forming

.1 Form vertical surfaces to full depth using forming material that will not deform under loading by plastic concrete.

.2 Securely position forms to required lines and grades.

.3 Coat forms with form release agent.

.4 Obtain approval of forms before placing concrete.

.5 Slip forming may be approved for concrete curbs subject to evaluation of mechanical equipment proposed for use.

.6 Exterior concrete aprons, washdown basin, walks: Form slabs in grid pattern of joints shown, providing expansion joints and control joints, respectively, as indicated. Place concrete in alternate panels, in checkerboard pattern. Finish and cure for a minimum of 72 hours and until concrete has reached a strength sufficient to withstand construction loads. Remove intermediate form work between panels. Install joint filler for expansion joints. Place concrete in remaining alternate panels preventing damage to edges of previous placed sections. Cut back end of existing concrete pier as shown on Drawing A-07.

.7 Form sidewalks to provide joints as shown with expansion joints at maximum centres of 3 metres and with intermediate false joints.

3.2 Reinforcing Steel

.1 Place steel to details indicated and in accordance with Section 03201.

.2 Make laps 24 bar diameters where continuous reinforcement is required.

.3 Make laps of wire mesh of 150 mm width.

3.3 Concrete

.1 Do concrete work in accordance with Section 03300 and as specified herein.

.2 Finish exposed surfaces to a smooth uniform finish, free of open texturing and exposed aggregate. Do not work more mortar to surface than required. Do not use neat cement as a drier to facilitate finishing.

.3 Fine wood float finish surface, with Class B tolerance, to provide non-skid texture to exterior slabs with exception of sidewalks.

.4 Round edges, including edges of joints, with 10 mm radius edging tool.

.5 Finish surfaces to within 3 mm in 3 m from line, level or grade as measured with a straightedge placed on surface, providing indicated drainage slopes.

.6 Cure and protect concrete in accordance with CAN3-A23.1-M77. Do not use curing compound on exterior slabs.

.7 Sidewalks: place concrete underbed and topping course in one operation with topping mix with special aggregate as specified in Paragraph 2.1.5.4 of this Section. Screed level. Apply retardant to surface in accordance with manufacturer's directions. After recommended period of time wash out surface to produce 4 mm exposure of surface aggregate. Ensure exposed aggregate is free of cement film. Cure as specified.

Pg. 8 Addendum #1

3.4 Expansion and Contraction Joints

.1 Install joints as indicated.

.2 When sidewalk is adjacent to curb, make joints of curb, gutters and sidewalk coincide.

.3 Install expansion joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure unless otherwise indicated.

.4 Seal joints with approved sealant.

3.5 Backfill

.1 Allow concrete to cure for 7 days prior to backfilling.

3.6 Corrosion Prevention

.1 Apply with spray method only, two coats of one to one mixture of boiled linseed oil and kerosene.

.2 Insure concrete surfaces are dry, free of dirt or dust, and at least two weeks old before applying coating.

.3 Apply each coat at a rate of 0.1 L/sq m.

.4 Dry first coat thoroughly before applying second coat.

.5 Protect adjacent surfaces from spray.

3.7 Inspection and Testing

.1 Testing of concrete and concrete materials will be by testing laboratory designated by Engineer.

.2 Costs of tests will be paid by Engineer, in accordance with Section 01410.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Excavating and Backfilling:	Section 02220
	.2	Storm Sewers:	Section 02701
	.3	Sanitary Sewers:	Section 02702
	.4	Concrete Reinforcement:	Section 03200
	.5	Cast-in-place Concrete:	Section 03300

1.2 Material Certification

.1 At least 4 weeks prior to commencing work, submit manufacturer's test data and certification that materials meet requirements of this section. Include manufacturer's drawings, information and shop drawings where pertinent.

PART 2 - PRODUCTS

2.1 Materials

.1 Concrete:
.1 To Section 03300.
.2 Cement: to CAN3-A5-M77, type 10.
.3 Concrete mix design to produce 20 MPa minimum compressive strength at 28d and containing 25 mm maximum size course aggregate, with water/cement ratio to CAN3-A23.1-M77, table 7 for class A exposure and 75 mm slump at time and point of deposit. Air entrainment to CAN3-A23.1-M77, table 8 for class A exposure.

.2 Concrete reinforcement: to Section 03200.

.3 Precast manhole sections: to ASTM C478-79, circular. Top sections flat slab top type with opening offset for vertical ladder installation. Monolithic bases to be approved and set on concrete slabs cast in place.

.4 Precast catch basin sections: to ASTM C478-79.

2.1 Materials (Cont'd)

.5 Joints: to be made watertight using rubber rings, bituminous compound, epoxy resin cement or cement mortar.

.6 Bituminous joint sealing compound: to CGSB 56-GP-4a.

.7 Mortar:
.1 Aggregate: to CSA A82.56-M1976.
.2 Cement: to CAN3-A8-M77.

.8 Ladder rungs: to CSA G30.12-M1977 25M billet steel deformed bars, hot dipped galvanized to CSA G164-1965 (R1972). Rungs to be safety pattern (drop step type).

.9 Adjusting rings: to ASTM C478-79.

.10 Concrete Brick: to CSA A165.2-1972.

.11 Frames, gratings, covers to plan dimensions and following requirements:
.1 Metal gratings and covers to bear evenly on frames. A frame with grating or cover to constitute one unit. Assemble and mark unit components before shipment.
.2 Gray iron castings to ASTM A48-76 (AASHTO M105-76), strength class 30B.
.3 Castings to be coated with two applications of asphalt varnish.
.4 Manhole frames and covers: to Metro Toronto Area Standard, Drawing No. 331 heavy duty municipal type.
.5 Catch basin frames and covers: to Metro Toronto Area Standard, Drawing No. 312.

PART 3 - EXECUTION

3.1 Excavation and Backfill

.1 Excavate and backfill in accordance with Section 02220.

.2 Obtain approval of Engineer before installing intake structure, manholes or catch basins.

3.2 Concrete Work

.1 Do concrete work in accordance with Section 03300.

.2 Place concrete reinforcement in accordance with Section 03200.

.3 Position metal inserts in accordance with dimensions and details indicated.

3.3 Installation

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses. Maximum of three units behind point of pipe laying will be allowed.

.3 Pump excavation free of standing water and remove soft and foreign material before placing concrete base.

.4 Cast bottom slabs directly on undisturbed ground or when permitted by Engineer, set precast concrete base on 150 mm minimum of well compacted granular material, 98% standard Proctor density.

.5 For precast units:

.1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base. Make each successive joint watertight with approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination thereof. If bituminous compound used, apply to CGSB 56-GP- 9a.

.2 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.

.3 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.

3.3 Installation (Cont'd)

.6 For sewers:
.1 Place stub outlets and bulkheads at elevations and in positions indicated.
.2 Bench to provide a smooth U-shaped channel. Side height of channel to be 0.75 times diameter of sewer. Slope adjacent floo at 1 on 10. Curve channels smoothly. Slope invert to establish sewer grade.

.7 Set frame and cover to required elevation on no more than 4 courses of brick. Make brick joints and join brick to frame with cement mortar, parge and make smooth and watertight.

.8 Place frame and cover on top section to elevation indicated. If adjustment required use concrete ring.

.9 Clean units of debris and foreign materials. Remove fins and sharp projections. Prevent debris from entering system.

3.4 Leakage Test

.1 Install watertight plugs or seals on inlets and outlets of each new manhole and fill manhole with water. Leakage not to exceed 0.3% per hour of volume of manhole.

.2 If permissable leakage is exceeded, correct defects. Repeat until acceptable.

.3 Engineer will issue Test Certificate for each manhole passing test.

---------- END ----------

PART 1 - GENERAL

1.1 Related Work

.1 Asphalt concrete paving: Section 02508

1.2 Samples

.1 Submit to Engineer following material sample quantities at least 4 weeks prior to commencing work.
.1 Two 1 L samples of each type of paint.
.2 Follow sampling procedure outlined in CGSB 1-GP-71.

.2 Clearly mark samples with name of project and its location, paint manufacturer's name and address, name of paint, CGSB Specification number and formulation number and batch number.

PART 2 - PRODUCTS

2.1 Materials

.1 Paint:
.1 To CGSB 1-GP-74M, alkyd traffic paint.
.2 Colour: to CGSB 1-GP-12C yellow.
.3 Upon request, Engineer will supply a qualified product list of paints applicable to work. Qualified paints may be used before having them tested.

.2 Thinner: to CGSB 1-GP-5M.

PART 3 - EXECUTION

3.1 Equipment Requirements

.1 Paint applicator of an approved pressure type distributor capable of applying paint in single or double and dashed lines and that will ensure uniform application and a positive means of shut-off.

3.2 Condition of Surfaces

.1 Pavement surface to be free from surface water, frost, ice, dust, oil, grease and other foreign materials.

3.3 Application

.1 Lay out pavement markings accurately.

.2 Unless otherwise approved by the Engineer apply paint only when air temperature is above 10 deg C and no rain is forecast.

.3 Apply traffic paint evenly at a rate of 3 sq m/L.

3.3 Application (Cont'd)

.4 Do not use thinner unless approved by Engineer.

.5 Paint lines must be of uniform colour and density with sharp edges.

3.4 Tolerance

.1 Paint markings to be within ±12 mm of dimensions specified.

3.5 Protection of Completed Work

.1 Protect pavement markings until dry.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Excavating and Backfilling:	Section 02220
	.2	Manholes and Catch Basins:	Section 02601
	.3	Cast-in-Place Concrete:	Section 03300

Pg. 3 & 4 Addendum #1

1.2 Samples	.1	At least 4 weeks prior to commencing work, inform Engineer of proposed source of bedding materials and provide access for sampling.
1.3 Material Certification	.1	At least 2 weeks prior to commencing work, submit manufacturer's test data and certification that pipe materials meet requirements of this section.
1.4 Scheduling of Work	.1	Schedule work to minimize interruptions to existing services.
	.2	Maintain existing flow during construction.
1.5 Manufacturers Instructions	.1	Make available 1 copy of manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 Concrete Pipe

.1 Non-reinforced circular concrete pipe and fittings: to CSA A257.1-1974, ASTM C14-80 ASTM C14M-80a designed for flexible rubber gasket joints to ASTM C443- 79 ASTM C443M-80 CSA A257.3-1974.

.2 Reinforced circular concrete pipe and fittings: to CSA A257.2-1974, ASTM C76-80 ASTM C76M-80a designed for flexible rubber gasket joints to ASTM C443- 79 ASTM

.3 Lifting holes:
.1 Pipe 900 mm and less in diameter; no lift holes.

2.2 Plastice Pipe

.1 Type PSM Poly (Vinyl Chloride): to ASTM D3034-80.
.1 Standard Dimensional Ratio (SDR), 35.
.2 Separate gasket and integral bell system.
.3 Nominal lengths 6 m.

2.3 Pipe Bedding Materials

.1 Granular material:
.1 Gradation to within specified limits when tested to ASTM C136-81 and ASTM C117-80 (AASHTO T11-78 and T27-78) and giving smooth curve without sharp breaks when plotted on semi log grading chart.

.2 Bedding Sand:
.1 Natural sand or crushed rock screenings to following grading requirements:

ASTM Sieve Size	Percent Passing
9.50 mm	100
4.75 mm	50 - 100
2.00 mm	30 - 90
0.425 mm	10 - 50
0.075 mm	0 - 10

.2 Liquid Limit: ASTM D423-66(1972) (AASHTO T89-76) # Maximum 25.
.3 Plasticity Index: ASTM D424-59(1971) (AASHTO T90-70) # Maximum 6.

.3 Granular A:
.1 To the requirements of [illegible]C Material Specification Form 1010.

2.4 Joint Mortar

.1 Portland cement: to CAN3-A5-M77 type 10.

.2 Mortar to consist of one part Portland cement to two parts clean sharp sand mixed with minimum amount of water to obtain optimum consistency for use intended. Do not use additives.

PART 3 - EXECUTION

3.1 Preparation

.1 Clean pipes and fittings of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site.

3.2 Trenching and Backfilling

.1 Do trenching and backfill work in accordance with Section 02220.

.2 Trench line and depth require approval prior to placing bedding material and pipe.

3.3 Concrete Bedding and Encasement

.1 Do concrete work to Section 03300. Place concrete to details indicated or directed.

.2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Do not backfill over concrete within 24 h after placing.

.4 Use concrete bedding only when directed by Engineer.

3.4 Granular Bedding

.1 Place granular bedding materials to details indicated on drawings.

.2 Shape bed true to grade and to provide continuous, uniform bearing surface for barrel of pipe. Do not use blocks when bedding pipe.

.3 Shape transverse depressions as required to receive bell if bell and spigot pipe is used.

3.4 Granular Bedding (Cont'd)

.4 Compact full width of bed to at least 95% of maximum density ASTM D1557, Method C or D.

.5 Use bedding stone in lieu of bedding material when directed.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with bedding material or common backfill as directed.

3.5 Installation

.1 Lay and join pipe in accordance with manufacturer's recommendations.

.2 Handle pipe by approved methods. Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.

.3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Do not exceed maximum joint deflection recommended by pipe manufacturer.

.6 Do not allow water to flow through pipes during construction except as may be permitted by Engineer.

.7 Whenever work is suspended, install removeable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Position and join pipes by approved methods. Do not use excavating equipment to force pipe sections together.

.9 Install PVC pipe and fittings in accordance with CSA B 181.12-1967.

.10 Joints:

.1 Concrete, pipe:

.1 Install gaskets as recommended by manufacturer.

3.5 Installation (Cont'd)

.10 Joints:(Cont'd)

.1 Concrete, pipe:(Cont'd)

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes carefully before joining.

.4 Maintain pipe joints free from mud, silt, gravel and other foreign material.

.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Remove disturbed or dirty gaskets; clean, lubricate and replace before joining is attempted.

.6 Complete each joint before laying next length of pipe.

.7 Minimize joint deflection after joint has been made to avoid joint damage.

.8 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.11 When any stoppage of work occurs, block pipes as directed to prevent "creep" during down time.

.12 Plug lifting holes with approved prefabricated plugs set in non-shrink grout.

.13 Cut pipes as required for special inserts, fittings or closure pieces in a neat manner, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.

.14 Make watertight connections to manholes and catch basins. Use non-shrink grout when suitable gaskets are not available.

.15 Plug open upstream ends of pipes with removable watertight concrete, steel or wooden bulkheads.

---------- END ----------

PART 1 - GENERAL

1.1 Related Work	.1	Excavating and Backfilling:	Section 02220
	.2	Manholes and Catch Basins:	Section 02601
	.3	Sanitary Force Mains and Pumps:	Section 02724
	.4	Cast-in-Place Concrete:	Section 03300

1.2 Samples

.1 At least 4 weeks prior to commencing work, inform Engineer of proposed source of bedding materials and provide access for sampling.

1.3 Material Certification

.1 At least 2 weeks prior to commencing work submit manufacturer's test data and certification that pipe materials meet requirements of this section.

1.4 Scheduling of Work

.1 Schedule work to minimize interruptions to existing services.

.2 Maintain existing sewage flows during construction.

1.5 Manufacturers Instructions

.1 Make available 1 copy of manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1 Plastic Pipe

.1 Type PSM Poly (Vinyl Chloride): to ASTM D3034-80.
- .1 Standard Dimensional Ratio (SDR): 35.
- .2 Locked-in separate gasket and integral bell system.
- .3 Nominal lengths: 6 m.

2.2 Cement Mortar

.1 Portland cement: to CAN3-A5-M77 type 10.

.2 Mix mortar one part by volume of cement to two parts of clean, sharp sand mixed dry. Add only sufficient water after mixing to give optimum consistency for placement. Do not use additives.

2.3 Pipe Bedding Materials

.1 Granular materials:
- .1 Gradation to within specified limits when tested to ASTM C136-81 and ASTM C117-80 (AASHTO T11-78 and T27-78) and giving a smooth curve without sharp breaks when plotted on a semi log grading chart.

.2 Bedding Sand:
- .1 Natural sand or crushed rock screenings to following grading requirements.

ASTM Sieve Size	Percent Passing
9.50 mm	100
4.75 mm	50 - 100
2.00 mm	30 - 90
0.425 mm	10 - 50
0.075 mm	0 - 10

- .2 Liquid Limit: ASTM D423-66(1972) (AASHTO T89-76)# Maximum 25
- .3 Plasticity Index: ASTM D424-59(1971) (AASHTO T90-70) # Maximum 6.

.3 Granular A:
- .1 To the requirements of MTC Material Specification Form 1010.

2.4 Oil Waste Tank

.1 Steel sheet to ASTM A 569, steel plate ASTM A283 Grade C, one coat asphalt paint, fabricate in accordance with ULC S603M latest edtion.

PART 3 - EXECUTION

3.1 Preparation

.1 Clean pipes and fittings of debris and water before installation. Inspect materials for defects before installing. Remove defective materials from site.

3.2 Trenching and Backfill

.1 Do trenching and backfill work in accordance with Section 02221.

.2 Trench line and depth require approval prior to placing bedding material and pipe.

.3 Do not backfill trenches until pipe grade and alignment have been checked and accepted and infiltration and exfiltration test results are within limits specified.

3.3 Granular Bedding

.1 Place granular bedding materials in accordance with details indicated or directed.

.2 Shape bed true to grade and to provide continuous, uniform bearing surface for barrel of pipe. Do not use blocks when bedding pipe.

.3 Shape transverse depressions as required to receive bell if bell and spigot pipe is used.

.4 Compact full width of bed to at least 95% of maximum density ASTM D1557, Method C or D.

.5 Use bedding stone in lieu of sand bedding material when directed.

.6 Fill excavation below bottom of specified bedding adjacent to manholes or structures with bedding material or common backfill as directed.

3.4 Installation

.1 Lay and join pipes in accordance with manufacturer's recommendations.

.2 Handle pipe with approved equipment. Do not use chains or cables passed through pipe bore so that weight of pipe bears upon pipe ends.

.3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points. Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

.4 Commence laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.

.5 Do not exceed maximum joint deflection recommended by pipe manufacturer.

.6 Do not allow water to flow through pipe during construction, except as may be permitted by Engineer.

.7 Whenever work is suspended, install a removeable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

.8 Position and join pipes by approved methods. Do not use excavating equipment to force pipe sections together.

.9 Install PVC pipe and fittings in accordance with CSA B181.12-1967.

.10 Pipe Jointing:

.1 Install gaskets in accordance with manufacturer's recommendations.

.2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.3 Align pipes carefully before joining.

.4 Maintain pipe joints free from mud, silt, gravel and other foreign material.

.5 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed shall be removed, cleaned and lubricated and replaced before joining is attempted.

.6 Complete each joint before laying next length of pipe.

3.4 Installation (Cont'd)

.10 Pipe Jointing: (Cont'd)

.7 Minimize joint deflection after joint ha been made to avoid joint damage.

.8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.

.9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.

.11 Block pipes as directed when any stoppage of work occurs to prevent creep during down time.

.12 Plug lifting holes with approved pre-fabricated plugs set in non-shrink grout.

.13 Cut pipes as required for special inserts, fittings or closure pieces in a neat manner, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.

.14 Make watertight connections to manholes. Use non-shrink grout when suitable gaskets are not available.

.15 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes. Joint of saddle to pipe shall be structurally sound and watertight.

.16 Upon completion of pipe laying and after Engineer has inspected pipe joints, place specified granular material to dimensions indicated or directed and in accordance with Section 02220. Leave joints exposed until exfiltration tests are completed.

.17 When infiltration and exfiltration test results are acceptable to Engineer, backfill remainder of trench in accordance with section 02220.

3.5 Field Testing

.1 Repair or replace pipe, pipe joint or bedding found defective.

.2 When directed by Engineer, draw a tapered wooden plug with a diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.

.3 Remove foreign material from sewers and related appurtenances by flushing with water.

3.5 Field Testing (Cont'd)

.4 Perform infiltration and exfiltration testing as soon as practicable after jointing and bedding are complete, and service connections have been installed.

.5 Do infiltration and exfiltration testing as directed. Perform tests in presence of Engineer. Notify Engineer 24 h in advance of proposed tests.

.6 Carry out tests on each section of sewer between successive manholes including service connections.

.7 Install watertight bulkheads in suitable manner to isolate test section from rest of pipeline.

.8 Exfiltration test:
.1 Fill test section with water in such a manner as to allow displacement of air in line. Maintain under nominal head for 24 h to ensure absorption in pipe wall is complete before test measurements are commenced.
.2 Immediately prior to test period add water to pipeline until there is a head of 1 m over interior crown of pipe measured at highest point of test section or water in manhole is 1 m above static ground water level, whichever is greater.
.3 Duration of exfiltration test shall be two hours.
.4 Water loss at end of test period shall not exceed maximum allowable exfiltration ove. any section of pipe between manholes.

.9 Infiltration test:
.1 Conduct infiltration test in lieu of exfiltration test where static ground water level is 750 mm or more above top of pipe measured at highest point in line to be used.
.2 Do not interpolate a head greater than 750 mm to obtain an increase in allowable infiltration rate.
.3 Install a watertight plug at upstream end of pipeline test section.
.4 Discontinue pumping operations for at least 3 d before test measurements are to commence and during this time keep thoroughly wet at least one third of pipe invert perimeter.
.5 Prevent damage to pipe and bedding material due to flotation and erosion.

3.5 Field Testing (Cont'd)

.9 Infiltration test: (Cont'd)

.6 Place a 90x V-notch weir, or other measuring device approved by Engineer in invert of sewer at each manhole.

.7 Measure rate of flow over a minimum of h, with recorded flows for each 5 min interval.

.10 Infiltration and exfiltration shall not exce following limits in L per hour per 100 m of pipe, including service connections.

Nominal Pipe diameter in mm	Plastic pipe
100	
125	3.88
150	4.62
200	5.51
250	7.45
300	9.39
350	11.33
400	13.27
450	14.91
500	16.84
550	18.78
600	20.72
700	22.80
800	26.53
900	30.11
1000	33.69
1100	37.56
1200	41.29
	45.01

Values shown in columns 2 are in litres per hour per 100 metres of pipe.

.11 Leakage shall not exceed following limits in litres per hour per mm of diameter per 100 m of sewer including service connections:

.1 Exfiltration, based on 600 mm head, 0.175 L.

.2 Infiltration, 0.150 L.

.12 Repair and retest sewer line as required, until test results are within limits specified.

.13 Repair visible leaks regardless of test

END

PART 1 - GENERAL

1.1 Related Work	.1	Excavating and Backfilling:	Section 02220
Pg. 2 & Addendum #1.	.2	Cast-in-Place Concrete:	Section 03300
1.2 Samples	.1	At least 4 weeks prior to commencing work, inform Engineer of proposed source of bedding materials and provide access for sampling.	
1.3 Material Certification	.1	At least 4 weeks prior to commencing work, submit manufacturer's test data and certification that pipe materials meet the requirements of this section. Include manufacturer's drawings, information and shop drawings where pertinent.	
1.4 Shop Drawings	.1	Submit shop drawings in accordance with Section 01340.	
1.5 Record Drawings Operating and Maintenance Data	.1	Provide record drawings, in accordance with Section 01720 including directions for operating valves. Provide list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details, maintenance and operating instructions in accordance with Section 01730.	
1.6 Scheduling of Work	.1	Schedule work to minimize interruptions to existing services.	
	.2	Submit schedule of expected interruptions for approval by Engineer and adhere to interruption schedule as approved by Engineer.	
	.3	Notify Base Manager a minimum of 24 h in advance of any interruption in service.	

1.6 Scheduling of Work (Cont'd)

.4 Do not interrupt water service for more tha
h and confine this period between 10:00 and
16:00 h local time unless otherwise
authorized.

.5 Notify fire department of any planned or accidental interruption of water supply to hydrants.

PART 2 - PRODUCTS

2.1 Pipe and Fittings

.1 Ductile iron: to CSA B131.13-1977 ANSI A21.51-1976 class 2 for 1034 kPa.

.2 Cast-iron: to ANSI A21.6-1980, class 125, for 860 kPa.

.1 Joints:

.1 Mechanical, rubber gaskets with lead tip and double duck backing, high strength heat treated cast-iron or alloy steel tie head bolts with hex nuts.

.2 Ensure electrical conductivity across joints.

.2 Fittings: to CSA B131.9-1978 AWWA C110-77.

2.2 Valves and Valve Boxes

.1 Gate valves: to AWWA C500-80, standard iron body, bronze mounted double disc valves with non-rising stems, suitable for 1 MPa with mechanical joints.

.2 Valves to open counter clockwise.

.3 Cast iron valve boxes: three piece sliding type adjustable over a minimum of 450 mm complete with valve operating extension rod, 30 mm minimum diameter, of such length that when set on valve operating nut top of rod will not be more than 150 mm below cover. Base to be large round type with minimum diameter of 300 mm. Top of box to be marked "WATER".

.4 Underground type post indicator valve: High strength cast iron, water proof, bronze operating nut, solid bronze indicator, indicator post to accurately indicate valve open or closed.

2.3 Service Connections

.1 Copper tubing: to ASTM B68-80, type K, annealed.

.2 Ductile iron pipe: to CSA B131.13-1977 class 2.

.3 Copper pipe joints: to be of compression type suitable for 1 MPa working pressure.

.4 Brass inverted key-type curb stops: red brass to ASTM B62-80 compression type with drains Curb stops to have adjustable bituminous coated cast iron service box with stem to suit depth of bury. Top of cast iron box marked "WATER".

.5 Tee connections: for services above 25 mm diameter. Tee connections to be fabricated of same material and to same standards as specified pipe fittings and to have ends matching pipe to which they are joined.

2.4 Hydrants

.1 Post type hydrants: to ULC-S-520; designed for working pressure of 1030 kPa with two 65 mm threaded hose and pumper outlets, 150 mm riser barrel, 125 mm bottom valve and 150 mm connection for main. Hydrants to open counter clockwise, threads to local standard. Depth of bury 1.7 m minimum.
.1 Provide key operated gate valve located 1 m from hydrant.
.2 Provide wrench with each hydrant.
.3 Colour hydrants yellow.

2.5 Pipe Bedding Materials

.1 Granular material, general:
.1 Gradation to be within specified limits when tested to ASTM C136-81 (AASHTO T11-78 and T27-78) and giving a smooth curve without sharp breaks when plotted on a semi log grading chart.
.2 Bedding Sand:
.1 Natural sand or crushed rock screenings to following grading requirements:

ASTM Sieve Size	Percent Passing

2.5 Pipe Bedding Materials (Cont'd)

.1 (Cont'd)

.2 Bedding Sand: (Cont'd)

.1 (Cont'd)

ASTM Sieve Size	Percent Passing
9.50 mm	100
4.75 mm	50 - 100
2.00 mm	30 - 90
0.425 mm	10 - 50
0.075 mm	0 - 10

.2 Liquid limit: ASTM D423-66(1972) (AASHTO T89-76), maximum 25.

.3 Plasticity index: ASTM D424-59(1971) (AASHTO T90-70), maximum 6.

.2 Granular A:

.1 To the requirements of MTC Material Specification Form 1010.

.3 Concrete required for cradles, encasement, supports, thrust blocks, all to Section 03300.

2.6 Pipe Disinfection

.1 Sodium hypochlorite Calcium hypochlorite to AWWA B300-80 to disinfect water mains.

2.7 Tools and Equipment

.1 3 service post wrenches for curb stops.

.2 3 hydrant wrenches.

.3 3 tee-handle operating keys for valves.

.4 2 post indicator valve wrenches.

PART 3 - EXECUTION

3.1 Preparation

.1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects. Remove defective materials from site.

3.2 Trenching and Backfill

.1 Do trenching and backfill work to Section 02220.

.2 Trench depth to provide minimum cover over pipe of 1.7 m from finished grade or as indicated.

.3 Trench alignment and depth require Engineer's approval prior to placing bedding material or pipe.

.4 Do not backfill trenches until installed work has been checked and accepted by Engineer and hydrostatic and leakage test results are within limits specified.

3.3 Concrete Bedding and Encasement

.1 Do concrete work to Section 03300. Place concrete to details indicated or directed. directed.

.2 Pipe may be positioned on concrete blocks to facilitate placing of concrete. When necessary, rigidly anchor or weight pipe to prevent flotation when concrete is placed.

.3 Do not backfill over concrete within 24 h after placing concrete.

.4 Use concrete bedding when directed by Engineer.

3.4 Granular Bedding

.1 Place granular bedding materials to details indicated or directed.

.2 Shape bed true to grade to provide continuous uniform bearing surface for pipe exterior. Do not use blocks when bedding pipe.

3.4 Granular Bedding (Cont'd)

.3 Shape transverse depressions in bedding as required to make joints.

.4 Compact full width of bed to at least 95% maximum density ASTM D1557, Method C or D.

.5 Place crushed stone instead of sand bedding material when directed.

.6 Fill any excavation below level of bottom o specified bedding with crushed stone and compact.

.7 Use bedding sand for pipes 50 mm diameter an less.

3.5 Pipe Installation

.1 Building water service and fire main shall terminate 1.5 m from buildings.

.2 Lay pipes to AWWA C600a-80 and manufacturer's standard instructions and specifications. Do not use blocks except as permitted in 3.3.2.

.3 Join pipes in accordance with to AWWA C600a-80 and manufacturer's recommendations.

.4 Handle pipe by approved methods. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.

.5 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Take up and replace defective pipe. Correct pipe which is not in true alignment or grade or pipe which shows undue settlement after installation.

.6 Face socket ends of pipe in direction of laying. For mains on a grade of 2% or greater, face socket ends up-grade.

.7 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

.8 Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Whenever work is stopped, install a removeable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.

3.5 Pipe Installation (Cont'd)

.9 Position and join pipes with approved equipment. Do not use excavating equipment to force pipe sections together.

.10 Cut pipes as required for specials, fittings or closure pieces, in a neat manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave a smooth end at right angles to axis of pipe.

.11 Align pipes carefully before jointing.

.12 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.13 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.

.14 Complete each joint before laying next length of pipe.

.15 Minimize deflection after joint has been made.

.16 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.

.17 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Engineer.

.18 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.

.19 Do not lay pipe on frozen bedding.

.20 Protect hydrants, valves and appurtenances from freezing.

.21 Upon completion of pipe laying and after Engineer has inspected work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated or directed.

3.5 Pipe Installation (Cont'd)

.22 Leave joints and fittings exposed for hydrostatic and leakage testing.

.23 Hand place granular material in uniform la not exceeding 150 mm thick to minimum 600 over top of pipe. Dumping of material directly on top of pipe is not permitted.

.24 Place layers uniformly and simultaneously c each side of pipe to prevent lateral displacement of pipe.

.25 Compact each layer to at least 95% maximum density ASTM D1557, Method C or D.

.26 When hydrostatic and leakage test results ar acceptable to Engineer, surround and cover joints and fittings with granular material placed and compacted as specified herein. Backfill remainder of trench to Section 02220.

3.6 Valve Installation

.1 Install valves to manufacturer's recommendations at locations indicated.

.2 Support valves by means of either concrete or wood blocks, located between valve and solid ground. bedding same as adjacent pipe. Maximun length of pipe on each end of valve shall be l m. Valves shall not be supported by pipe.

.3 Install underground post-type indicator valves to manufacturer's recommendations.

3.7 Service Connections

.1 Do not install service connections until satisfactory completion of hydrostatic and leakage tests of water main.

.2 Construct service connections at right angles to watermain unless otherwise directed. Locate curb stops as shown on drawings.

.3 Tappings on ductile iron, may be threaded without service clamps. Double strap service connections with galvanized malleable iron body and neoprene gasket cemented in place may be used. Tappings to conform to following:

3.7 Service Connections (Cont'd)

.3 (Cont'd)

Pipe Diameter (mm)	Maximum Tap Without Clamp (mm)	Maximum Tap With Clamp (mm)
100	20	25
150	20	40
200	25	50
250	25	50
300	40	75

.4 Employ only competent workmen equipped with suitable tools to carry out tapping of mains, cutting and flaring of pipes.

.5 Install tap service connections on top half of main, between 45 and 90 deg. measured from apex of pipe.

.6 In order to relieve strain on connections, install service pipe in "Goose Neck" form "laid over" into horizontal position.

.7 Install curb stop with corporation box on services 50 mm dia. or less in diameter. Equip larger services with a gate valve and cast iron box. Set box plumb over stop and adjust top flush with final grade elevation. Leave curb stop valves fully closed.

.8 Place temporary location marker at ends of plugged or capped unconnected water lines. Each marker to consist of a 38 x 89 mm stake extending from pipe end at pipe level to 600 mm above grade. Paint exposed portion of stake red with designation "WATER SERVICE LINE" in black.

3.8 Hydrants

.1 Install hydrants at locations indicated or directed.

.2 Install hydrants in accordance with AWWA Manual of Practice M-17-1970.

.3 Install 150 mm gate valve and cast iron valve box on hydrant service leads as indicated.

3.8 Hydrants (Cont'd)

.4 Set hydrants plumb, with hose outlets paral with edge of pavement or curb line, with pumper connection facing roadway and with b flange set at elevation of 50 mm above fina grade.

.5 Place concrete thrust blocks as indicated a specified ensuring that drain holes are unobstructed.

.6 To provide proper draining for each hydrant, excavate a pit measuring not less than 1 x 1 0.5 m deep and backfill with coarse gravel o crushed stone to a level 150 mm above drain holes.

.7 Place appropriate sign on installed hydrants indicating whether or not they are in service during construction.

3.9 Thrust Blocks

.1 Do concrete work to Section 03300.

.2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or as directed by Engineer.

.3 Keep joints and couplings free of concrete.

.4 Do not backfill over concrete within 24 h after placing.

3.10 Hydrostatic and Leakage Testing

.1 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.

.2 Notify Engineer at least 24 h in advance of all proposed tests. Perform tests in presence of Engineer.

.3 Where any section of system is provided with concrete thrust blocks, do not conduct tests until at least 5 d after placing concrete or 2 d if high early strength concrete is used.

.4 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Engineer.

3.10 Hydrostatic and Leakage Testing (Cont'd)

.5 Before testing, bed and cover pipe between joints in accordance with paragraph 3.5 to prevent movement or snaking of pipe line when test pressure is applied.

.6 Leave joints and fittings exposed.

.7 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.

.8 Open valves.

.9 Expel air from main by slowly filling main with potable water. Install corporation stops at high points in main where no air-vacuum release valves are installed, Remove stops after satisfactory completion of test and seal holes with plugs.

.10 Thoroughly examine exposed parts and correct for leakage as necessary.

.11 Apply hydrostatic test pressure of 1550 kPa based on elevation of lowest point in main and corrected to elevation of test gauge, for a period of one hour.

.12 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.

.13 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.

.14 Repeat hydrostatic test until all defects have been corrected.

.15 Apply a leakage test pressure of 1034 kPa after complete backfilling of trench, based on elevation of lowest point in main and corrected to elevation of gauge, for a period of 2 h.

.16 Define leakage as amount of water supplied from water storage tank meter in order to maintain test pressure for 2 h.

.17 Do not exceed allowable leakage of 0.03 L/mm diameter per 300 m of pipe, including lateral connections, per hour.

.18 Locate and repair defects if leakage is greater than amount specified.

3.10 Hydrostatic and Leakage Testing (Cont'd)

.19 Repeat test until leakage is within specifie allowance for full length of watermain.

3.11 Flushing and Disinfecting

.1 Flushing and disinfecting operations, including existing ship service connections, shall be witnessed by Engineer. Notify Engineer at least 4 d in advance of proposed date when disinfecting operations will commence.

.2 Flush water mains through available outlets with a sufficient flow to produce a velocity of 1.5 m/s, within pipe for 10 min, or until foreign materials have been removed and flushed water is clear.

.3 Flushing flows shall be as follows:

Pipe Size NPS	Flow (L/s) Minimum
6 and below	38
8	75
10	115
12	150

.4 Provide connections and pumps as required.

.5 Open and close valves, hydrants and service connections to ensure thorough flushing.

.6 When flushing has been completed to satisfaction of Engineer, introduce a strong solution of chlorine into watermain and ensure that it is distributed throughout entire system.

.7 Disinfect water mains to AWWA C601-68.

.8 Rate of chlorine application to be proportional to rate of water entering pipe.

.9 Chlorine application to be close to point of filling water main and to occur at same time.

.10 Operate valves, hydrants and appurtenances while main contains chlorine solution.

.11 Flush line to remove chlorine solution after 24 h.

3.11 Flushing and Disinfecting (Cont'd)

.12 Measure chlorine residuals at extreme end of pipe-line being tested.

.13 Bacteriological tests to be performed on water main, after chlorine solution has been flushed out. Samples to be taken daily for a minimum of two days. Should contamination remain or recur during this period, repeat disinfecting procedure.

.14 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.

.15 After adequate chlorine residual not less than 50 ppm has been obtained leave system charged with chlorine solution for 24 h. Further samples shall be taken to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.

---------- END ----------

PART 1 - GENERAL

1.1 Related Work

.1 Excavating and Backfilling: Section 02220

.2 Cast-in-Place Concrete: Section 03300

.3 Sanitary Sewers and Oily Water Sewers: Section 02702

1.2 Samples

.1 Submit samples in accordance with Section 01340.

.2 At least 4 weeks prior to commencing work, inform Engineer of proposed source of bedding materials and provide access for sampling.

1.3 Material Certification

.1 At least 2 weeks prior to commencing work, submit manufacturer's test data and certification that pipe materials meet requirements of this section.

1.4 As Built Drawings, Operating and Maintenace Data

.1 Provide As Built drawings on project completion in accordance with Section 01720. Give directions and list equipment required to open and close valves, details of pipe material, location of cleanouts, maintenance and operating instructions, in accordance with Section 01730.

1.5 Scheduling of Work

.1 Schedule work to minimize interruptions to existing services.

.2 Notify Base Manager a minimum of 24h in advance of any interruption in service.

1.6 Manufacturers Instructions

.1 Make available 1 copy of manufacturers installation instructions.

1.7 Machinery Maintenance Manuals

.1 Conform to Section 01730 and provide the following:

.1 Six bound copies of a machinery maintenance book, containing a title page, and index of contents, reduced-size copies of the lubrication charts, and parts drawings of all proprietary units and enclosed specially built units, and reduced size copies of shop drawings, with bills of material, all in English.

.2 Include for all parts where applicable and manufacturer's instructions for operations, adjustment and maintenance.

.3 Machinery maintenance book approximately 225 x 300 mm, with hard covers. Imprint covers neatly with descriptive title. Imprint title page with names of Engineer and Contractor, and date issue. Separate various sections which comprise book with divider pages with tabs. Modify standard parts drawings to be suitable, and block out irrelevant material. Modify all general information used as text where necessary to show pertinence to the equipment furnished under this contract, and remove irrelevant material.

.4 Submit arrangement of machinery maintenance book, method of binding, material included and all text to Engineer for approval, in duplicate.

.5 Provide lubrication schedule to maintain equipment in full operating condition as specified. Obtain lubrication instructions from suppliers of purchased equipment for inclusion in maintenance manuals.

.6 Include full lubrication instructions for fabricated machinery.

.7 Include spare parts list.

.8 Include detailed faultfinding and correcting procedures.

1.8 Work on Railway Right of Way

Pg. 10 Addendum #1.

PART 2 - PRODUCTS

2.1 Pipes and Fittings

.1 Wet well piping:
.1 Ductile iron pipe: to CSA B131.13-1977, thickness class 2.
.2 Pipe joints: flanged.
.3 Pipe fittings: to CSA B131.9-1978.

.2 Polyvinyl chloride pipe: to CSA B137.3-M198 AWWA C900-75.
.1 Size: as indicated on drawings.
.2 100 mm dia. SDR: 18 50 mm dia. SDR: 21
.3 Pressure Class: 1 MPa.
.4 Gasket bell end.
.5 Pipe joints: bell and spigot with rubbe gaskets solvent welded joints or mechanical joints to ANSI A21.11-1980 AWWA C111-1980, with transition gaskets to pipe manufacturers specifications.
.6 Rubber gaskets: to ANSI A21.11-1980 AWW C111-1980. Gaskets for mechanical joints to be duck-tipped transition gaskets for PVC.
.7 Cast iron fittings: to CSA B131.9-1978.

2.2 Pipe Bedding Materials

.1 Granular materials:
.1 Gradation: within specified limits when tested to ASTM C136-81 and ASTM C117-80 (AASHTO T11-78 and T27-78) and giving a smooth curve without sharp breaks when plotted on a semi-log grading chart.

.2 Bedding Sand:
.1 Natural sand or crushed rock screenings to following grading requirements.

ASTM Sieve Size		Percent Passing
9.50	mm	100
4.75	mm	50 - 100
2.00	mm	30 - 90
0.425	mm	10 - 50
0.075	mm	0 - 10

.2 Liquid Limit: ASTM D423-66(1972) (AASHTO T89-76) # Maximum 25.
.3 Plasticity Index: ASTM D424-59(1971) (AASHTO T90-70) # MAximum 6.

.3 Granular A:
.1 To the requirements of MTC Material Specification Form 1010.

.4 Concrete for thrust blocks to Section 03300.

2.3 Valves

.1 Gate valves: to AWWA C500-80, standard iron body, bronze mounted double disc valves with non-rising stems, suitable for 1 MPa with flanged joints complete with handwheel.

.2 Swing check valves: to ASTM A-126 Class B with ASTM B-62 Bronze Face, standard iron body, suitable for 1 MPa with flanged joints.

.3 Valves to open counter clockwise.

2.4 Pumps

.1 Sewage pumps: Submersible, 9.5 litres/second, 14.0 m head, lead pump operated by a manual switch on control panel, lag pump operate in parallel with lead pump under abnormal conditions, high liquid level alarm, non clog, centrifugal type directly connected by a common solid stainless steel shaft with the motor, hermetically sealed, sliding guide brackets, bail or 2-eye bolts arranged so that the lifting chain can exert a direct pull over the centre of gravity, cast iron volute, cast iron or hard alloy iron impeller, fasteners of stainless steel.

.2 Oily water pumps: Submersible 12.5 litres/second, 5.5 m head, pumps operated by a manual switch on control panel, provide controls so that only one pump may operated at one time, high liquid level alarm, non clog, centrifugal type directly connected by a solid stainless steel shaft with the motor, hermetically sealed, sliding guide brackets, bail or 2-eye bolts arranged so that the lifting chain can exert a direct pull over the centre of gravity, cast iron volute, cast iron or hard alloy iron impeller, fasteners of stainless steel.

.3 Motors: Speed not to exceed 1,800 rpm, cast iron watertight body, anti-friction bearings with 50,000 hours bearing life, capable of operating the pump continuously at any point of the selected impeller curve, squirrel cage induction type, windings insulated to Class "B" with rotors running in oil, or Class "F" with the rotors running in air, power supply 600V 3Ph.

.4 Float switches: liquid level type, shock proof mercury switch, form C contacts, hard PVC watertight casing, 3 conductor type

2.4 Pumps (Cont'd)

.4 Float switches:(Cont'd)
flexible cord, floats to suit pumps, one alar
float, 1 spare float.

.5 Control Panel:
.1 Locate in adjacent "pumps and electrical room", fully automatic control of sewage pump operating in duplex, manual alternation and control of pumps, exterior discount switch in wall recess, paint the panel to EEMAC Performance Specification of ANSI 61 gray with a colour to Canadian Government's Stds. Board 501-212, mounting plate of white baked enamel semigloss, CSA enclosure 5 (EEMAC 12) made of fabricated steel, suitably braced, with formed hinged front doors to open over 90 deg. for full inside access and secured with a lockable automotive type handle, fixed sub-brackets for circuit breakers and MCIs arranged to permit their handles to extend through the door but nor door mounted. Secure the components to a mounting plate which is bolted into the panel.
.2 Service supply equipment: one main circuit breaker 600 V, 3p, 14 KA IC. min. with thermal/magnetic trips. Safety interlock the breaker with the panel door. NOTE: Size the breaker for both pumps and aux. loads.
.3 Pump starters: full voltage starters.
.4 Pump starter control: mount on the panel door, two selector switches "HAND-OFF-AUTOMATIC" (1 per pump), one selecotr switch "PUMP #1 - PUMP #2" for manual, lead pump selection for sewage pumps, two elapsed time meters, non reset type, 5 digit min. hours and tenths, digits 3 x 5 mm or larger. Equal to Cramer #635 or Engler #10NG7 or Crompton Parkinson (1 per pump), two indicating lamps, red lens, 22 mm dia. min., lamp removed from the front (1 per pump). One indicating lamp as above (alarm).
.5 Wiring: control wire not less that #14 AWG. stranded type TEW or equal, power wire not less that #12 AWG. type TEW or equal, numbered at each wire end with printed sleeving to correspond with schematic diagram. Equal to "Brady" markers, provide grommets and shields for mechanical protection, provide adequate supports, "Hinge-cable" wiring between cabinet and door mounted components to cause minimum flexing, properly laced and secured.
.6 Factory tests:

2.4 Pumps (Cont'd)

.5 Control Panel:(Cont'd)

.6 Factory tests:(Cont'd)

.1 Provide non-witnessed factory tests on each pump, include in report, head and quantity readings at 5 capacity points; i.e. shut-off, run-out, and 3 points spanning the design point, motor V & A readings at the above capacity points, 2 readings of KW (elect) at or near the design point, test the control panel for simulated operation, certify the test report and include 5 copies with the final Shop Drawings and Manuals.

PART 3 - EXECUTION

3.1 Preparation

.1 Clean pipes and fittings of debris and water before installation. Carefully inspect materials for defects before installing. Remove defective materials from site.

3.2 Trenching and Backfill

.1 Do trenching and backfill in accordance with Section 02220.

.2 Trench alignment and depth require approval prior to placing bedding material or pipe.

.3 Do not backfill trenches between joints until pipe slope and alignment have been checked and accepted. Do not backfill at joints and valves until pressure and leakage test results are within limits specified.

3.3 Bedding

.1 Place bedding material to details indicated and compact to minimum of 95% of maximum density ASTM D1557, method C D.

.2 Use bedding stone in lieu of sand bedding material when directed.

3.4 Installation of Force Mains

.1 Lay pipes in accordance with AWWA C600a-80 for cast iron pipe and ductile iron pipe and manufacturer's recommendations for P.V.C. pipe.

3.4 Installation of Force Mains (Cont'd)

.2 Join pipes in accordance with AWWA C600a-80 for cast iron and ductile iron pipe and manufacturer's recommendations.

.3 Avoid damage to machined ends of pipes in handling and moving pipe.

.4 Maintain grade and alignment of pipes.

.5 Align pipes carefully before jointing.

.6 Do not exceed maximum joint deflection recommended by pipe manufacturer unless directed in writing by Engineer. Use special bends where necessary to avoid joint deflection.

.7 Support pipe firmly over entire length, except for clearance necessary at couplings.

.8 Keep pipe and pipe joints free from foreign material.

.9 Avoid bumping gasket and knocking it out of position, or contaminating with dirt or other foreign material. Gaskets so disturbed to be removed, cleaned, lubricated and replaced before jointing is attempted.

.10 Support pipes by means of hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.11 Apply sufficient pressure in making joint to ensure that joint is complete to manufacturer's recommendations.

.12 Apply restraint to force main to ensure that joints when completed are held in place, by tamping fill material under and alongside pipe, or otherwise as approved by Engineer.

.13 Block pipe as directed when any stoppage of work occurs to prevent creep during downtime.

3.5 Thrust Blocks

.1 Place concrete thrust blocks between bends, tees and fittings and undisturbed ground.

.2 Keep pipe couplings free of concrete.

3.5 Thrust Blocks (Cont'd)

.3 Bearing area of thrust blocks to be as shown on drawings.

3.6 Field Testing of Force Main

.1 Testing of force main to be carried out under supervision of Engineer.

.2 Before testing, bed and cover pipe between joints to prevent movement of force main when test pressure is applied.

.3 Leave joints and fittings exposed.

.4 Strut and brace caps, bends and tees, to prevent movement when test pressure is applied.

.5 Expel air from force main, by slowly filling main with water. High points to be drilled and tapped and suitable cocks installed to vent air and to be shut when pressure is applied. Remove cocks after satisfactory completion of test and seal holes with tight fitting plugs.

.6 Apply a hydrostatic test pressure of 1.5 MPa based on elevation of lowest point in line and corrected to elevation of test gauge for hydrostatic test and 1.0 MPa for leakage test.

.7 Apply pressure for 1h for pressure test and 2h for leakage test.

.8 Examine exposed pipe, joints and fittings while system is under pressure.

.9 Remove defective joints, pipe and fittings and replace with new sound material.

.10 Make leaking joints watertight.

.11 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2h.

.12 Do not exceed allowable leakage as defined in AWWA C600a-80.

.13 Locate and repair defects if leakage is greater than amount specified in item 3.6.12.

3.6 Field Testing of Force Main (Cont'd)

.14 Repeat test until leakage is within specifie allowance for full length of force main.

.15 Complete backfill.

.16 Repeat test after completing backfill.

3.7 Installation of Pump System

.1 Install pumps and controls to manufacturer's recommendations.

.2 When the contractor has completed his installation work and before the equipment is operated, the Contractor will instruct the Supplier to commission the equipment.

.3 Provide the services of a technical representative to the site to carry out the tests.

.4 Provide the following checks and tests and prepare an itemized report as to their condition:

.1 Pump Condition: pump body, impeller running free, quick disconnect connection, cable connections, gaskets and oil level.

.2 Wet Well Condition: pump sliding free on guide rails, pump cable with sufficient slack, floats suitably positioned and will not snarl, no cable splices or junction box int the wet well, well clean.

.3 Control Panel Condition: components including motor overloads correctly rated for the pumps. Record overload settings on schematic, date and sign.

.4 Start-up Operation: supply voltage suitable, pump rotation correct, operation of pumps, float switches, lead pump selector, overloads isloate associated control, alarm float.

.5 Pump Load Checks: load current on all phases for single and parallel pump operation, supply voltage under load.

.6 Further Tests: as directed by the Engineer.

.5 Instruct base personnel on the operation and service of the equipment either during the checks and tests or afterwards.

3.8 Painting and Packing

.1 Surface Preparation: prepare the surface of the pump assembly and steel access frames and covers by blast cleaning to SSPC - SP6 requirements (commercial blast cleaning), prepare other ferrous components covered in Part 4 Auxilliary Equipment to SSPC - SP3 requirements (Power tool cleaning).

.2 Painting/Galvaninzing: steel access frames and covers, hot dip galvanize after fabrication, pump assembly and other ferrous auxiliary equipment - apply a factory primary coat anc compatible finish coats for corrosion protection.

.3 Packing: provide packing to protect against breakage or loss of components during transi to its distination, also moisture in the control panel.

---------- END ----------

PART 1 - GENERAL

1.1 Related Work

.1 Concrete accessories: Section 03250

.2 Concrete reinforcement: Section 03200

.3 Cast-in-place concrete: Section 03300

.4 Formvoid: Section 02220

1.2 Reference Standards

.1 Do concrete formwork in accordance with ACI-347-78 and CAN3-A23.1-M77, except where specified otherwise.

.2 Do falsework in accordance with CSA S269.1-1975, except where specified otherwise.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate method and schedule of construction, materials, arrangement of joints, ties, shores, liners and locations of temporary embedded parts.

1.4 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

PART 2 - PRODUCTS

2.1 Materials

.1 Formwork lumber: plywood and wood formwork materials to CAN3-A23.1-M77.

.2 Form areas, where concrete surface remains exposed, with high density overlaid plywood to CSA 0121-M1978.

.3 Form release agent: chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing set of film of concrete in contact with form.

.4 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

PART 3 - EXECUTION

3.1 Erection

.1 Verify lines, levels and column centres before proceeding with formwork and ensure dimensions agree with drawings.

.2 Construction forms to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN3-A23.1-M77.

.3 Obtain Engineer's permission before framing openings in concrete walls not indicated.

.4 Form sides of footings.

.5 Hand-trim bottoms and remove loose earth from earth forms before placing concrete.

.6 Align form joints and make watertight. Keep form joints to minimum.

.7 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.8 Leave formwork in place for following minimum periods of time after placing concrete:
- .1 one day for walls and sides of beams
- .2 fourteen days for beam soffits, slabs, decks and other structural members or seven days when replaced immediately with adequate shoring at 3 m o/c maximum in any direction.

.9 Re-use of formwork and falsework subject to requirements of CAN3-A23.1-M77, Claus 11.9.

PART 1 - GENERAL

1.1 Related Work

.1 Concrete accessories: Section 03250

.2 Formwork Section 03100

.3 Cast-in-place concrete: Section 03300

1.2 Reference Standards

.1 Do reinforcing work in accordance with CAN3-A23.1-M77, except where specified otherwise.

1.3 Test Reports

.1 Upon request, provide Engineer with certified copy of mill test report of steel supplied, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcing work.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate bar sizes, spacing, location and quantities of reinforcement, mesh, chairs, spacers and hangers with identifying code marks to permit correct placement, without reference to structural drawings, to Reinforcing Steel Manual of Standard Practice 1983 by Reinforcing Steel Institute of Ontario.

.3 Detail placement of reinforcement where special conditions occur.

.4 Design and detail lap lengths and bar development lengths to CAN3-A23. 3-M77, unless otherwise indicated.

1.5 Delivery and Handling

.1 Deliver reinforcement to site for each stage of construction as required.

.2 Use methods which will maintain reinforcement in its fabricated form.

1.6 Substitutes

.1 Substitution of different size bars permitted only upon written approval of Engineer.

PART 2 - PRODUCTS

2.1 Materials

.1 Reinforcing steel: billet steel, grade 400 (except ties and stirrups may be grade 300) deformed bars to CSA G30.12-M1977.

.2 Welded steel wire fabric: to CSA G30.5-1972 (R1979). Provide in flat sheets where depth of concrete is less than 4".

.3 Reinforcement in exterior apron slabs, in floor slabs inside exterior overhead doors for 6 metre length and width of door and any other area exposed to de-icing chemicals shall be epoxy coated to R.S.I.O. Manual of Standard Practice.

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.4 Chairs, bolsters, bar supports, spacers: to CAN3-A23.1-M77 and adequate for strength and support of reinforcing construction conditions.

.5 Use plastic, precast concrete or other approved non-staining bar supports where concrete will remain exposed to view.

2.2 Fabrication

.1 Fabricate reinforcement to CAN3-A23.1-M77.

.2 Fabrication tolerances for reinforcing steel to "Reinforcing Steel Manual of Standard Practice 1983" by Reinforcing Steel Institute of Ontario.

.3 Obtain Engineer's approval for locations of reinforcement splices other than shown on steel placing drawings.

.4 Clearly identify reinforcement in accordance with bar lists.

PART 3 - EXECUTION

3.1 Field Bending

.1 Do not field bend reinforcement, except where indicated or authorized by Engineer.

3.1 Field Bending (Continued)

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.2 Placing Reinforcements

.1 Place reinforcing steel to CAN-A23.1-M77 and as indicated on reviewed shop drawings.

.2 Obtain Engineer's approval of reinforcing steel and position before placing concrete.

.3 Clean reinforcement before placing concrete.

PART 1 - GENERAL

1.1 Related Work

.1 Concrete formwork: Section 03100

.2 Concrete reinforcement: Section 03200

.3 Sealant: Section 07900

1.2 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

PART 2 - PRODUCTS

2.1 Materials

.1 Ribbed waterstops: extruded pvc of sizes indicated, with shop welded corner and intersecting pieces:

.1 Tensile strength: to ASTM D412-80, Die "C" method, minimum 11.4 MPa.

.2 Elongation: to ASTM D412-80, Die "C" method, minimum 275%.

.3 Tear resistance: to ASTM D624-73, Die "B" method, minimum 48 kN/m.

2. Premoulded joint fillers:

.1 Bituminous impregnated fiber board: to ASTM D1751-73 (1978).

PART 3 - EXECUTION

3.1 Waterstops

.1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.

.2 Only straight heat sealed butt joints permitted in field. Use factory welded corners and intersections.

3.2 Joint Fillers

.1 Locate and form expansion joints as indicated. Install joint filler.

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Underslab granular fill: Section 02220

.2 Excavation for pile caps: Section 02220

.3 Concrete accessories: Section 03250

.4 Concrete formwork: Section 03100

.5 Concrete reinforcement: Section 03200

.6 Concrete floor finishes: Section 03345

.7 Perimeter insulation: Section 07212

.8 Equipment bases: Section 16221

1.2 Reference Standards

.1 Do cast-in-place concrete work in accordance with CAN3-A23.1-M77, except where specified otherwise.

1.3 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

PART 2 - PRODUCTS

2.1 Materials

.1 Cement: Normal, type 10, to CAN3-A5-M77.

.2 Water, fine aggregates, normal density, coarse aggregates: to CAN3-A23.1-M77.

.3 Air entraining admixtures: to CAN3-A266.1-M78.

.4 Water reducing admixtures: Type WN to CAN3-A266.2-M78.

.5 Pozzolanic mineral admixtures: to CAN3-A23.5-M82.

.6 Non-shrink grout: premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, of pouring consistency, capable of developing compressive strength of 50 MPa at 28 days.

.7 Dry pack: premixed composition of non-metallic aggregate, cement and sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compression strength of 50 MPa at 28 days.

2.2 Concrete Mixes

1. General

a. All concrete to be normal density concrete, proportioned to Clause 14 in CAN3-A23.1-M77 to give required mixes.

b. All cement, normal type 10.

c. Weight of all concrete - 2,400 kg/m^3.

d. All concrete to contain water-reducing admixture.

e. 28 day strength for all concrete to be 30MPa unless noted otherwise on drawings. Skim slab shall be 15 MPa.

f. All concrete exposed to freeze-thaw cycles shall contain air entrainment at 6% $\pm$ 1%.

g. Slump at point and time of discharge - maximum 80 mm, minimum 20 mm.

2. Floor slab over steel deck - minimum cement content of 285 kg/m^3 of concrete, Class D exposure, 14 mm nominal coarse aggregate.

3. Wall beams and pile caps - Class C exposure, 28 mm nominal coarse aggregate.

4. Framed slab on grade, slab on grade and suspended slabs - foot traffic only - minimum cement content of 285 kg/m^3 of concrete, class D exposure, 20 mm nominal coarse aggregate.

5. Framed slab on grade and slab on grade subject to vehicular traffic - minimum cement content of 320 kg/m^3 of concrete, class D exposure, 20 mm nominal coarse aggregate.

6. Concrete walls - class C exposure, 20 mm nominal coarse aggregate.

7. Exterior concrete slabs - minimum cement content of 320 kg/m^3, class A exposure, 20 mm nominal coarse aggregate.

8. Skim coat - Class D exposure, 20 mm nominal coarse aggregate.

9. Concrete fill in pipe piles - Class D exposure, 20 mm nominal coarse aggregate.

2.2 Concrete Mixes (Continued)

10. Provide certification that plant, equipment, and all materials to be used in concrete comply with the requirements of CAN3-A23.1-M77

11. Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with CAN3-A23.1-M77, Clause 17.5.

12. Obtain Engineer's approval before using chemical admixtures other than those specified

13. Use of calcium chloride not permitted.

PART 3 - EXECUTION

3.1 Workmanship

.1 Obtain Engineer's approval before placing concrete. Provide 48 hour notice prior to placing of concrete.

.2 Place concrete in accordance with CAN3-A23.1-M77.

.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

.4 Obtain Engineer's approval of proposed method of protection of concrete during placing and curing in adverse weather, prior to placing of concrete.

.5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

3.2 Inserts

.1 Set sleeves, ties, anchor bolts, pipe hangers and other inserts, openings and sleeves, in concrete floors and walls, as required by other trades. Sleeves, openings, etc., greater than 100 x 100 mm not indicated on structural drawings must be approved by Engineer.

.2 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of all modifications from Engineer before placing of concrete.

3.2 Inserts (Continued)

.3 Check locations and sizes of sleeves, openings, etc., shown on structural drawings with architectural, mechanical and electrical drawings.

3.3 Grouting

.1 Grout underside of steel column and beam bearing plates with non-shrinking grout to manufacturer's instructions.

3.4 Finishing

.1 Finish vertical concrete surfaces to CAN3-A23.1-M77.

.2 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges, unless otherwise detailed.

3.5 Defective Concrete

.1 Remove defective concrete, blemishes and embedded debris and repair as directed by Engineer.

3.6 Inspection and Testing

.1 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Engineer.

.2 Frequency and method of testing shall be to CAN3-A23.1-M77 and CAN3-A23.2-M77. (Minimum of one strength test for each 100 m^3 of concrete placed each day and at least 1 test for each separate type of concrete placed each day.)

.3 Prepare one additional test cylinder during cold weather concreting. Cure cylinder on job site under same conditions as concrete it represeents.

.4 Engineer will pay costs for testing. Refer to Section 01410.

PART 1 - GENERAL

1.1 Related Work

.1 Concrete reinforcement: Section 03200

.2 Cast-in-place concrete: Section 0330(

.3 Joint sealants: Section 0790(

1.2 Reference Standards

.1 Do concrete floor finishing in accordance with CAN3-A23.1-M77, except where specified otherwise.

.2 Concrete Floor Contractors Association Specifications.

.3 Terrazzo Tile and Marble Association of Canada Specifications.

1.3 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

PART 2 - PRODUCTS

2.1 Materials

*.1 Non-metallic floor hardener - hangar (helicopter area only) - Colorplete L.R. by Sternson. See Room Finish Schedule for colour.

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*.2 Curing Compound - hangar (helicopter area only) - Florseal by Sternson coloured to match floor. Keep floor protected. After 28 days, apply Colorhard Wax by Sternson.

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.3 Non-metallic non slip floor hardener: premixed mineral aggregates, including emery particles.

.4 Saw cut filler: two component, catalyst cured, self-levelling sealant.

.5 Water: Clean, potable taken directly from water mains.

.6 Cover sheets for curing concrete slabs: 2 mil thick flexible plastic.

PART 3 - EXECUTION

3.1 Floor Finish

1. General

a. Apply materials in accordance with manufacturer's specifications.

b. See Architectural Room Finish Schedule for locations of various types of finish required.

c. Slope floors to drains.

d. Float surface with wood or metal floats or with power finishing machine and bring surface to grade. Use stainless steel trowel blades in hangar (helicopter area.)

e. Do not sprinkle dry cement or dry cement and sand mixture over concrete surfaces.

f. Saw cut crack-control joints where shown on drawings to CAN3-A23.1-M77.

g. Grind areas which do not meet requirements for smoothness of elevation.

2. Exposed Concrete Floor - hangar (helicopter area)

a. Wood float into surface, in two shakes, 14 kg/m^2 total of non-metallic floor hardener (item 2.1.1.)

b. Spin trowel surface to produce non-slip finish to Class B tolerance.

3. Exposed concrete floors - shops and other areas listed as hard concrete:

a. Wood float into surface, in two shakes, 5 kg/m^2 total of non-metallic non-slip floor hardener.

b. Spin trowel surface to produce non-slip finish to Class B tolerance, except welding layout area (see Drawing S1) which shall have Class A tolerance.

4. Remaining exposed concrete floors and below VAT and Carpet:

a. Steel trowel to produce a smooth surface with Class B tolerance.

3.1 Floor Finish (Continued)

5. Exterior Aprons:

   a. Finish in accordance with Architectural drawings to Class B tolerance.

6. Terrazzo:

   a. Rake surface to provide bond.

7. Ceramic Tile:

   a. Wood float to Class B tolerance.

8. Curing:

   a. In all areas, except hangar (helicopter area) after slab finishing operations completed, soak surface of slab with water.

   b. Place cover sheets on slabs, while surface is still wet.

   c. Tape all joints to prevent loss of moisture.

   d. Provide ballast on cover sheets where required to prevent damage from wind.

   e. Keep cover sheets in place for 7 days.

3.2 Repairing cracks in Concrete Slabs

.1 After concrete has set for 28 days, examine surfaces carefully for cracks.

.2 Fill cracks with grout and make good slab surface.

PART 1 - GENERAL

1.1 Related Work

.1 Mortar and grout for masonry: Section 04100

.2 Masonry accessories: Section 04150

.3 Masonry reinforcing and tying: Section 04160

.4 Concrete unit masonry: Section 04220

.5 Wall insulation: Section 07411

.6 Lateral support for top of non-bearing partitions: Section 05120

1.2 Reference Standard

.1 Do masonry work in accordance with CAN3-S304-M78 except where specified otherwise.

1.3 Source Quality Control

.1 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements, in accordance with Section 01340.

1.4 Samples

.1 Submit samples in accordance with Section 01340:
.1 Two of each type of masonry unit specified.
.2 One of each type of masonry accessory specified.
.3 One of each type of masonry reinforcement and tie proposed for use.
.4 As required for testing purposes.

1.5 Product Delivery, Storage and Handling

.1 Deliver materials to job site in dry condition.

.2 Keep materials dry until use.

.3 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

1.6 Cold Weather Requirements

.1 When air temperature is below 5 deg C take following precautions in preparing and using mortar:
.1 Heat sand slowly and evenly. Do not use scorched sand, having a reddish cast, in mortar.
.2 Heat water to 70 deg C maximum; 20 deg C minimum.
.3 After combining heated ingredients maintain temperature of mortar between 5 deg C and 50 deg C until used.
.4 Protect mortar from rain and snow.

.2 Maintain dry beds for masonry and use dry masonry units only. Do not wet masonry units in winter.

1.7 Hot Weather Requirements

.1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

1.8 Protection

.1 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

.2 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

.3 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

PART 2 - PRODUCTS

2.1 Materials

.1 Masonry materials are specified in related Sections indicated in 1.1 of this Section.

PART 3 - EXECUTION

3.1 Workmanship

.1 Build masonry plumb, level and true to line, with vertical joints in proper alignment.

.2 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.2 Tolerances

.1 Walls to receive thinset ceramic tile: plumb within 1:600.

.2 Deviation in joint thickness: ±3 mm.

3.3 Exposed Masonry

.1 Remove chipped, cracked, and otherwise damaged units in exposed masonry and replace with undamaged units.

3.4 Jointing

.1 Tool with round jointer to provide smooth, compressed, uniformly concave joints for all exposed and painted concrete block surfaces.

.2 Strike flush all joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.

3.5 Joining of Work

.1 Where necessary to temporarily stop horizontal runs of masonry, and in building corners;
.1 Step-back masonry diagonally to lowest course previously laid.
.2 Do not "tooth" new masonry.
.3 Fill in adjacent courses before heights of stepped masonry reach 1200 mm.

3.6 Cutting

.1 Cut out neatly for electrical switches, outlet boxes, and other recessed or built-in objects.

.2 Make cuts straight, clean, and free from uneven edges.

.3 Where partial units are required at exposed or painted surfaces cut units with a masonry saw.

3.7 Building-In

.1 Build in items required to be built into masonry.

.2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.

.3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.

3.8 Parging

.1 Use parging mortar specified in Section 04100.

.2 Apply parging in uniform coating not less than 12 mm thick, where indicated at exterior walls, and a minimum of 6 mm thick where ceramic wall tile is to be applied to concrete unit masonry substrate.

3.9 Support of Loads

.1 Use 20 MPa concrete to Section 03300, where concrete concrete fill is used in lieu of solid units.

.2 Install building paper below voids to be filled with concrete; keep paper 25 mm back from faces of units.

.3 Where specially reinforced concrete masonry walls or partitions are indicated on structural drawings provide concrete fill and vertical reinforcement in addition to horizontal masonry reinforcement.

3.10 Provision for Movement

.1 Leave 25 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.

.2 Fill space with purpose made mineral fibre material capable of being compressed into space and of maintaining thermal, sound, and fire characteristics of wall; where installed at a fire separation material shall bear ULC label as a firestopping material and be installed to maintain fire rating of wall. At steel deck structure filler shall be preformed to suit profile of steel deck.

3.11 Loose Steel Lintels

.1 Install loose steel lintels. Centre over opening width.

3.12 Control Joints

.1 Provide continuous control joints at locations indicated or at maximum centres of 7.5 m.

.2 Construct control joints of regular joint width. Keep joint free of mortar. Stop masonry reinforcement on each side of joint unless specifically indicated otherwise. Install joint filler compressed at least 33% when installed. Neatly caulk joint with specified sealant, tooled to match mortar joints.

3.13 Testing

.1 Inspection and testing will be carried out by Testing Laboratory designated by Engineer.

.2 Engineer will pay costs for testing, as specified in Section 01410.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Masonry procedures: Section 04050

.2 Concrete unit masonry: Section 04220

1.2 Reference Standard

.1 Do masonry mortar and grout work in accordance with CSA A179M-1976 except where specified otherwise.

1.3 Samples

.1 Submit a set of six 50 x 50 x 50 mm size samples of mortar in accordance with Section 01340. Submit additional sets of six samples at intervals determined by Engineer.

1.4 Approval

.1 Do not commence masonry work until mortar is tested and approved by Engineer.

PART 2 - PRODUCTS

2.1 Materials

.1 Mortar and grout: CSA A179-M1976.

.2 Colour: ground coloured natural aggregates.

.3 Dirt resistant additives aluminum tristearate, calcium stearate or ammonium stearate.

.4 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.

2.2 Material Source

.1 Use same brands of materials and source of aggregate for entire project.

2.3 Mortar Types

.1 Mortar for interior masonry:
.1 Loadbearing: Type N based on Property specifications.
.2 Non-loadbearing: Type N based on Property specifications.

2.3 Mortar Types (Cont'd)

.2 Following applies regardless of mortar types and uses specified above:
.1 Mortar for grouted reinforced masonry: Type M based on Property specifications.
.2 Mortar for pointing: Type N based on Proportion specifications to which is added dirt resistant additive in proportion recommended by manufacturer.

2.4 Grout

.1 Grout: to CSA A179-M1976 Table 3.

.2 Grout masonry at bearing points and where indicated on drawings.

2.5 Parging

.1 Parging mortar: Type N, based on Property specification CSA A179-M1976.

PART 3 - EXECUTION

3.1 Measurement and Mixing

.1 Mix grout to semi-fluid consistency.

.2 Incorporate admixtures into mixes in accordance with manufacturer's instructions.

.3 Prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour nor more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Masonry procedures: Section 04050

.2 Mortar and grout for masonry: Section 04100

.3 Masonry reinforcing and tying: Section 04160

.4 Concrete unit masonry: Section 04220

PART 2 - PRODUCTS

2.1 Materials

.1 Control and expansion joint filler: extruded, closed cell, expanded polyethylene, in rod or tube form with uncompressed width of 1.5 times joint width.

.2 Sealant for control joints: one component, elastomeric, chemical-curing to CAN2-19.13-M82, Type 2.

.3 Building paper: around steel columns at expansion joints: to CAN2-51.32-M77, single ply laminated type, impregnated, non-perforated.

PART 3 - EXECUTION

Refer to Section 04050 and 04220.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Masonry procedures: Section 04050

.2 Mortar and grout for masonry: Section 04100

.3 Masonry accessories: Section 04150

.4 Concrete unit masonry: Section 04220

1.2 Reference Standards

.1 Do masonry reinforcing and tying in accordance with CAN3-S304-M78 unless specified otherwise.

PART 2 - PRODUCTS

2.1 Materials

.1 Metal ties and wire reinforcement: to CAN3-S304-M78.

.2 Bar type reinforcement: to CAN3-S304-M78.

.3 Bolts and anchors: to CAN 3-S304-M78.

.4 Corrosion protection: to CAN3-S304-M78, for metal ties and horizontal reinforcing in exterior walls, walls in shower area, and perimeter walls of Washroom Area 160.

PART 3 - EXECUTION

3.1 Horizontal Reinforcing

.1 Install in wythes of concrete unit masonry at vertical intervals 400 mm maximum, horizontal reinforcement comprising two 3.8 mm deformed rods, each rod 25 mm from each face, and lapped 150 mm at each splice. Use heavier reinforcement where indicated on reinforcing schedule on structural drawings.

3.2 Bonding and Tying

.1 In addition to installation of horizontal reinforcing to 3.1.1 above, bond double wythe walls of Test Room 124 using adjustable, hooked box-type metal ties between wythes, with maximum spacing of one tie per 0.247 sq m of wall area. Hook ties fabricated of 3.8 mm rods.

.2 At steel columns: hooked flat bar galvanized ties to suit clips on columns as provided by Section 05120. Minimum size: 3 mm thick x 25 mm wide x 200 mm long with 25 mm turn-downs Z-275 galvanizing.

3.2 Bonding and Tying (Cont'd)

.3 Masonry ties to concrete substrate: galvanized dovetail ties to suit anchor slots provided by Section 03300. Minimum size: 3 mm thick x 25 mm wide x 200 mm long, Z-275 galvanizing. Install at 200 mm centres vertically.

3.3 Engineered Masonry

.1 Concrete filled and reinforced engineered masonry in accordance with CAN3-S304-M78 and as indicated on structural drawings.

.2 Above concrete fill and vertical/reinforcement is in addition to specified horizontal masonry reinforcement.

3.4 Reinforced Lintels and Bond Beams

.1 Reinforce masonry lintels and bond beams as indicated. Make joints in lintels and bond beams to match adjacent walls.

.2 Place and grout reinforcing in accordance with CAN3-S304-M78. Use concrete of 20 MPa strength conforming to requirements of Section 03300.

3.5 Bolts and Anchors

.1 Embed bolts and anchors solidly in mortar or grout to develop maximum resistance to design forces.

3.6 Control Joints

.1 Stop reinforcing 25 mm short of each side of control joints unless otherwise indicated.

3.7 Lateral Support and Anchorage

.1 Provide lateral support and anchorage in accordance with CAN3-S304-M78 and as indicated.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1	Masonry procedures:	Section 04050
.2	Mortar and grout for masonry:	Section 04100
.3	Masonry accessories:	Section 04150
.4	Masonry reinforcing and tying:	Section 04160
.5	Wall insulation:	Section 07411

PART 2 - PRODUCTS

2.1 Materials

.1 Standard concrete masonry units to CSA A165.1-M1977.
- .1 Classification:
  - .1 Hollow units: H/7.5/A/M
  - .2 75% solid units: S/12.5/A/M
  - .3 100% solid units: S/12.5/A/M
- .2 Size: modular.
- .3 Special shapes: provide bullnosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams, and where half-size units are indicated.

.2 Acoustical concrete masonry units to CSA A165.1-M1977 purpose-made slots to provide the acoustical characteristics specified.
- .1 Classification: H/7.5/C/M
- .2 Size: modular.
- .3 Special shapes: Provide purpose-made shapes for lintels and bond beams.
- .4 Noise reduction coefficients:
  - .1 NRC range .60 to .70 for 150 mm wide units with 16 mm wide slots and two cavities with non-combustible fibrous filler elements, when surface painted before testing.
- .5 Sound transmission class: STC 47 for 150 mm wide units with 16 mm wide slots and non-combustible fibrous filler elements when painted on unslotted side with two coats cement base paint before testing.

.3 Concrete brick units: solid ashtar units, 390 x 90 x thickness indicated, or solid concrete brick, 190 x 57 x 90, laid to indicated wall thicknesses. Classification: S/12.5/A/M.

PART 3 - EXECUTION

3.1 Laying Concrete Masonry Units

.1 Bond: running stretcher.

.2 Coursing height: 200 mm for one block and one joint.

.3 Jointing: concave where exposed or where paint or other finish coating is specified. Cut joints flush behind base.

.4 Bearing: Provide 100% solid units for two courses below bearing points of lintels and structural elements, and at other indicated locations.

.5 In addition to horizontal reinforcing specified in Section 04160, install horizontal reinforcing in first and second bed joints above and below openings and extending a minimum of 600 mm beyond each side of opening.

.6 Construct bases for lockers and fill with grout.

3.2 Concrete Masonry Lintels

.1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.

.2 End bearing: not less than 200 mm.

3.3 Cleaning

.1 Allow mortar droppings on concrete masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block and finally by brushing.

.2 Upon completion of concrete unit masonry in an area where masonry is to be exposed, scrub surfaces by saturating masonry with clean water and scrubbing vigorously with stiff fibre brushes and a solution of trisodium-phosphate and clean water. Rinse thoroughly with clean water under pressure. Clean a test area, allow to dry and obtain Engineer's approval before proceeding. Carry out balance of cleaning work to standard approved in test area.

**********END**********

ncrete and

teel joists: Section 05210

etal decking: Section 05315

etal siding: Section 07411

iscellaneous metals: Section 05500

prayed fireproofing: Section 07250

inish painting: Section 09900

Beams supporting monorails: Section 14330

Lintels: Section 05500

Do structural steel work in accordance with CSA S16-1969 and CSA S16S3-1981, except where specified otherwise. Keep copy on site during construction.

Do welding in accordance with CSA W59-1982, except where specified otherwise.

Submit 4 certified copies of mill reports covering chemical and physical properties of steel used in this work.

Design details and connections in accordance with requirements of CSA S16-1969 and CSA S16S3-1981 to resist forces, moments and shears indicated.

Submit shop drawings in accordance with Section 01340.

1 Project will be built in stages. Allow for multi phases of construction.

1 Structural steel to CAN3-G40.21-M81 as follows:

(a) rolled sections - Grade 300W

(b) H.S.S. sections - Grade 350W, Class H to CAN3-G40.20-M81.

2 Bolts, nuts and washers: to ASTM A325M-79.

3 Welding materials: to CSA W59-1982.

Shop paint primer: to CGSB 1-GP-40M.

Fabricate structural steel as indicated in accordance with CSA S16-1969, CSA S16S3-1981 and in accordance with shop drawings.

Provide punched holes from 11 to 27 mm in diameter for attachment of other work. Refer to drawings for details and locations.

Reinforce openings to maintain required design strength.

Weld 3" long steel slots to all columns and overhead door frames in masonry walls at 400 mm o/c vertically, to suit block coursing, to accept masonry anchors.

All steel members must be straight within tolerance of 1:1000.

3.2 O/H Door Frames, Bollards and Guardrails

.2 Provide smooth even surfaces by grinding any raised lettering rolled in, notches, ridges, or other surface defects.

.3 Cut all members to fit neatly into required position. Mitre and weld all guard rail joints as shown on Drawing S7.

.4 Make all welds neat and continuous. File or grind exposed welds smooth and flush.

.5 Erected members shall be in required plane within tolerance of 1:1000.

3.3 Shop Painting

.1 Clean, prepare surfaces to SSPC-SP3 and shop prime structural steel in accordance with CSA S16-1969, except where members to be encased in concrete.

3.4 Marking

.1 Mark materials in accordance with CAN3-G40.20-M81. Do not use die stamping. Place marking at locations not visible from floor after erection.

.2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.5 Erection

.1 Erect structural steel as indicated in accordance with CSA S16-1969, CSA S16S3-1981 and reviewed shop drawings.

.2 Make all exterior welds continuous. Welds which remain exposed to view must be carefully done to give a neat appearance or else repaired to approval.

.3 Obtain written permission of Engineer prior to field cutting or altering of structural members not shown on drawings.

.4 Touch up shop primer to bolts, welds and burned or scratched surfaces at completion of erection.

3.6 Field Quality Control

.1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Engineer.

.2 Engineer will pay costs of tests as specified in Section 01410.

PART 1 - GENERAL

1.1 Related Work

.1 Structural steel: Section 05120

.2 Metal decking: Section 05315

.3 Field painting: Section 09900

1.2 Reference Standards

.1 Do work in accordance with CSA S16-1969 and CSA S16S3-1981, except where specified otherwise.

.2 Do welding in accordance with CSA W59-1982, except where specified otherwise.

.3 Use qualified fabricators in accordance with CSA W47.1-1973 Division 1.

1.3 Design of Steel Joists

.1 Design steel joists to carry loads indicated on drawings in accordance with CSA S16-1969 and CSA S16S3-1981.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Each drawing submitted shall bear the signature and stamp of qualified professional engineer registered in Province of Ontario.

.3 Indicate joist spacing, bearing and anchorage details, framed openings, accessories, schedule of materials, depth, camber and loadings.

1.5 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

PART 2 - PRODUCTS

2.1 Materials

.1 Structural steel: Grade 300W to CAN3-G40.21-M81 and CSA S136-1974.

.2 Welding materials: to CSA W59-1982.

.3 Shop paint primer: to CGSB 1-GP-40M.

2.2 Fabrication

.1 Fabricate steel joists and accessories in accordance with CSA S16-1969 and CSA S16S3-1981.

.2 Weld in accordance with CSA W59-1982.

.3 Provide top and/or bottom chord extensions where indicated.

2.3 Shop Painting

.1 Clean, prepare surface to SSPC-SP3 and shop prime steel to CSA S16-1969 and CSA S16S3-1981.

PART 3 - EXECUTION

3.1 Erection

.1 Erect steel joists and bridging as indicated in accordance with CSA S16-1969, CSA S16S3-1981 and reviewed shop drawings.

.2 Where ceilings are not provided, install bridging carefully in straight lines and splice at joists to give neat appearance.

.3 Obtain written permission from Engineer prior to field cutting or altering joists or bridging.

.4 Touch up shop primer to bolts, welds, burned or scratched surfaces at completion of erection.

3.2 Field Quality Control

.1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Engineer.

.2 Engineer will pay costs of tests as specified in Section 01410.

PART 1 - GENERAL

1.1 Related Work

.1	Curved Monitor Roof and Sunscreen Panels	Section 05316
.2	Cast-in-Place Concrete	Section 03300
.3	Structural steel:	Section 05120
.4	Steel joists:	Section 05210
.5	Miscellaneous metal:	Section 05500
.6	Installation of acoustic deck insulation:	Section 07550
.7	Built-up roofing:	Section 07550
.8	Field painting:	Section 09900
.9	Metal siding:	Section 07411

1.2 Reference Standards

.1 Do design, fabrication and erection in accordance with CSA S136-1974 and CSA S136.1-1975.

.2 Do steel decking work in accordance with Canadian Sheet Steel Building Institute Standard for Steel Roof Deck, October 1976, Revised June 1981, except where specified otherwise.

.3 Do welding in accordance with CSA W59-1982, except where specified otherwise.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Each drawing submitted shall bear the signature and stamp of qualified professional engineer registered in Province of Ontario.

.3 Clearly indicate decking plan, profile, dimensions, core thickness, connections to supports and spacings, projections, location and type of closures, openings and reinforcement details and accessories.

1.4 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

PART 2 - PRODUCTS

2.1 Materials

.1 Sheet steel: Grade A structural quality to ASTM A446-76 with Z275 zinc coating to ASTM A525-80.

.2 Acoustical insulation in acoustic deck: fibrous glass 18.0 kg/m^3 density profiled to suit deck flutes. Supply to site for installation by Division 07550.

.3 Acoustic closures: 25 mm thick closed cell neoprene profiled to deck corrugations.

.4 Cover plates, cell closures and flashings in deck containing concrete: galvanized steel sheet with minimum steel core thickness of 0.86 mm.

.5 Primer: zinc rich, ready mix to CGSB 1-GP-181+Amdt-Mar-78.

2.2 Types of Decking

.1 Roof deck and floor deck: 0.76 mm core thickness, 38 mm deep profile, non-cellular, with interlocking side laps.

.2 Acoustic roof deck: 0.76 mm core thickness, 38 mm deep profile, non-cellular, perforated on vertical face of flutes, with interlocking side laps.

PART 3 - EXECUTION

3.1 Erection

.1 Erect metal decking as indicated to manufacturer's instructions.

.2 Immediately after decking is permanently secured in place, touch up galvanized surface with primer where scratched or burned by welding.

.3 In areas where there are no ceilings, special care must be used to prevent damage to exposed surface of deck. Final appearance of exposed steel deck must be acceptable to Engineer. Remove and replace unacceptable areas at no additional cost.

3.2 Closures

.1 Install acoustic closures over all exterior walls and over each face of interior partitions where ceilings omitted.

.2 Where flutes run at right angles to interior partitions, fill web spaces with double run of steel acoustical closures.

.3 Where flutes are parallel to interior partitions, install steel closure flashings to provide neat juncture between two materials.

.4 Closures are not required between interior partitions and underside of decking in areas having suspended ceiling.

.5 Attach metal cell closures at locations required to contain poured concrete as recommended by manufacturer.

3.3 Openings and Areas of Concentrated Loads

.1 Framing of deck openings 150 to 300 mm shall be as recommended by manufacturer, except as otherwise indicated. No reinforcement required for openings cut in deck which are smaller than 150 mm.

.2 For deck openings over 300 mm and for areas of concentrated load, reinforce in accordance with structural framing details.

PART 1 - GENERAL

1.1 Related Work

.1	Structural steel framing members:	Section 05120
.2	Steel Joists:	Section 05210
.3	Steel Decking:	Section 05315
.4	Metal siding and soffits:	Section 07411
.5	Curved sunscreens over south and east windows of Administration Wing and over south windows of Waiting 102 and Chief Pilot 104.	Section 07411

1.2 Reference Standards

.1 Do design, fabrication and erection in accordance with CSA S136-1974 and CSA S136.1-1975.

.2 Do steel decking work in accordance with Canadian Sheet Steel Building Institute Standards for Steel Roof Deck, Oct. 1976, Rev. June 1981, except where specified otherwise.

.3 Do welding in accordance with CSA W59-1982, except where specified otherwise.

1.3 Examination

.1 Before commencing erection, carefully examine structure and if any defects or discrepancies between the structure and the reviewed erection drawings are found, the General Contractor will be notified at once and work will not commence until corrective measures are taken.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate dimensions, thicknesses, profiles, supporting and attachment methods, closures, flashings and related work.

.3 Employ the services of a professional structural engineer, licensed in the Province of Ontario, to design curved monitor roof and wind deflectors to safely sustain loads and stresses supported by structural supports provided under Section 05120. Shop drawings shall bear stamp of responsible professional engineer.

1.5 Construction Stages

.1 Project will be built in stages. Allow for multi phases of construction.

PART 2 - PRODUCTS

2.1 Materials

.1 Steel Decking: minimum of 0.61 mm thick Grade A structural quality to ASTM A446-76, Z275 zinc coating to ASTM A525-M80, prepainted both sides, curved parallel to flutes. Profile same as Type 2 siding indicated on drawings.

.2 Galvanized flat sheet: over inner steel deck before vapour barrier is applied, to ASTM A526-80 with Z-275 zinc coating. Minimum base metal thickness: 0.4 mm. Secure to inner steel deck with pop-rivets at 300 mm centre in both directions, or by alternate fastening approved by Engineer.

.3 Insulation: semi-rigid glass fibre insulation with density of 29 kg/m^3. Thickness are required to provide insulation with total RSl=2.9.

.4 Wind vapour barrier: reinforced, flexible polyvinyl chloride sheet to CGSB 37-GP-54 m of type for concealed application meeting following requirements.

.1 Main sheet: thickness: 1.5 mm; weight 2kg/m^2; tensile strength: 750N/5cm; water vapour transmission not exceeding 3 gr/24h.m^2; colour: black.

.2 Interfacing sheet where in contact with bituminous flashing: thickness: 1.2 mm; weight 1.6 kg/m^2; tensile strength: 600 N/5cm; colour: yellow.

.3 Adhesive: fully adhere to substrate using adhesive recommended by manufacturer.

.4 Joints and laps: fully heat welded using equipment and method recommended by manufacturer.

.5 Installation: to CGSB 37-GP-55M and manufacturer's instructions.

.5 Sub girts, clips and angles: Grade A structural quality to ASTM A446-76, Z275 zinc coating to ASTM A525-M80.

2.1 Materials (Continued)

.6 Exposed flashings and closures: same thickness and finish as outer sheet.

.7 Concealed sheet metal flashings and closures: galvanized sheet steel with base metal thickness of 0.46 mm.

.8 Side lap waterproofing: tubyl tape.

.9 Flute closures: 25 mm thick, closed cell neoprene, profiled to deck corrugations.

2.2 Types of Decking

.1 Curved Monitor Roof (sandwich panel)
a. Outer sheet and liner sheet - pre-painted steel deck, 0.61 mm minimum core thickness, 38 mm deep profile non-cellular, with side laps.
b. Fibrous glass insulation.
c. Vapour barrier.
d. Sub girts, clips and reinforcement for hanging loads.

.2 Curved Wind Deflector on Monitor Roof and curved bulkhead above hangar door: prefinished, preformed aluminum cladding of Type 2 profile with base metal thickness of 1.27 mm. Finish as specified in Paragraph 2.1.2 of Section 07411. Factory formed to required radius. Supporting members shall be galvanized after fabrication.

2.3 Prepainting

.1 Painting both sides of deck, shall be completed before curving of deck commences.

.2 Sheets shall be prefinished with colours of proven durability and suitable for 20 year exterior exposure. Colours as indicated on Finish and Colour Schedule.

.3 Film dry thickness shall be 0.023 mm thick $\pm$ 0.005 mm to ASTM D105.

.4 Specular gloss shall be 30 plus or minus 5 degrees when measured with a Gardner 60° Glossmeter to ASTM D-523.

PART 3 - EXECUTION

3.1 Erection

1. General

a. All curved sections of decking to be erected by manufacturer.

b. Provide separation from metal other than steel.

2. Curved Monitor Roof

a. Curved liner sheet shall be fastened to the structural steel girts with No. 14 x 20 mm long type AB screw at maximum 300 mm centres.

b. Provide air and watertight interfaces with work by other Sections.

c. Fasten side laps of liner sheet with No. 14 x 20 mm long type AB screw at maximum of 600 mm.

d. Clips and sub-girts shall be fastened to structural steel with No. 14 x 20 mm long type AB screw at spacing recommended by manufacturer.

e. Install vapour barrier to liner sheet, fold and seal side laps.

f. Fasten insulation to liner sheet with hallmark adhesive or with insulation pins as required. Insulation to be installed in a minimum of two thicknesses with staggered joints.

g. Curved outer sheet to be fastened to sub-girts with a weatherguard screw at a maximum of 300 mm centres, complete with a neoprene bonded washer, colour to match the siding.

h. Side laps of outer sheet are to be caulked with butyl tape caulking and fastened with a weatherguard screw at a maximum of 600 mm.

j. Flashings and closures shall be fastened with weatherguard screws at 300 mm centres maximum.

3.1 Erection (Continued)

3. Curved Wind Deflectors and Curved Bulkhead over Hangar Door

a. Fasten sheets to sub-girts as g, above.

b. As h, above.

c. As j, above.

PART 1 - GENERAL

1.1 Related Work

.1	Installation of anchors in concrete and masonry:	Section 03300
.2	Structural steel:	Section 05120
.3	Metal joists:	Section 05210
.4	Metal stairs and associated stair rails, and wall rails, except stainless steel:	Section 05510
.5	Exterior 219 mm OD HSS pipe bollard and guard rails at buildings, at Guard House, in vicinity of north entrance to Administration Wing, and south of new Helicopter Hangar:	Section 05120
.6	Steel HSS framing for openings for exterior overhead doors:	Section 05120
.7	Supply of windsock mast on Helicopter Hangar:	Engineer.
.8	Supply of floor sockets in Shop 153 and Test Room 154:	Engineer
.9	Supports for Cooling Tower enclosure:	Section 05120
.10	Sump frames and covers, interior catch basin and floor trench frames and covers:	Section 15404

1.2 Reference Standards

.1 Do welding work in accordance with CSA W59-1982 unless specified otherwise.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

PART 2 - PRODUCTS

2.1 Materials

.1 Steel sections and plates: to CAN3-G40.21-M81, Grade 300W.

.2 Hollow structural sections: to CAN3-G40.21-M81, Grade 350W, Class H galvanized finish.

.3 Stainless steel: Type 302, exposed surfaces to have No. 4 polished finish.

.4 Welding materials: to CSA W59-1982.

.5 Bolts and anchor bolts: to ASTM A307-80.

.6 Galvanizing: unpassivated hot dipped galvanizing with minimum zinc coating of 600 g/sq m to CSA G164-M1981.

.7 Shop coat primer: to CGSB 1-GP-40M.

.8 Galvanized primer: zinc rich, ready mix to CGSB 1-GP-181M+Amdt-Mar-78.

.9 Grout: non-shrink, non-metallic, flowable, 24 hour MPa 15, pull-out strength 7.9 MPa.

2.2 Fabrication

.1 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Fabricate items from steel unless otherwise noted.

.3 Use self-tapping shake-proof countersunk flat headed screws on items requiring assembly by screws or as indicated.

.4 Where possible, fit and shop assemble work, ready for erection.

.5 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 Shop Painting

.1 Apply one shop coat of primer to metal items, with exception of stainless steel, aluminum, galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C.

.3 Clean surfaces to be field welded; do not paint.

.4 Use zinc rich primer on all exterior work.

PART 3 - EXECUTION

3.1 Erection

.1 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.2 Provide suitable means of anchorage acceptable to the Engineer, such as dowels, anchor clips, bar anchors, expansion bolts and shields, toggles.

.3 Make field connections with high tensile bolts, or weld to CSA S16-1969 and CSA S16S1-1975.

.4 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.5 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection.

.6 Touch-up galvanized surfaces with zinc primer where burned by field welding.

3.2 Angle Lintels

.1 Supply mason with loose angle lintels of sizes indicated, for openings in masonry walls unless otherwise noted. Prime paint.

.2 Provide 150 mm minimum bearing at ends. Weld or bolt together where installed back-to-back.

3.3 Pipe Railings at Exterior Concrete Stairs

.1 Fabricate to detail of 50 mm OD seamless steel pipe with minimum wall thickness of 3.9 mm. All joints welded and ground smooth. Shop prime with 2 coats of zinc rich primer.

.2 Set railing standards in concrete with grout. Trowel surface smooth and flush with adjoining surface.

3.4 Corner Guards

.1 75 x 75 x 6 mm steel angle 1200 mm high with 3 anchors each guard.

.2 Apply shop coat of primer.

3.5 Access Ladders

.1 Fabricate ladders from 20 mm dia rungs let through 10 x 50 mm stringers and welded. Space rungs 300 mm oc. Set ladder a minimum of 100 mm clear of wall on bracket supports at 1200 mm oc except as otherwise indicated. Configuration and width as indicated.

.2 Galvanize finish for exterior, prime paint for interior.

.3 Galvanize exterior ladders after fabrication.

.4 Anchor securely to structure with fasteners to suit application. Use hot-dip galvanized fasteners for exterior ladders.

3.6 Service Pit Grating Helicopter Hangar

.1 Fabricate in two removable sections to suit indicated size of service pit.

.2 Provide frames for three sides of pit, fabricated of 38 x 38 x 6 mm steel angle, mitred at corners, and with concrete anchors at 300 mm centres. Galvanize after fabrication.

.3 Grating of all-welded construction consisting of 32 x 3 mm serrated steel flat bars, on edge, at 30 mm centres. 6 mm twisted steel cross bars at 100 mm centres. Galvanize after fabrication.

.4 Secure each section with two galvanized steel saddle clips at each end, secured with galvanized bolts.

3.7 Grating and Frame, Battery Charging 155

.1 Provide frame fabricated of 38 x 38 x 6 mm angle of Type 302 stainless steel. Mitre, weld, and reinforce at corners. Provide concrete anchors at 300 mm centres.

.2 All welded grating of Type 302 stainless steel with 32 x 3 mm flat bars on edge at 30 mm centres with 6 mm square or round cross bars at 100 mm centres. Fabricate in one section to size indicated.

.3 Stainless steel finish, annealed, pickled and bright rolled.

3.8 Frames for Interior Overhead Door

.1 Fabricate to indicated dimensions of 6 mm bent steel plate with ground edges. Mitre, reinforce, and weld corners.

.2 Provide adjustable masonry jamb anchors at 600 mm centres. Provide clip angle base anchors for jambs of 75 x 75 x 6 mm angle.

.3 Shop prime.

3.9 Angle Frames for Exterior Louvre Openings

.1 Fabricate frame of 88.9 x 127 x 6.35 mm steel angle, mitred, reinforced, and welded at corners. Verticals of 101 x 101 x 6.35 steel angles at maximum centres of 1200 mm.

.2 Provide adjustable masonry jamb anchors at 600 mm centres. Drill head and sill sections at 600 mm centres for 9 mm bolts.

.3 Galvanize after fabrication.

3.10 Channel Supports for Ceiling-hung Toilet Compartments and Screens

.1 Supply and install to support ceiling attached members of compartments and screens.

.2 Supporting members continuous, of not less than C150 x 16 channel supported from structure above by hangers at centres not exceeding 800 mm. Hangers of not less than 50 x 50 x 6 mm steel angles. Design hangers and connections to support a load of 275 kg per hanger. Brace hangers with diagonal braces of 50 x 50 x 6 mm steel angles to structure above.

3.11 Security Grille: Air Shaft in Emergency Generator Room 141

.1 Take field dimensions before fabricating.

.2 To detail with 36 x 6 mm steel flat bar frame welded at corners. Bars of 12.7 mm diameter tempered high carbon steel rods let into frame and welded at spacing not to exceed 150 mm. Galvanize after fabrication.

.3 Secure to coping at perimeter with 9 mm hot-dip galvanized lag bolts at 600 mm centres.

3.12 Threshold Angles, Exterior Overhead Doors

.1 To be installed as indicated wherever exterior concrete apron abutts interior concrete floor slab at exterior overhead doors. To extend width of door opening.

.2 Fabricate of 75 x 75 x 6 mm steel angles with concrete anchors at 600 mm centres. Galvanize after fabrication.

3.13 Cable Door and Frame: Winch House

.1 Fabricate to indicated size and details of steel plate and structural sections. Frame reinforced and welded at corners. Install hinges supplied under Section 08710.

.2 Galvanize after fabrication.

.3 Install balance of hardware supplied under Section 08710 using corrosion resistant fasteners.

3.14 Stainless Steel Railings at Balustrades: Administration Wing

.1 Of Type 304 stainless steel seamless tubing with minimum wall thickness of 1.24 mm. All exposed surfaces in No. 4 satin finish.

.2 To detail with top rail of 50 mm OD tubing, and secondary rail and balusters of 31 mm OD tubing. All bends made to smooth radii.

.3 All joints welded, ground smooth, and polished to a No. 4 finish to match that on tubing. Provide stainless steel flanges for attachment of horizontal rail to wall. Make joints in railings with concealed internal sleeve. Weld joint, grind and polish. Cap ends of railings.

.4 At balustrades provide concealed supports to floor slab fabricated of seamless steel pipe of size to fit snugly into balusters and with 75 x 150 x 6 mm base plate drilled for 12 mm bolts. Minimum wall thickness of pipe: 2.9 mm.

3.14 Stainless Steel Railings at Balustrades: Administration Wing (Cont'd)

.5 Plug weld balusters to stubs on steel stair stringers and to concealed supports at balustrade. Grind welds smooth and polish to match finish on railing.

3.15 Shelf Supports and Hanging Rod: Ante Room 173

.1 To detail with continuous 16 x 50 mm steel flat bar hanging rod. Provide attachment to end walls.

.2 Exposed hangers of 19 mm square steel bar with shelf supports of two 12 x 50 mm steel flat bars with flat bar end supports. Centres as shown.

.3 Above ceiling provide and install hanger fabricated of 75 x 75 x 6 mm steel angle verticals and diagonal bracing attached to structure above. Provide adjustable bolted connection between angle hangers and square bar verticals.

.4 Shop prime.

3.16 Stainless Steel Trim at Risers and Stringers: Main Stair Ground to Second Floor: Administration Wing

.1 Install prior to installation of precast terrazzo stair treads.

.2 Riser facings of one piece. To detail of 1.27 mm thick stainless steel sheet with exposed face in No. 4 satin finish.

.3 Trim at stringers to indicated height. Fabricate of 1.27 mm thick stainless steel sheet with exposed edge ground and polished, in No. 4 satin finish.

.4 Wire brush steel stringer to remove all primer and rust. Clean contact face of stainless steel of all oil and surface deposits. Adhere trim to stringer using clear one-part silicone sealant to CGSB 19-GP-9Ma, first priming contact surfaces with primer recommended by sealant manufacturer.

3.17 Frame and Cover: Floor Access Hatch, Corridor 124

.1 Frame of 75 x 75 x 6 mm steel angle, mitred, reinforced, and welded at corners. Welded in 13 x 13 mm stop of bar stock steel. Concrete anchors at 400 mm centres. Galvanize after fabrication.

.2 Cover of 12.7 mm checkered steel plate. Secure to stop of frame with countersunk head stainless steel machine screws tapped into stop on frame.

.3 In cover provide two 13 mm reinforced, threaded holes for screw-in "T" handles. Provide threaded handles.

3.18 Manhole Frame and Cover: Washdown Area 160

.1 Provide commercially made cast iron manhole cover and frame with opening of 600 mm x 600 mm, or 600 mm diameter if circular. Cover non draining but with lift holes. Gray iron castings to ASTM A48-76, strength class 30B. Coated with two coats of asphalt varnish. Heavy duty municipal type.

3.19 Sand Traps: Washdown Area 160

.1 Fabricate tanks, frames, and covers to detail of steel plate and structural shapes. All welded construction provide watertight assembly for tank.

.2 Galvanize after fabrication.

3.20 Equipment Towers: Helicopter Hangar

.1 Design, supply and install two towers as follows:
.1 10 meter tower for anemometer assembly and wind vane on "U" arm support. Engineer will supply anenometer assembly, wind vane, and "U" arm support to be installed under this Section. Provide stub mast for obstruction light. Wiring for power and instrumentation by Division 16.
.2 6 meter tower for windsock assembly with lighting. Mast with windsock frame and lighting will be supplied by Engineer to be installed under this Section. Wiring by Division 16. Provide and maintain temporary clearance light until permanent lighting is installed.

.2 Towers shall be self-supporting, without guy wires, triangular profile towers, of lattice design. Safely climable. Galvanized after fabrication and phosphatized for field painting.

.3 Employ services of a professional structural engineer, licensed in the Province of Ontario, to design towers to requirements of CSA C37-M1981 and to withstand dead and live load stresses, including combined wind and ice stresses for area.

3.20 Equipment Towers: Helicopter Hangar (Cont'd)

.4 Submit shop drawings, bearing the stamp of the professional engineer responsible for the design, and giving design loads, stresses, size of members, details of mountings and connections.

.5 Drawings showing mounting requirements and imposed loads of equipment to be supplied by Engineer will be made available by the Engineer.

3.21 Communication Tower: Administration Wing

.1 Design, fabricate, and install communication tower to height and general configuration shown, of safely climbable, triangular, open lattice work design with brackets provided for equipment and obstruction light. Equipment to be mounted will be supplied and installed by Owner. Drawings showing equipment and mounting requirement will be made available by the Engineer. Wiring by Division 16. Tower shall be self-supporting with guy wires. Provide and maintain temporary obstruction light until permanent light is installed.

.2 All components to be galvanized after fabrication and phosphatized for field painting.

.3 Employ the services of a professional structural engineer, licensed in the Province of Ontario, to design tower to requirements of CSA C37-M1981, equipment loadings, and live load stresses applicable to area, as set out in NBC.

.4 Submit shop drawings, bearing the stamp of the professional engineer responsible for the design, and giving design loads and stresses, sizes of members, details of mounting and connections, and tower configuration.

.5 Refer to Drawing S-4 for loads and reactions allowed for in the structure of the Administration. Refer to Drawing A-6 for equipment weights.

3.22 Mechanical Attachment Rubber Wall Protection Washdown Area 160

.1 Wall mounted member of continuous 75 x 100 x 6 mm steel angle with 12.7 mm diameter by 50 mm long welded stud bolts at 300 mm centres and drilled at 400 mm centre for wall anchor bolts with countersunk flat heads.

.2 Continuous clamping band of 50 x 16 x 6 mm steel channel drilled to fit over stud bolts.

.3 Galvanize entire assembly after fabrication.

3.23 Steel Bracket Stops - Doors 156D and 158D	.1	To detail of HSS tubular sections with steel stop plate and all anchors. All welded construction. Galvanize after fabrication. Provide galvanized U-bolt of 5 mm diameter to secure stay chain supplied under Section 08710.
3.24 Bench Supports Male Locker Room	.1	To detail of HSS tubular structural section with edges trued and ground smooth. Welded in base plate. Angle supports bolted through slotted holes and with lock washers to allow vertical adjustment.
3.25 Support for Ceiling Track, Spray Paint 161	.1	To detail with continuous horizontal steel angle with steel angle hangers and diagonal braces to structure above. All welded construction. Shop prime with zinc-rich primer. Install plumb and level with botom of supporting leg of angle flush with ceiling.
3.26 Vertical Flat Bar For Fabric Divider, Spray Paint 161	.1	Fabricate of 4.76 x 38 mm galvanized steel flat bar x height of fabric divider (approximately 6 metres). Drill at 150 mm centres with 5 mm holes coinciding with centres of grommets in fabric divider. Obtain exact length of bar and spacing of holes by taking field dimensions.
3.27 Brackets for Wood Rail, Multipurpose Room 176	.1	To detail shown on Detail 115/23 on Drawing A-23.
	.2	Drill rear leg for 12 mm diameter bolts into expansion shields. Drill other leg and back for 5 mm diameter wood screws.
3.28 Bracing for Glazed Partitions	.1	Supply and install above ceiling line to brace glazed partitions in following locations. .1 North wall of Yard Office 167. .2 North wall of Lunch Room 168.
	.2	Refer to Detail 105/21, 20/22 on Drawing A-22.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Installation of anchors in concrete and masonry:	Section 03300 and 04050
	.2	Concrete fill to treads:	Section 02528
	.3	Handrails and balustrades to exterior concrete stairs:	Section 05500
	.4	Steel ladders:	Section 05500
	.5	Stainless steel railings:	Section 05500
	.6	Stainless steel riser and stringer trim on main stairs in Administration Wing:	Section 05500
	.7	Terrazzo treads and landings:	Section 09410
	.8	Precast terrazzo stair treads:	Section 09420
	.9	Resilient tile treads and landings:	Section 09660

1.2 Reference Standards

.1 Do welding work in accordance with CSA W59-1982 unless specified otherwise.

1.3 Design Criteria

.1 Design metal stair, balustrade and landing connections to NBC vertical and horizontal live load requirements.

.2 Detail and fabricate stairs to NAAMM Metal Stairs Manual January 1982.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate construction details, sizes of steel sections and thickness of steel sheet.

.3 Each shop drawings submitted shall bear the stamp of qualified professional engineer registered in Ontario.

PART 2 - PRODUCTS

2.1 Materials

.1 Steel sections and plates: to CAN3-G40.21-M81, Type 300W.

.2 Steel plate: to CAN3-G40.21-M81, Type 260W.

.3 Grating treads: to ANSI A202.1-1981 Type W-19-4 steel with 40 mm wide, abrasive nosing. Landing grating of same type with 40 mm wide abrasive nosing at top of stair.

.4 Welding materials: to CSA W59-1982.

.5 High strength bolts: to ASTM A325-M80.

.6 Shop coat primer: to CGSB 1-GP-40M.

.7 Steel pipe: seamless, to ASTM A53-76 Type E, Grade A. Minimum wall thicknesses as follows:
.1 38 mm outside diameter: 3.7 mm.
.2 50 mm outside diameter: 3.9 mm.

2.2 Fabrication

.1 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

.2 Accurately form connections with exposed faces flush; mitres and joints tight. Make risers of equal height.

.3 Grind or file exposed welds and steel sections smooth.

.4 Shop fabricate stairs in sections as large and complete as practicable.

2.3 Steel Pan Stairs

.1 Steel stair except main stairs in Administration wing:
.1 Fabricate stairs with closed riser steel pan construction.
.2 Form treads and risers from 3 mm thick steel plate. Secure treads and risers to 30 x 30 x 5 mm horizontal and vertical angles welded to stringers.
.3 Form stringers from 250 x 9 mm steel plate with edges ground.
.4 Provide clip angles for fastening of furring channels, where applied finish is indicated for underside of stairs.

2.3 Steel Pan Stairs (Cont'd)

.1 (Cont'd)
.5 Join ends of centre stringers where exposed at landings.
.6 Provide and weld in reinforcing bars in steel tread pans ready to receive concrete or terrazzo tread fill.

2.4 Main steel stairs Administration Wing

.1 Fabricate stairs to detail with closed riser and steel pan construction.

.2 Form treads and risers to detail from 3 mm thick steel plate. Secure treads and risers to 30 x 30 x 5 mm horizontal and vertical angles welded to stringers.

.3 Provide 15 mm diameter x 50 mm long steel studs in tread pans as shown.

.4 Form box stringers of steel plate as detailed with all joints welded and ground smooth. Provide steel studs on top edge to receive balusters by others. Provide continuous 38 x 9 mm steel filler plate between stringers and adjacent walls.

.5 Provide clip angles and/or runners for fastening of furring channels, where applied finish is to be installed to underside of stairs.

2.5 Grating Stairs Helicopter Hangar

.1 Fabricate stringers of 200 x 10 mm steel plate with edges ground. Extend outer stringer to wall.

.2 Treads as specified in Paragraph 2.1.3 of this Section. Tread width minimum of 289 mm. Secure by welding between stringers.

.3 Form landing with surround of C100 x 8 steel channels. Secure to wall with bolts into drilled in expansion sleeves.

.4 Landing of steel grating of same construction as treads. Weld in place.

2.6 Piperail Balustrades

.1 Construct balusters and handrails from seamless steel pipe as indicated.

.2 Fabricate wall handrails and brackets as indicated.

.3 Cap and weld exposed ends of balusters and handrails.

.4 Terminate at abutting wall with end flange.

2.7 Painting

.1 Clean surfaces in accordance with Steel Structures Painting Council SSPC-SP2-63.

.2 Apply one coat of shop primer except interior surfaces of pans.

.3 Apply two coats of primer in different colours to parts inaccessible after final assembly.

.4 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease, do not paint when temperature is below 7 deg C.

.5 Do not paint surfaces to be field welded.

PART 3 - EXECUTION

3.1 Installation of Stairs

.1 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.

.2 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Installation of expansion joint covers in floors: Section 03300

1.2 Design Criteria

.1 Joint movement: design expansion joint covers to permit unrestricted lateral movement of up to ±50% of joint width.

1.3 Samples

.1 Submit 150 mm long samples of expansion joint cover in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Materials

.1 Aluminum extrusions: Aluminum Association alloy AA 6063-T5.

.2 Stainless steel brake formed or roll formed sections: to ASTM A167-80b, type 304.

.3 Flexible inserts-floor joints:
.1 Shop-poured filler: elastomer, durometer hardness A/25 to ASTM D2240-75; ultimate elongation 700% to ASTM D412-80 method A; beige colour.

.4 Isolation coating: alkali resistant bituminous paint.

.5 Accessories: concealed fasteners and anchors: galvanized steel.

2.2 Finishes

.1 Aluminum components: mill finish on floor joints.

.2 Isolate aluminum from concrete and masonry by means of isolation coating.

2.3 Fabrication

.1 Fabricate expansion joint covers, square, true, straight and accurate to required sizes and profiles.

.2 Fabricate lengths in continuous runs up to 6 m.

.3 Shop assemble covers ready for installation where practicable.

2.3 Fabrication (Cont'd)

.4 Fabricate floor joint covers with:
.1 Filler inserts to manufacturer's standard.
.2 Mounting holes for securement to concrete by means of mounting bolts into expansion shield, or adjustable concrete anchors. Secure at 600 mm centres.

.5 Fabricate wall and ceiling joint covers with:
.1 Extruded aluminum cover plates for flat surfaces installation, with snap-lock anchor clips of 6063-T52 aluminum alloy. Cover plate with continuous neoprene or vinyl gaskets.
.2 Continuous anchor clip secured at 600 mm centres with screws into drilled-in expansion shields.
.3 Cover plate factory prime coated for field painting.

2.4 Joint Covers

.1 Floor joint covers:
.1 To accommodate 25 mm expansion joint.
.2 Across corridor at Doors 191A and 191B: to accommodate 3 mm vinyl asbestos tile floor finish in Corridor 191 and concrete floor finish in Corridor 126.
.3 At Door 151A: to accommodate concrete floor each side.

.2 Wall joint covers: at walls of corridor at doors 191A and 191B:
.1 To accommodate 25 mm expansion joint.

PART 3 - EXECUTION

3.1 Installation

.1 Set work plumb, square, level, free from distortion.

.2 Secure work accurately to structure in manner not restricting joint movement.

.3 Provide acceptable means of anchorage, such as anchor clips, expansion bolts and shields, welded studs or toggles.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Concrete formwork: Section 03100

.2 Finish carpentry: Section 06200

1.2 Source Quality Control

.1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

PART 2 - PRODUCTS

2.1 Lumber Material

.1 Except as indicated or specified otherwise lumber shall be softwood, S4S, moisture content (MC) not greater than 12% at time of installation, in accordance with following standards:
.1 CSA 0141-1970.
.2 NLGA Standard Grading Rules for Canadian Lumber, effective December 1, 1980.

.2 Framing and board lumber: in accordance with Table 9.3.3.A of NBC 1980 except as indicated or specified otherwise.
.1 Stud wall framing: Eastern Spruce or Jack Pine, Standard Stud No. 2.
.2 Roof and floor joists: Eastern Spruce or Jack Pine, Standard No. 2.

.3 Furring, blocking, nailing strips, grounds, rough bucks:
.1 Use S2S or S4S material.
.2 Board sizes: all species, NLGA Standard No. 2 grade.
.3 Dimension sizes: all species, NLGA Standard No. 2 grade.

.4 Cants, curbs, nailers for roofing: Eastern Spruce or Jack Pine species, NLGA No. 2 grade.

2.2 Panel Material

.1 Panels for roof sheathing, exterior wall sheathing, subflooring, underlay, and sheathing at copings and parapets, shall be of type and grade as specified in accordance with following standard:
.1 Douglas fir plywood (DFP): to CSA 0121-M1978.

2.2 Panel Material (Cont'd)

.2 Except as specified otherwise panels shall be 1200 x 2400 mm size, square-edge. Thicknesses as indicated.

.3 Roof sheathing: plywood, DFP sheathing grade or PP standard sheathing grade, T&G edge.

.4 Exterior wall sheathing: plywood, DFP sheathing grade, T&G edge.

.5 Subflooring: plywood, DFP sheathing grade, T&G edge. Solid one side, sanded one side.

.6 Underlay: plywood, DFP sheathing grade, solid one side, sanded one side.

.7 Backboard electrical equipment: 19 mm thick, solid one side, sanded one side. Mounted on 25 x 75 mm strapping around perimeter at maximum centres of 300 mm.

2.3 Building Papers

.1 Exterior wall sheathing paper: to CAN2-51.32-M77 single ply laminated type coated impregnated perforated as indicated.

2.4 Dampproof Membrane

.1 Polyethylene film: to CAN2-51.33-M77, Type 1, 0.15 mm thickness.

2.5 Adhesives

.1 Subflooring adhesive: to CGSB 71-GP-26M, cartridge loaded.

2.6 Fastenings and Hardware

.1 In accordance with Part 9 of NBC 1980 as supplemented by following requirements except where specific type is indicated.

.2 Nails, spikes and staples to NBC 9.23.3 except:
.1 Use common spiral nails and spiral spikes except where indicated otherwise.
.2 Use hot galvanized finish steel for exterior work and interior highly humid areas except where indicated otherwise.

.3 Bolt, nut, washer, screw and pin type fasteners: with hot-dip galvanized finish to CSA G164-M1981 for exterior work, interior highly humid areas and for pressure-preservative treated lumber, elsewhere with primer paint finish where installed on sight-exposed surfaces.

2.6 Fastenings and Hardware (cont'd)

.4 Use surface fastenings of following types, except where specific type is indicated.
.1 To hollow masonry, plaster and panel surfaces use toggle bolt.
.2 To solid masonry and concrete use expansion shield with lag screw, jute fibre or lead plug with wood screw.
.3 To structural steel use bolts through drilled hole, or welded stud-bolts or power driven self-drilling screws, or welded stud-bolts.

2.7 Wood Preservative

.1 Surface-applied wood preservative: copper napthenate or pentachlorophenol base, water repellant wood preservative coloured, to CSA 080-1974.

2.8 Underlayment

.1 Concrete and glass reinforced panel underlayment over subfloor in Guard House as underlayment for ceramic floor tile. Composition underlayment board of following qualities:
.1 Thickness: 12 mm.
.2 Moisture content not exceeding 5.3%.
.3 Water absorption (ASTM D1037-72a) not exceeding 14.5%.
.4 Compressive strength: 24 MPa.
.5 Fastener pull through: 114 kg.
Purpose manufactured as water-resistant underlay.

2.9 Mineral Fibre Insulation

.1 Glass fibre insulation, friction-fit type, to CSA A101-M1977. Install to provide total RSI = 3.5 for insulation.

2.10 Vapour Barrier

.1 Polyethylene film to CAN2-51.33-M80, Type 1, 0.152 mm thick. Tape for sealing as recommended by manufacturer.

2.11 Flexible Membrane Flashing Material

.1 Under insulation for entire area of Guardhouse roof, including area under lantern.

.2 Flexible, reinforced membrane composed of two layers of 0.508 mm thick polyvinyl chloride layers permanently bond to and enclosing 10 x 10 woven glass mesh.

.3 Apply by complete adhesion using adhesive recommended by manufacturer. All joints lapped a minimum of 150 mm and lap completely adhered with adhesive.

2.12 Rigid Insulation Guardhouse Roof

.1 Polystyrene to CGSB 51-GP-20M, Type 4, with 0.87 R.S.I. factor per 25 mm thickness. Thickness as indicated.

PART 3 - EXECUTION

3.1 Furring and Blocking

.1 Install furring and blocking as required to space-out and support surface applied cabinets, lockers and other work.

.2 Install blocking to support wood dock bumpers at Doors 143C and 143D, and to support perimeter door seal at Door 143C. Treat wood with wood preservative and attach with hot-dip galvanized bolts into drilled in expansion shield. Countersink bolt heads.

.3 Align and plumb faces of furring and blocking to tolerance of 1:600.

3.2 Rough Bucks, Nailers

.1 Install wood bucks and nailers as indicated including:
.1 Wood linings around frames for doors, windows, other openings. Preservative treat material before installation.

.2 Except where indicated otherwise use material at least 38 mm thick secured with 9 mm bolts located within 300 mm from ends of members and uniformly spaced at 1200 mm between.

.3 Countersink bolts where necessary to provide clearance for other work.

3.3 Roof Fascias, Cants, Nailers, Curbs

.1 Install wood cants, fascia backing, nailers, curbs and and other wood supports for roofing and sheet metal work, as indicated. Preservative treat material before installation.

.2 Secure with galvanized 9 mm bolts where indicated, galvanized nails elsewhere. Locate fastenings within 300 mm from ends and uniformly spaced between. Space bolts at 1200 mm and nails at 600 mm centres except where indicated otherwise.

3.4 Surface-Applied Wood Preservative

.1 Treat surfaces of material with wood preservative, before installation. Wherever possible apply preservative after materials have been cut and fit to size.

.2 Apply preservative by dipping, or by brush or spray to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.4 Treat all material designated as follows:
.1 Wood cants, fascia backing, copings, curbs, nailers.
.2 Wood furring on outside surface of exterior masonry or concrete walls.
.3 Wood blocking at exterior openings.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Rough carpentry:	Section 06100
	.2	Laminated plastic work:	Section 06240
	.3	Plastic-faced wood doors:	Section 08213
	.4	Supply of finishing hardware:	Section 08710
	.5	Painting and finishing:	Section 09900
	.6	Miscellaneous steel hangers and supports:	Section 05500

1.2 Reference Standards

.1 Do millwork to Millwork Standards of the Architectural Woodwork Manufacturers Assocation of Canada (AWMAC) 1978.

1.3 Samples

.1 Submit duplicate 300 x 300 mm samples of each type of solid wood or plywood to receive stain or natural finish, in accordance with Section 01340.

.2 Submit duplicate 300 mm long samples of each type of trim and moulding, in accordance with Section 01340.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate details of construction, profiles, jointing, fastening and other related details.

PART 2 - PRODUCTS

2.1 Materials

.1 Hardwood lumber: to National Hardwood Lumber Association (NHLA) requirements, moisture content of maximum 10%, Birch and Red Oak species, to AWMAC custom grade.

.2 Hardwood plywood: to CSA 0115-1967 of thickness indicated.
.1 Red Oak plywood good two sides, rift cut face, rotary cut back, particle board core with Type II bond.
.2 Birch plywood, sound two sides, with lumber core with Type II bond.

2.1 Materials

.3 Canadian softwood plywood: to CSA 0151-M1978 solid two sides.

.4 Poplar plywood: to CSA 0153-1976 sanded grade, sound two sides, veneer core.

.5 Mat-formed wood particle board to CAN3-0188.1-M78, grade "R", sanded faces, of thicknesses indicated.

.6 Composition counter top, Battery Room 114: 32 mm thick. Colour: black. Specially formulated laboratory counter top consisting of a density compacted composition of mineral fibre, portland cement and inert materials. All exposed surfaces and edges sanded and polished, edges rounded to 3 mm radius. Drip groove cut into underside splined joints.

.7 Wood doors: for sliding tackboards in Multi-Purpose Room 176: to CSA 0132.2-M1977, flush doors, tubular core, faces Poplar or Birch veneer for paint finish. Thickness: 35 mm.

.8 Fiberglass lining, interior planter: 2 part epoxy coating to CGSB 1-GP-193M. Fibrous glass reinforcing mat to CGSB 37-GP-64M.

.9 Nails and staples: to CSA B111-1974; galvanized for exterior work, interior highly humid areas, plain finish elsewhere.

PART 3 - EXECUTION

3.1 Cabinetwork

.1 Fabricate casework to AWMAC conventional diversified construction custom classification.

.2 Cabinet doors to be AWMAC type 6, 19 mm thick, flush overlay custom classification. Faced and edged with laminated plastic and with plastic laminate backing sheet.

.3 Set nails and screws, in wood trim apply stained plain wood filler to indentations, sand smooth and leave ready to receive finish.

.4 Install and adjust cabinet hardware for shelves, doors and drawers. Recess shelf standards unless noted otherwise.

3.1 Cabinetwork (Cont'd)

.5 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

.6 Fit shelves with hardwood edging.

.7 Provide 10 mm thick solid matching wood strip on plywood edges 12 mm or thicker, exposed in final assembly. Strips same width as plywood.

3.2 Planter Lining

.1 Mix and apply epoxy resin coating in accordance with manufacturer's directions. Apply heavy coat or resin to wood liner. Immediately apply continuous layer of fibrous glass reinforcing fabric with joints lapped a minimum of 100 mm. Embed completely in first coat of resin. At internal and external corners apply 150 mm wide strips of fabric reinforcement and embed in resin. Allow to cure. Apply two finishing coats of epoxy resin allowing curing time between coats as recommended by resin manufacturer.

3.3 Interior Trim

.1 Standing and running trim to be AWMAC custom classification.

.2 Trim to be of Red Oak species, as detailed.

3.4 Laminated Oak Bench Seats

.1 Shop fabricate of quarter-sawn red oak laminations of 19 x 63 mm dimension stock assembled under pressure using water-resistant adhesive to dimensions indicated. Fabricate each bench seat in one section. Shop sand to 57 mm thickness with rounded edge. Leave ready to receive field finish.

3.5 Erection

.1 Set and secure materials and components in place, rigid plumb and square.

.2 Provide heavy duty fixture attachments for wall mounted cabinetwork.

.3 Prepare external exposed and semi-exposed surfaces ready for sealing, staining and varnishing or painting.

.4 Prepare internal non-exposed surfaces ready for sealing with varnish or shellac.

.5 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Finish carpentry: Section 06200

.2 Plastic faced doors: Section 08213

1.2 Samples

.1 Submit duplicate samples of joints, edging, cutouts and postformed profiles in accordance with Section 01340.

1.3 Maintenance Data

.1 Provide maintenance data for plastic laminate work for incorporation into maintenance manual specified in Section 01730.

1.4 Product Handling

.1 Cover finished laminated plastic surfaces with heavy kraft paper or put in cartons during shipment. Protect installed laminated surfaces by approved means. Do not remove until immediately before final inspection.

.2 Do not store or install materials in areas where relative humidity is less than 25% or greater than 60% at 22 deg C.

1.5 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that the laminated plastic work will not warp or delaminate for a period of two years from the date of Interim Completion of entire contract.

PART 2 - PRODUCTS

2.1 Materials

.1 Laminated plastic for flatwork: to CAN3-A172-M79, Grade GP, Type 1, 1.6 mm thick; based on solid colour range with textured finish as indicated on Finish and Colour Schedule.

.2 Laminated plastic for postforming work: to CAN3-A172-M79, Grade PF, Type 3, 1.6 mm thick, based on solid colour range with textured finish as indicated on Finish and Colour Schedule.

2.1 Materials (Cont'd)

.3 Laminated plastic backing sheet: supplied by same manufacturer as facing sheet; not less than 0.5 mm thick and same thickness and colour as face laminate. Sanded one side. Use for backing doors on cabinets.

.4 Laminated plastic liner sheet: supplied by same manufacturer as facing sheet, not less than 0.51 mm thick, white colour. Use as balancing sheet where concealed from view.

.5 Plywood core: to CSA 0153-M1980 solid two sides, 19 mm thick, plywood core.

.6 Particle board core: to CAN3-0188.1-M78, sanded faces, of thickness indicated.

.7 Laminated plastic adhesive: resorcinol resin adhesive to CSA 0112.7-M1977.

.8 Draw bolts and splines: as recommended by fabricator.

2.2 Shop Fabrication

.1 Comply with CAN3-A172-M79, Appendix 'A'.

.2 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.

.3 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.4 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 2400 mm. Keep joints 600 mm from sink cutouts.

.5 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.

.6 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 deg. Do not mitre laminate edges.

2.2 Shop Fabrication (Cont'd)

.7 Apply laminate backing sheet to reverse side of core of plastic laminate work for cabinet doors.

.8 Apply laminated plastic liner sheet interior of cabinetry.

PART 3 - EXECUTION

3.1 Installation

.1 Install work plumb, true and square, neatly scribed to adjoining surfaces.

.2 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.

.3 Use draw bolts and splines in countertop joints. Maximum spacing 450 mm oc, 75 mm from edge. Make flush hairline joints.

.4 Provide cutouts for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.

.5 At junction of laminated plastic counter back splash and adjacent wall finish, apply small bead of sealant.

.6 Site apply laminated plastic to units as indicated. Adhere laminated plastic over entire surface. Make corners with hairline joints. Use full sized laminate sheets. Make joints only where approved. Slightly bevel arrises.

.7 For site application, offset joints in plastic laminate facing from joints in core.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Removal of concrete fins, chipping out and patching of cracks, honeycombs and tieholes: Section 03300

1.2 Environmental Requirements

.1 Provide adequate weather protection during application and curing.

1.3 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that the waterproofing work of this section is guaranteed against leakage for a period of two years from the date of Interim Completion of entire contract.

PART 2 - PRODUCTS

2.1 Materials

.1 Bitumen:
.1 Type 1 for application and curing at temperatures above 5 deg C: to CGSB 37-GP-2M or CGSB 37-GP-16M or CGSB 37-GP-28M or CSA A123.4-M1979.
.2 Type 2 for application and curing at temperatures above 0 deg C but below 5 deg C: to CGSB 37-GP-16M or CSA A123.4-M1979.

.2 Reinforcing fabrics: to CGSB 37-GP-63M.

.3 Sealing compound: to cGSB 37-GP-29M.

.4 Protection board: 6 mm thick board having impact resistance to protect membrane from site damage.

PART 3 - EXECUTION

3.1 Workmanship

.1 Do waterproofing to applicable CGSB application standard for material specified in 2.1.1 unless otherwise specified.

Material		Application
CGSB 37-GP-2M	use	CGSB 37-GP-3M
CGSB 37-GP-16M	use	CGSB 37-GP-36M
CGSB 37-GP-28M	use	CGSB 37-GP-3M
CGSB 37-GP-50M	use	CGSB 37-GP-51M
CSA A123.4-M1979	use	CGSB 37-GP-37M

3.2 Application

.1 Apply fluid reinforced 3 ply waterproofing to minimum 1.5 mm ply thickness:
.1 To exterior faces of foundation walls from 50 mm below finish grade level to and including tops of foundation wall footings.

.2 Seal joints around penetrations through waterproof membrane with sealing compound, before applying waterproofing.

3.3 Protection Board

.1 Apply protection board to cover waterproofing membrane at locations indicated.

.2 Ensure that surface of waterproofing membrane is undamaged before application of protection board and that no loose particles are sandwiched between membrane and board.

.3 Provide protection board in locations where no rigid perimeter insulation is to be applied.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Roof insulation: Section 07550

.2 Insulation in prefabricated wall siding: Section 07411

.3 Insulation for mechanical work: Sections 15260 and 15280

PART 2 - PRODUCTS

2.1 Insulation

.1 Expanded polystyrene: to CGSB 51-GP-20M, Type 4, RSI indicated, square edges. Only polystyrene insulations listed on CGSB Qualified Products List GP-41 are acceptable for use on this project. KSI factor of 0.029. Thicknesses as indicated on drawings.

2.2 Adhesive

.1 Vapour barrier type, medium trowel consistency.

Physical properties:	
Solids content:	97% by volume
Density:	1.75 kg/L
Drying time at 20 deg C:	
initial set:	12 hours
final set:	48 hours
Service temperature at glue line:	-45 deg C to 38 deg C
Application temperature:	5 deg C minimum
Permeance (3 mm wet film, to ASTM E96-66 (1972), method E):	2.0 ng/Pa.s.sq m)

2.3 Accessories

.1 Aluminum sheet for above grade insulation protection: 1.3 mm thick aluminum patterned utility sheet in stucco or pebbled pattern, unpainted. Top edge brake formed to provide flange for attachment to bottom Z-girt of wall system with stainless steel screws at 300 mm centres. Width as required to suit varying grade conditions so as to extend a minimum of 400 mm below finished grade.

.2 Protection board: to CSA A247-M1978, Type II, 12 mm thick.

PART 3 - EXECUTION

3.1 Workmanship

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.4 Offset both vertical and horizontal joints in multiple layer applications.

.5 Do not enclose insulation until it has been inspected and approved by Engineer.

3.2 Perimeter Foundation Insulation

.1 For vertical application apply adhesive to entire contact face of insulation with a notched trowel with 5 mm notches, 10 mm oc. Butter edges of insulation board with 3 mm of adhesive. Press firmly to substrate with sliding motion and bring into firm contact with adjacent boards. Hold in place until adhesive sets.

.2 Extend vertical insulation to depth and heights indicated on drawings for various locations.

.3 Where horizontal or near horizontal below grade insulation is indicated in addition to or in lieu of vertical insulation, coordinate work with backfilling work, placing insulation on compacted granular fill with sheets in firm contact. Do not place more insulation than can be backfilled over during same working day.

.4 Where insulation is indicated in split-slab insulation at exterior entrance slabs coordinate work with concrete work. Place insulation with sheets in firm contact using sufficient adhesive to prevent displacement during concrete placement.

3.3 Protective Metal Installation

.1 Where vertical perimeter insulation extends above grade to underside of metal wall cladding install aluminum utility sheet over insulation.

.2 After insulation layer has been installed for a sufficient time to be firmly set, apply adhesive to exterior face of insulation with notched trowel and embed aluminum sheet firmly and secure top flange to Z-girt of wall or to sill member of louvres using stainless steel sheet metal screws. Use lengths of sheet of 3600 mm with tightly butted joints. Install so as to avoid joints at external corners. Provide brake formed sheets for such corners.

4.4 Insulation Retaining Wall and Head Wall * Rpt. Addendum #1

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Insulation of mechanical equipment: Section 15260, 15270, and 15280.

1.2 Reference Standards

.1 Do insulation work in accordance with CGSB 51-GP-22MP except where specified otherwise.

1.3 Qualifications of Application

.1 Application of insulation only by applicators certified by material manufacturer as being a qualified installer of their material.

1.4 Test Reports

.1 Submit test reports in accordance with Section 01340, verifying qualities of sprayed foam insulation meeting or exceeding requirements of this specification.

1.5 Protection

.1 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

1.6 Environmental Requirements

.1 Apply insulation only when ambient temperatures are within prescribed limits.

PART 2 - PRODUCTS

2.1 Materials

.1 Insulation: foamed-in-place urethane foam to CGSB 51-GP-24M, 1977, Amd June 1979, and meeting following requirements:
- .1 product shall not contain urea formaldehyde.
- .2 density in place: 28 kg/cubic metre.
- .3 closed cell content: 94%
- .4 KSI factor: 0.022

.2 Acceptable products: "Forth-Pak" by Insta-Foam International Inc., P.O. Box 21, Etobicoke, Ontario, M9C 4V2, or equal approved by Engineer.

PART 3 - EXECUTION

3.1 Installation

.1 Completely fill hollow steel H.S.S. sections forming frames for exterior overhead doors and adjacent man doors, including jamb and head sections. Similarly completely fill tubular steel sections at exterior louvre openings and other conditions so indicated on drawings.

.2 Fill jambs and heads as soon as erected, before masonry work is erected, but after all field welding is complete.

.3 Drill holes of size and at intervals recommended by manufacturer consistent with dimensions of void to be filled. Drill holes where they will later be concealed by masonry or by other frame components. Obtain Engineer's approval of size, location, and spacing of holes before doing field drilling.

.4 Where drilled holes will be exposed in finished work provide and install spring clip type hole covers, primed for painting.

.5 Use equipment and methods recommended by manufacturer, and in accordance with Reference Standard.

3.2 Field Inspection

.1 Allow for drilling additional 6 mm diameter holes at 1.5 m centres, in areas selected by Engineer, to ensure sections are completely filled.

.2 Completely fill any voids discussed during field inspection, drilling additional holes as may be required to prove out work.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Masonry column fireproofing: Section 04220

.2 Plaster fireproofing: Section 09150

.3 Metal furring and gypsum board fireproofing: Section 09250

1.2 Qualifications of Applicator

.1 Licensed by manufacturer of fireproofing materials.

1.3 Test Reports

.1 Submit product data including certified copies of test reports verifying sprayed fireproofing applied to substrate as constructed on project will meet or exceed requirements of Specification.

.2 Submit test results in accordance with ULC S101-1980 for fire endurance and CAN4-S102-M80 for surface burning characteristics.

.3 For assemblies not tested and rated, submit proposals based on related designs using accepted fireproofing design criteria.

1.4 Samples

.1 Submit duplicate 300 x 300 mm size sample of exposed finish of sprayed fireproofing, in accordance with Section 01340.

1.5 Protection

.1 At outdoor temperatures less than 5 deg C, ensure that a 5 deg C air and substrate temperature is maintained during and for 24 hours after application. Ensure that natural ventilation to properly dry the fireproofing during and subsequent to its application is provided. In enclosed areas lacking openings for natural ventilation, ensure that interior air is circulated and exhausted to the outside.

.2 Provide temporary enclosures to prevent spray from contaminating air beyond application area.

.3 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of sprayed fireproofing materials.

PART 2 - MATERIALS

2.1 Materials

.1 Sprayed fireproofing: ULC labelled and listed cementitious or asbestos-free mineral fibre fireproofing qualified for use in ULC Designs specified.

.2 Sealer: type recommended by fireproofing manufacturer, qualified for use in ULC Design specified.

PART 3 - EXECUTION

3.1 Preparation

.1 Substrate shall be free of material, which would impair bond.

.2 Verify that painted substrate are compatible and have suitable bonding characteristics to receive sprayed fireproofing.

.3 Remove incompatible materials.

.4 Ensure that items required to penetrate sprayed fireproofing are placed before installation of fireproofing.

.5 Ensure that ducts, piping, equipment, or other items which would interfere with application of fireproofing are not positioned until sprayed fireproofing work is completed.

3.2 Application

.1 Apply bonding adhesive or primer to substrate if recommended by manufacturer.

.2 Apply sprayed fireproofing to correspond with tested assemblies, or acceptable calculation procedures to provide following fire resistance ratings.
.1 Two hour roof assembly in single storey shop wing in area bounded by Column Lines L and N and Column Lines 10 and 17: beams and deck to ULC Design R-804.
.2 One hour floor assembly between Ground Floor and Second Floor of Administration Wing: beams and floor deck to ULC Design O-804. Individual beam on Column Line S between Column Lines 12 to 13 to ULC Design F-818.

3.2 Application (Cont'd)

.2 (Cont'd)
.3 One hour floor assembly between Second Floor of Administration Wing and Fan Room 197, Vestibule 196 and Stair 195 above: beams and floor deck to ULC Design F-818.
.4 Columns to ULC Design X-813 to provide minimum of one hour: In Administration Wing:
.1 Ground Floor: columns R-16, S-10, and S-16
.2 Second Floor: columns Q-12, Q-13.
.5 Tamp fibrous fireproofing after application to provide dense, medium smooth finish on exposed fireproofing over Dry Battery Storage 147 and apply sealer.
.6 Apply sealer to surface of sprayed fireproofing in accordance with manufacturer's directions.
.7 Where masonry column fireproofing ends at intersection of columns with horizontal beams, fill space between steel and masonry with metal lath and spray top with 50 mm of fireproofing and spray protect column for balance of its height. Similarly close top of metal furring and gypsum board column fireproofing enclosures.

3.3 Inspection and Testing

.1 Inspection and testing of sprayed fireproofing will be carried out by Testing Laboratory designated by Engineer.

.2 Engineer will pay costs for testing, as specified in Section 01410.

3.4 Patching

.1 Patch damage to fireproofing caused by testing or by other trades before fireproofing is concealed, or if exposed, before final inspection.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Parged masonry walls: Section 04220

.2 Curved monitor roofs and attached wind deflectors: Section 05316

.3 Linear metal ceilings and soffits: Section 09514

1.2 Samples

.1 Submit duplicate 300 x 300 mm size samples of each type of prefinished cladding, in accordance with Section 01340.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate dimensions, thicknesses, profiles, supporting and attachment methods, trims, closures, flashings, facias, soffits and related work.

.3 Employ the services of a professional structural engineer, licensed in the Province of Ontario to design supports, fastening, spacing of girts, support of system at parapets, and like conditions. Shop drawings shall bear stamp of responsible professional engineer.

PART 2 - PRODUCTS

2.1 Materials

.1 Prefinished aluminum cladding: of 1100-H14 alloy with minimum base metal thickness of 1.27 mm. Factory formed to indicated profiles for Types 1 and 2 cladding as indicated on drawings. Embossed surface Type 3 cladding is Type 2 factory formed to curved shape of indicated radius.

.2 Finish: Factory applied coating to CGSB 93-GP-1a supplemented and amended as follows:
.1 Type 1
.2 Class F2S
.3 Specular gloss: 30+/- 10 units.
.4 Coating: not less than .025 micrometers, fluorocarbon coating with prime coat and finish coat separately baked.

2.1 Materials (Cont'd)

.2 (cont'd)
.5 Outdoor exposure period 20 years.
.6 Colours: as indicated on finish and colour schedule.
.7 Coated on concealed face.

.3 Aluminum clad panels; Guard House: prefinished aluminum sheet as specified in Paragraphs 2.1.1 and 2.1.2 above in flat sheet, pan-formed, and factory adhered under heat and pressure to 19 mm sanded exterior grade fir plywood. Provide flanged edges.

.4 Prefinished closures, flashings, trim: prefinished aluminum sheet of quality specified in Paragraphs 2.1.1 and 2.1.2 above in colour to match adjacent wall cladding. Minimum base metal thickness as follows:
.1 Cap flashings at copings, drip flashings, base flashings: 1.27 mm.
.2 Corner trim, closures around openings and miscellaneous trim members: 1.6 mm.

.5 Galvanized sheet steel: commercial quality to ASTM A526-80 with Z275 zinc coating. Base metal thicknesses as follows:
.1 Concealed wind-vapour closures at columns, roof line, openings, corners, and other indicated locations: 0.76 mm.
.2 Interior face of parapet wall construction: 1.2 mm.
.3 Wall liner sheet for metal wall systems. Manufacturers standard double-V rib liner sheet with 12 mm ribs of 0.65 mm base metal thickness. Shop treated for field painting by others.

.6 Structural supporting assemblies:
.1 Structural members to CAN3-G40-M81, Grade 300W.
.2 Bolts, nuts, washers to ASTM A325M-79.
.3 Welding to CSA W59-1982.
.4 Galvanizing: unpassivated hot dip galvanizing with medium zinc coating of 600 g/sq m to CSA G164-M1981.

.7 Sub-girts, clips: of steel to ASTM A446, Grade A, with Z275 zinc coating. Minimum base metal thickness of 1.27 mm except where design of system requires heavier members consisting of thermal clip spacing sub-girts away from wall, fitting into slots in sub-girt to allow horizontal movement.

.8 Zinc rich primer: to CGSB 1-GP-181M + Amdt-Mar-78.

2.1 Materials (Cont'd)

.9 Rigid insulation: semi-rigid glass fibre insulation with density of 63.6 kg/cubic m. Thickness in walls as required to provide insulation with total RSI = 2.9.

.10 Sealants: in accordance with Section 07900, paragraph 2.1.4.2, colour selected by Engineer. Only sealants listed on CGSB Qualified Products List are acceptable for use on this project.

.11 Fasteners:

.1 Exposed fasteners: stainless steel hex-head with neoprene bonded washer. Nylon covered heads in colour to match metal wall cladding.

.2 Concealed fasteners, Type 1 cladding: stainless steel with hex-head.

.3 Concealed fasteners steel to steel: hex-head, cadmium or zinc plated.

.4 Concealed fasteners for securing galvanized steel wind-vapour flashings and closures to masonry or concrete: pin bolt type into drilled in expansion shields. Galvanized steel pin with washer as required. For fastening sheet metal use galvanized steel sheet metal screws. For fastening into structural sections drill and tap for galvanized machine screws.

.12 Sprayed-on vapour barrier: solvent type asphalt mastic vapour barrier coating in spray grade. Apply to minimum wet film thickness of 3.2 mm at ambient temperatures recommended by manufacturer. Water vapour permeance for 3.2 mm wet film not more than 1.15 ng/Pa.s. square m.

.13 Replacement cladding: Provide and deliver to Engineer additional prefinished aluminum wall cladding matching that used on buildings in profile, quality, and colour. Supply in following quantities, protected for storage.

.1 Type 1 cladding: 8 lengths x 4.3 m long.
.2 Type 2 cladding: 3 lengths x 4.3 m long.

.14 Caulking at edges of wind vapour closures: to CAN2-19.13-M82, Type 2 Class B.

.15 Flexible membrane flashing: provide as shown at expansion joints and other indicated locations. Flexible, reinforced polyvinylchloride membrane material consisting of two 0.508 mm thicknesses of polyvinyl chloride permanently bonded to10 x 10 woven glass mesh. Apply with adhesive recommended by manufacturer.

PART 3 - EXECUTION

3.1 Wall Cladding on Exterior Masonry Walls

.1 Apply first application of sprayed vapour barrier, to wet film thickness of 1.6 mm, to parged masonry substrate.

.2 Install sheet metal wind vapour closures at columns, corners, openings at spandrel beams, and on interior face of copings and parapets and interfacing with metal roof deck, and other indicated locations. Profiles as indicated with ribs to allow for movement. Lap all joints a minimum of 75 mm and seal lap with sealant. Secure with fasteners at maximum centres of 300 mm. Apply caulking at edges to make vapour tight. All fasteners through continuous 19 mm galvanized steel channel along edges of wind-vapour closures.

.3 Similarly install spacer clips and vertical sub-girts.

.4 Apply second application of sprayed vapour barrier to wet film thickness of 1.6 mm embedding previously placed sheet metal components and flanges of clips and sub-girts.

.5 Apply first layer of semirigid insulation with sheets in firm contact with each other and tightly fitted to penetrating components. Use sufficient spot adhesive to prevent displacement during erection of balance of cladding system.

.6 Install horizontal sub-girts allowing space between ends of girts to accommodate thermal movement.

.7 Apply second layer of insulation.

.8 Apply exterior prefinished aluminum cladding, flashings, trim, closures, and related work. Conceal fasteners for Type 1 cladding. Note that cladding at coping level is to secured through slotted holes to accommodate any deflection in structural framing of building.

3.2 Insulated Metal Wall Systems: General

.1 This paragraph refers to self-supporting metal wall systems such as upper part of south wall of Waiting 102 and Chief Pilot 104 in Helicopter Hangar, exterior walls of Second Floor of Administration Wing, and end wall of roof monitors, consisting of following:
.1 Inner double-rib liner sheet with joints lapped and seal and secured with screws at 150 mm centres to form vapour barrier system.
.2 Spacer chips and sub-girts.
.3 Insulation to provide total RSI for insulation of not less than 2.9.
.4 Exterior prefinished, preformed aluminum cladding in indicated profile and colour.
.5 Entire assembly designed to provide air and weathertight assembly supported from structural frame of buildings, and capable of withstanding imposed live and dead loads.
.6 Provide all coping flashings, base flashing, sheet metal interfaces at roof, openings, corners, and all finished trim and closures.

3.3 Curved Sunscreens

.1 To wall system specified in Paragraph 3.2 of this Section install supporting members for curved cladding and soffit. Design to transmit stresses to structural frame of building. Galvanize supporting framework after fabrication.

.2 Install curved cladding and soffit cladding including all flashings, closures, and trim.

.3 Design sunscreen at Helicopter Hangar to withstand higher than normal wind forces generated by helicopters landing and taking off from helicopter pad.

3.4 Exterior North and South Walls, Flammable Liquids Storage Building

.1 Insulated metal wall system as specified in Paragraph 3.2 of this Section but designed so entire walls will act as blow-out panel designed to blow-out at internal pressure of 1 kPa.

3.5 Soffits

.1 To detail consisting of interior double-ribbed metal liner sealed and secured as vapour barrier, sub-girts, insulation as in walls, and exterior prefinished, preformed aluminum cladding, flashings, closures, and trim. At vertical and horizontal insulation in soffit spaces support insulation with 22 x 63.5 mm galvanized steel furring channels at 300 mm centres fastened at right angles to subgirts.

3.6 Metal Column Covers

.1 Provide and install prefinished aluminum circular column covers on columns S-10, S-16, and R-16 to detail 74/3,24/17 on Drawing A-17, including supply and installation of all bracing and supporting members to steel columns and expanded polyethylene filler at base of covers. All supporting members hot-dip galvanized after fabrication.

.2 Aluminum covers prefinished as specified in Paragraph 2.1.2 of this Section of the Specifications.

3.7 Metal Roofing

.1 Over sloping wood deck supplied under Section 06100 provide standing seam roofing fabricated of prefinished aluminum sheet with base metal thickness of 1.27 mm. Quality of finish as specified in Paragraph 2.1.2 of this Section. Colour as indicated.

.2 Include all flashing at eaves, facias, and at base of lantern.

.3 Construct metal work in accordance with Aluminum Association's "Aluminum Sheet Metal Work in Building Construction, 1971" and as indicated.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Supply of sound absorbing insulation for acoustical steel roof deck: Section 05315

.2 Wood cant strips, blocking: Section 06100

.3 Metal flashings: Sections 07620, 07411

.4 Sloping glazed skylights: Section 08120

.5 Roofing of curved surfaces of roof monitors: Section 07411

.6 Roof drains: Section 05421

.7 Explosion venting roof hatch: Section 07830

1.2 Reference Standards

.1 Do roofing work in accordance with applicable standard standard in Canadian Roofing Contractors Association (CRCA) Roofing Specifications Manual, ULC Design R804 Specification in applicable area, except where more stringent requirements are specified.

1.3 Guarantee

*.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that roofing assembly and membrane flashing will remain leakproof and free of the following defects: splitting of seams, delamination, lifting, loosening, undue expansion and contraction, and any other defects which causes any degradation to the roofing membrane or membrane flashing for two years from date of Interim Completion of entire contract.

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.2 Repair leaks in roofing assembly and membrane flashing within 48 hours of notification.

.3 Inspect roof 30 days before expiry of guarantee and repair defects within 15 days of inspection.

1.4 Delivery and Storage

.1 Deliver and store materials to manufacturer's instructions, in original packages with labels intact. Store under cover on elevated platform, away from open flame or ignition sources. Stand rolls on ends, protect edges. Cover insulation exposed to sunlight for more than 2 days.

.2 Do not store material on roof. Remove and replace damaged, wet or broken material.

PART 2 - PRODUCTS

2.1 Materials

.1 Gypsum sheathing board: 12.7 mm thick to CSA AB2.27-M1977, for unrated roof assemblies. Use 15.9 mm thick sheathing board to ULC Guide No. 40 U18.23 for section of fire-rated roof assembly between Column Lines L and N on shop wing.

.2 Saturated roofing felts: No. 15, asphalt saturated felts to CSA A123.3-M1979.

.3 Coated roofing sheets: Type CF, coated base sheet to CSA A123.2-M1979.

.4 Dry sheathing: to CAN2-51.32-M77. Use over wood roof deck on Guardhouse.

.5 Bitumens:
.1 Bitumen: Type 1 and 3 asphalt to CSA A123.4-M1979.
.2 Primer: asphalt to CGSB 37-GP-9M.
.3 Roofing cement: to CGSB 37-GP-5M.
.4 Sealing compound: to CGSB 37-GP-29M.

.6 Roof insulation: polystyrene to CGSB 51-GP-20M Type 4 with 0.87 RSI factor per 25 mm thickness square edges. Only Polystyrene insulations listed on CGSB Qualified Products List GP-41 are acceptable for use on this project. Apply in two layers to indicated thickness.

.7 Stone: 20 to 30 mm size, well graded, round, opaque, non-porous material, washed, reasonably free from fines, moisture, ice, snow or long splinters.

.8 Paving slabs: 760 x 760 x 50 mm thick, natural precast concrete paving slabs to CSA A231.1-1972. Where units on horizontal planes meet units on sloped planes provide specially cast units with edge bevels to suit or shop saw units to provide bevelled edges to suit.

.9 Flexible membrane flashing: consisting of two 0.508 mm thicknesses of flexible polyvinyl chloride permanently bonded to 10 x 10 woven glass fibre mesh, compatible with asphalt. Minimum tear strength: 18.14 kg. Weight: 1.46 kg/sq m. Use two-part adhesive recommended by manufacturer for adhesion to metal work on skylights, and for sealing lapped joints.

2.1 Materials (Cont'd)

.10 Accessories:
.1 Adhesive: listed by ULC under Roof Deck Construction Materials, Guide No. 360R13 and as recommended by manufacturer of material being adhered and for use under climatic conditions to be encountered.
.2 Roofing nails: to CSA B111-1974, Table 12, of galvanized steel or aluminum, sufficient length to penetrate wood decks at least 20 mm.
.3 Mechanical fasteners for gypsum board sheathing:
.1 For rated roof assembly in accordance with ULC Design No. R-804.
.2 At unrated roof assembly areas use power drive, self-tapping, drywall screws at maximum spacing of 600 mm with screws not more than 25 mm from edge of board around perimeter.

.11 Asphaltic concrete fill: proprietary lightweight asphaltic fill material composed of vermiculite aggregate to ASTM C332-66and asphalt binder to ASTM D312-64, Types 3 and 4.
Compacted density: 360 kg/cubic m
Load indentation: not exceeding 1.6 mm at 344 kPa.

PART 3 - EXECUTION

3.1 Workmanship

.1 Apply roofing over clean, dry surfaces.

.2 Locate kettles so smoke will not discolour building.

.3 Protect surrounding surfaces against damage from roofing work.

.4 Before application of roofing membrane, ensure deck is properly sloped to drains and eaves, respectively.

.5 Ensure items projecting through roof are solidly set and cant strips, reglets and nailing strips are in place.

3.2 Gypsum Sheathing

.1 Install sound absorbing insulation in flutes of steel deck in areas with acoustical steel deck.

.2 Install gypsum board sheathing to steel deck using continuous beads of adhesive on each flute. In addition fasten mechanically as specified in Paragraph 2.1.10.3 of this Section.

Gypsum athing (Cont'd)

.3 Lay boards with long side at right angle to flutes, stagger end joints, provide full support at ends.

.4 Cut sheathing cleanly and accurately to roof breaks and protrusions to provide a smooth surface.

3 Roofing mbrane Over Steel ck

.1 Prime gypsum board surface immediately after installation. Install asphaltic concrete fill where required to provide slopes to drains.

.2 Mop gypsum board with asphalt and apply coated base sheet. Lay base sheets with joints lapped 150 mm and fully mopped.

.3 Mop coated base sheet with uniform coating of asphalt into which while hot, roll three plies of felt. Lap each sheet 620 mm over preceding and mop the full lap. Apply asphalt at rate of 1.0 kg/sq m for each mopping of felt. Carry membrane to top of cant strips.

.4 Over roof membrane, apply floodcoat of asphalt at rate of 2.2 kg/sq m with heavy mop coating on completed bituminous flashings.

3.4 Roofing Membrane Over Concrete Deck

.1 Apply roofing membranes to CRCA Specification C-51, Class A.

.2 Apply asphalt primer to manufacturer's instructions and allow to dry.

.3 Starting at low point, mop primed surface with roofing asphalt and lay coated base sheet. Lap joints 150 mm and fully mop.

.4 Mop coated base sheet with uniform coating of asphalt into which while hot, roll three plies of felt. Lap each sheet 620 mm over preceding and mop the full lap. Apply asphalt at rate of 1.0 kg/sq m for each mopping of felt. Carry membrane to top of cant strips.

.5 Over roof membrane, apply flood coat of asphalt at rate of 2.2 kg/sq m with heavy mop coating on completed bituminous flashings.

3.5 Membrane Flashing

.1 Apply 4 membrane flashing to applicable CRCA Specifications.

.2 Mop in and seal flashings and flanges of items projecting through membrane.

3.6 Insulation

.1 Allow asphalt flood coat to completely cool before installing insulation.

.2 Stagger joints and moderately butt each sheet together. Apply in two layers with joints offset in alternate layers.

.3 Insulation to cover entire roof area and up cant strips. Shape edges of insulation boards to match slope of cant strips, and to suit changing planes.

3.7 Stone Topping

.1 Apply stone as soon as possible after placement of insulation at minimum rate of 90 kg/sq m of roof.

.2 Spread stone to even thickness over entire roof area. Do not stockpile stone to overload roof before spreading.

.3 After installation of metal flashings, push stone up base of metal for depth of 50 mm to secure toe of flashing.

3.8 Paving Slabs

.1 Allow moderate contact between slabs to permit drainage of surface water.

.2 Shim slabs up as required to obtain smooth surface transition from paver to paver.

.3 Do not stockpile slabs to overload roof before placing.

3.9 Field Quality Control

.1 Inspection and testing of roofing application will be carried out by testing laboratory designated by Engineer.

.2 Engineer will pay for tests as specified in Section 01410.

10 Flexible Membrane ashing

.1 Provide and install flexible membrane flashing around sloped glazing skylights.

11 Protection of nished Work

.1 Where work must continue over finished roofing membrane before insulation and topping is applied, protect surface with minimum 12 mm thick plywood sheets.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Wood cant strips, blocking, curbs, and nailing strips: Section 06100

.2 Protected membrane roofing: Section 07550

.3 Prefinished metal cap flashing at copings and parapets at exterior metal siding and prefinished metal drip flashings at bottom of metal siding: Section 07411

.4 Painting: Section 09900

1.2 Samples

.1 Submit duplicate 150 x 150 mm samples of each type of sheet metal material, colour and finish in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Sheet Metal Materials

.1 Copper sheet: to ASTM B370-77 soft temper with mass of 6.1 kg/sq m minimum mass.

.2 Utility sheet aluminum for concealed flashings: plain 0.9 mm minimum thickness, except as otherwise specified or indicated.

.3 Prefinished aluminum flashings: of 1100-H14 alloy with base metal thickness of 0.8 mm.

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2.2 Prefinished Aluminum Sheet

.1 Finish: factory applied coating to CGSB 93-GP-1M supplemented and amended as follows:
.1 Type 1.
.2 Class F2S.
.3 Colour to approval of Engineer to match colour selected for prefinished metal siding as indicated on Finish and Colour Schedule.
.4 Specular gloss: 30 +/- 10 units.
.5 Coating thickness: not less than .025 micrometres, fluorocarbon coating with prime coat and finish coat separately baked.
.6 Outdoor exposure period 20 years.

2.5 Accessories

.1 Isolation coating: to CGSB 1-GP-108C, alkali resistant bituminous paint.

.2 Plastic cement: to CGSB 37-GP-5M.

.3 Underlay for metal flashing: dry sheathing to CAN2-51.32-M77.

.4 Sealants: in accordance with Section 07900, paragraph 2.1.4.2, colour selected by Engineer. Only sealants listed on CGSB Qualified Products List are acceptable for use on this project.

.5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness 1.29 mm.

.6 Fasteners: of same material as sheet metal, to CSA B111-1974, ring thread flat head roofing nails for concealed fastening. Use screws for exposed fastening. Length and thickness suitable for metal flashing application.

.7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.8 Solder: to ASTM B32-76, 50% tin and 50% lead.

.9 Flux: commercial preparation suitable for materials to be soldered.

.10 Touch-up paint: as recommended by metal flashing and trim manufacturer.

2.6 Fabrication

.1 Fabricate aluminum flashings and other sheet aluminum work in accordance with Aluminum Association "Aluminum Sheet Metal Work in Building Construction 1971", and as indicated.

.2 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints. Use S-lock joints filled with sealant.

.3 Hem exposed edges on underside 12 mm. Miter and seal corners with sealant.

.4 Form section squares, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.7 Metal Flashings

.1 Form vertical parapet flashings, base and counterflashings to profiles indicated of 1.29 mm thick prefinished aluminum.

2.8 Pans

.1 Form plastic pans from 6.1 kg/sq m copper sheet metal with minimum 75 mm upstand above finished roof and 100 mm continuous flanges with no open corners. Solder joints. Make pans minimum 50 mm wider than member passing through roof membrane. Provide 400 mm upstand at supports for screen around Cooling Tower.

2.9 Flashing: Diesel Exhaust Stack * Pg. 13 Addendum #1

PART 3 - EXECUTION

Pg 13 * 2.11 2.10 Flashing: Exhaust Ducts from Spray Booth #1

3.1 Installation

.1 Install sheet metal work in accordance with Aluminum Sheet Metal Work in Building Construction - 1971 and as detailed.

.2 Use concealed fastenings except where approved before installation.

.3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.

.4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips.

.5 Lock end joints and caulk with sealant.

.6 Insert metal flashing under cap flashing to form weathertight junction.

.7 At base of metal siding, at intersection of roofs with vertical surfaces provide and install flashing to protect vertical insulation.

.8 At roof monitors provide metal flashings at vertical surfaces to window sill, to eave of monitor, and at end walls to underside of vertical metal siding.

.9 Insert flashings under cap flashing and caulk with sealant.

.10 Install plastic pans, where shown around items projecting through roof membrane. Fill pans with plastic cement.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Wood cant strips: Section 06100

.2 Metal roof flashings: Section 07620

.3 Field painting: Section 09900

1.2 Design Criteria

.1 Roof hatch to withstand snow load and wind uplift in O.B.C. Climatic tables base on 30 year maximums and temperature variation range of 80 deg C without damage to unit or permanent deformation to seals.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate size and description of components, materials, attachment devices, description of frame and finish, and construction details.

1.4 Maintenance Data

.1 Provide maintenance data for hardware complete with pertinent details, spare parts lists and warnings against harmful maintenance materials and practices for incorporation into maintenance manual specified in Section 01730.

1.5 Guarantee

*.1 Provide a written guarantee, signed and issued in the name of her Majesty the Queen in Right of Canada stating that roof hatches will remain weathertight and operative for a period of five years from the date of Interim Completion of entire contract.

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PART 2 - PRODUCTS

2.1 Materials

.1 Steel sheet: commercial grade to ASTM A526-71(1975), with galvanized zinc coating to ASTM A525-80a, designation G90.

.2 Gaskets: extruded resilient neoprene, with full recovery after 50% compression.

.3 Insulation: fibrous glass, to CSA A101-M1977, Type 1A with thermal resistance value of RSI 0.74.

.4 Fasteners: screws to CSA B35.3-1962 galvanized steel or stainless steel.

2.1 Materials (Cont'd)

.5 Sealants: in accordance with Section 07900 paragraph 2.1.4 colour selected by Engineer.

.6 Prime paint for galvanized steel: to CGSB 1-GP-181M + Amdt-Mar-78.

.7 Isolation coating: alkali resistant bituminous paint or epoxy solution.

2.2 Components

.1 Hatch lid, double leaf:
.1 Clear opening size: 1350 x 1350 mm inside dimensions
.2 Cover of 1.52 mm galvanized steel with beaded flange at perimeter.
.3 Liner of 0.8 mm galvanized steel.
.4 Resilient gasket/seal to inner face of lid in contact with hatch lid support frame.

.2 Hatch lid support frame: 2 mm galvanized steel with integral cap flashing for curb.

.3 Curb:
.1 Frame: 300 mm high, of 1.52 mm galvanized steel with 90 mm flange for support to deck and integral cap flashing.
.2 Outer surface cladding: 1.52 mm galvanized steel.

.4 Screws: to CSA B35.2.1963(R1969) galvanized steel for curb to structure and for hatch lip frame to outer attachment.

.5 Hinges: type recommended by roof hatch manufacturer.

.6 Operation: doors shall open automatically when actuated by a shock wave exerting a pressure of 1 kPa, and thereupon shall be positively held open against wind pressures.

2.3 Fabrication

.1 Fabricate components free of twists, bends, or visual distortion and properly insulated. Weld corners and joints.

.2 Ensure continuity of weather-tight seal.

.3 Design flashings to collect and lead off condensation accumulated.

.4 Zinc plate hardware and attachments. Shop prime ready for field painting.

PART 3 - EXECUTION

3.1 Installation

.1 Install roof hatches plumb, level and in proper alignment as indicated.

.2 Adjust and seal assembly with provision for expansion and contraction of components.

.3 Secure prefabricated curb assembly to structure where indicated.

.4 Ensure integral installation with roof membrane.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Caulking control joints in masonry: Section 04050

.2 Caulking between members of metal siding: Section 07411

.3 Caulking in connection with roof flashing: Section 07620

.4 Caulking between members of aluminum frames and screens: Section 08520

.5 Caulking between members of aluminum windows: Section 08520

.6 Acoustical caulking and caulking of control joints in connection with gypsum board finishes: Section 09250

1.2 Samples

.1 Submit duplicate samples of each type of material and colour to be used in accordance with Section 01340.

.2 Cure samples under conditions anticipated at job site during application.

1.3 Environmental Conditions

.1 Sealant and substrate materials to be minimum 5 deg C.

.2 Should it become necessary to apply sealants below 5 deg C, consult sealant manufacturer and follow their recommendations.

1.4 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in Right of Canada stating that caulking work of this Section is guaranteed against leakage, cracking, crumbling, melting, shrinkage, running loss of adhesion, or staining adjacent surfaces, for a period of three years from the date of Interim Completion of entire contract.

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PART 2 - PRODUCTS

2.1 Materials

.1 Primers: type recommended by sealant manufacturer.

.2 Joint fillers:
.1 General: compatible with primers and sealants, outsized 30 to 50%.
.2 Polyethylene, urethane, neoprene or vinyl: extruded closed cell foam, Shore A hardness 20, tensile strength 140 to 200 kPa.
.3 Neoprene or butyl rubber: round solid rod, Shore A hardness 70.
.4 Polyvinyl chloride or neoprene: extruded tubing with 6 mm minimum thick walls.

.3 Bond breaker: pressure sensitive plastic tape, which will not bond to sealants.

.4 Sealants:
.1 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only these primers.
.2 Sealant for all exterior caulking: restricted to one of following:
.1 Multi-component, chemical curing, to CAN2-19.24-M80, Type 2, Class B.
.2 Low-modulus, one component, silicone base, chemical curing, to CGSB 19-GP-9Ma.
.3 Sealant for interior caulking: one component, elastomeric, chemical curing, to CAN2-19.13-M82, Type 2, Class B.

.5 Colour of sealants: selected by Engineer.

.6 Joint cleaner xylol, methylethyleketon or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

PART 3 - EXECUTION

3.1 Preparation

.1 Remove dust, paint, loose mortar and other foreign matter. Dry joint surfaces.

.2 Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sandblasting.

.3 Remove oil, grease and other coatings from non-ferrous metals with joint cleaner.

.4 Prepare concrete, masonry, glazed and vitreous surfaces to sealant manufacturer's instructions.

.5 Examine joint sizes and correct to achieve depth ratio 1/2 of joint width with minimum width and depth of 6 mm, maximum width 25 mm.

.6 Install joint filler to achieve correct joint depth.

.7 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.8 Apply bond breaker tape where required to manufacturer's instructions.

.9 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.2 Application

.1 Apply sealants, primers, joint fillers, and bond breakers to manufacturer's instructions. Apply sealant using gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid. Superficial pointing with skin bead is not acceptable.

.2 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities. Neatly tool surface to a slight concave joint.

.3 Apply sealant to joints between window or door frames to adjacent building components, around perimeter of every external opening.

3.2 Application (Cont'd)

.4 Clean adjacent surfaces immediately and leave work neat and clean. Remove excess sealant and droppings using recommended cleaners as work progresses. Remove masking after tooling of joints.

**********END**********

Project

Parry Sound, Ontario
Transport Canada
Canadian Coast Guard

Base Reconstruction

Project Number

095074/354604

Project Date

May 31, 1984

This document is the document referred to as "Plans and Specifications" and marked "A" in the Articles of Agreement entered into

on the .....day of .....19.....
Between Her Majesty the Queen

and .....

Signed .....
(Minister)

.....
(Contractor)

VOLUME ONE

VOLUME ONE (continued)

VOLUME ONE (continued)

VOLUME TWO

VOLUME TWO (continued)

VOLUME TWO (continued)

VOLUME THREE

VOLUME THREE (Continued)

VOLUME FOUR

VOLUME FOUR (CONTINUED)

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Building-in and grouting frames in masonry: Section 04050

.2 Building-in frames into steel stud walls: Section 09111

.3 Steel hollow metal doors: Section 08110

.4 Hollow metal frames: Section 08310

.5 Sliding metal fire doors: Section 08310

.6 Rolling doors, fire rated: Section 08346

.7 Supply of finish hardware and mounting heights: Section 08710

.8 Glazing: Section 08800

.9 Painting: Section 09900

1.2 Requirements of Regulatory Agencies

.1 Fabricate and install labelled steel fire rated rated doors and frames to NFPA 80-1975 and ULC S-104 except where specified otherwise.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate each type of door and frame, material core thickness, reinforcements, glazing, location of exposed fasteners and arrangement of hardware.

.3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and in door schedule.

PART 2 - PRODUCTS

2.1 Materials

.1 Door and frame assembly: material and construction approved by ULC.

.2 Sheet steel: commercial grade steel to ASTM A525-8A finished to ASTM A526-1975-W25 wiped zinc finish. Core thickness not less than 1.2 mm for doors, not less than 1.6 mm for frames. Provide 2 mm base steel frames for openings over 1200 mm in unsupported width.

2.1 Materials (Cont'd)

.3 Door Core:
.1 Exterior doors: Hollow steel, vertically stiffened with internal steel ribs and all voids filled with ULC approved insulation to provide minimum insulation value for door of RSI-1.145.
.2 Interior doors: structural honeycomb core of kraft paper having 20 mm cell size to door thickness indicated.

.4 Frame floor anchors and channel spreaders. Minimum 2 mm thick base steel.

.5 Guard boxes: minimum 0.8 mm thick base steel.

.6 Corrugated steel frame tee anchors: thickness and design approved by ULC.

.7 Hinge, strike, etc., reinforcing: minimum 3.5 mm thick base steel.

.8 Glazing stops: commercial grade sheet steel of thickness and design approved by ULC.

.9 Primer: to CGSB 1-GP-181M+Amdt-Mar-78.

.10 Door bumpers: black neoprene, single stud.

.11 Provide astragals for pairs of doors in accordance with ULC requirements.

2.2 Fabrication

.1 Fabricate doors and frames in accordance with details, approved shop drawings and ULC requirements.

.2 Mortise, reinforce, drill and tap doors and frames and reinforcements to receive hardware using templates provided by finish hardware supplier.

.3 Chemically treat surfaces and apply one coat of primer.

.4 Attach ULC labels to doors and frames.

2.3 Frames

.1 Grind welded corners to a flat plane, fill with metallic paste filler and sand to uniform smooth finish.

.2 Protect strike and hinge reinforcements using guard boxes welded to frames.

2.3 Frames (Cont'd)

.3 Weld in two channel spreaders per frame, to ensure proper frame alignment.

.4 Provide for anchorage of frames to floor slab.

.5 Reinforce head of frames wider than 1200 mm.

.6 Install 3 bumpers on strike jamb of each single door and 2 bumpers at head for pairs of doors.

2.4 Doors

.1 Make provision for glass where indicated and provide glazing stops.

PART 3 - EXECUTION

3.1 Frame Installation

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreaders at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowance for deflection to ensure structural loads are not transmitted to frames.

3.2 Door Installation

.1 Install doors and hardware in accordance with templates and manufacturer's instructions.

.2 Adjust operable parts for correct function.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1	Steel hollow metal door frames:	Section 08111
.2	Steel fire doors and frames:	Section 08100
.3	Supply of finish hardware and mounting heights	Section 08710
.4	Glazing	Section 08800
.5	Painting	Section 09900
.6	Supply of door louvres	Section 10200

1.2 Samples

.1 Submit one 300 x 300 mm corner sample of each type door, in accordance with Section 01340.

.2 Show corner detail, butt cutout and glazing stops.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed or louvred. For location and sizes of door louvres refer to mechanical drawings.

PART 2 - PRODUCTS

2.1 Materials

.1 Sheet steel: 1.2 mm base thickness, commercial grade steel to ASTM A525-80a finished to ASTM A526(1975) W25 wiped zinc finish.

.2 Glazing stops: minimum 1 mm base thickness sheet steel with W25 wiped zinc finish to ASTM A525-80a screw fixed.

.3 Door Core:
.1 Interior doors: structural honeycomb core consisting of kraft paper having 20 mm cell size to thickness indicated.
.2 Exterior doors: hollow steel, vertically stiffened with internal steel ribs and all voids filled with semi-rigid fibrous insulation minimum density 24 kg/cu. m.

2.1 Materials (Cont'd)

.4 Primer: for touch up to CGSB 1-GP-181M+Amdt-Mar-78.

.5 Fixed transom over exterior man doors: construction as specified for exterior doors but with thickness and insulation to provide total insulation value of RSI = 3.0 either by use of semi-rigid fibrous insulation or foamed-in-place rigid urethane insulation.

2.2 Fabrication

.1 Fabricate steel doors as detailed, in accordance with Canadian Steel Door and Frame Manufacturers' Association, "Canadian Manufacturing Specifications for Steel Doors and Frames", 1978 for hollow steel and honeycomb core construction, respectively except where specified otherwise.

.2 Mortise, reinforce, drill and tap doors and reinforcements to receive hardware using templates provided by finish hardware supplier.

.3 Make provision for louvres and glazing as indicated and provide necessary glazing stops.

.4 Construct rail and stile doors in same manner as flush doors.

.5 Construct matching panels in same manner as doors.

.6 Touch up doors with primer where zinc finish damaged during fabrication.

PART 3 - EXECUTION

3.1 Installation

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.

.2 Adjust operable parts for correct function.

.3 Install louvres.

.4 Install fixed transoms, securely anchored with no fasteners exposed on face.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1	Building-in and grouting frames in masonry:	Section 04050
.2	Building-in frames into steel stud walls:	Section 09111
.3	Caulking of joints between frames and other building components:	Section 07900
.4	Steel hollow metal doors:	Section 08110
.5	Plastic faced wood doors:	Section 08213
.6	Fire doors and frames:	Section 08100
.7	Supply of finish hardware, including weatherstripping:	Section 08710
.8	Glazing:	Section 08800
.9	Painting:	Section 09900

1.2 Samples

.1 Submit one 300 x 300 mm corner sample of each type of frame in accordance with Section 01340.

.2 Show butt cutout and glazing stops.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.

.3 Include schedule identifying each frame with door and screen numbers relating to numbering on drawings and in door schedule.

PART 2 - PRODUCTS

2.1 Materials

.1 Sheet steel: commercial grade steel to ASTM A525-80a finished to ASTM A526(1975) W25 wiped zinc finish.
.1 Frames: 1.6 mm base thickness steel. Provide 2 mm base thickness steel frames for openings over 1200 mm in unsupported width.
.2 Floor anchors, channel spreaders and wall anchors: minimum 2 mm base thickness steel.
.3 Guard boxes: minimum 0.8 mm base thickness steel.
.4 Glazing stops: minimum 1 mm base thickness steel, screw fixed.

.2 Reinforcing channel: to CSA G40.21-M1978, type 300W.

.3 Door bumpers: black neoprene single stud.

.4 Primer: to CGSB 1-GP-181M+Amdt-Mar-78.

2.2 Fabrication

.1 Fabricate frames as detailed, to Canadian Steel Door and Frame Manufacturers' Association, "Canadian Manufacturing Specifications for Steel Doors and Frames", 1978; except where specified otherwise.

.2 Cut mitres and joints accurately and weld continuously on inside of frame profile.

.3 Grind welded corners and joints to flat plane, fill with metallic paste filler and sand to uniform smooth finish.

.4 Touch up frames with primer where zinc finish damaged during fabrication.

.5 Provide jamb anchors for fixing at floor.

.6 Reinforce head of frames wider than 1200 mm.

.7 Reinforce both jambs with 100 x 40 mm structural steel channel at door openings in screens. Install reinforcing continuous from floor to structure above, except where indicated otherwise.

.8 Install 3 bumpers on strike jamb for each single door and 2 bumpers at head for pairs of doors.

.9 Make provisions for glazing as indicated and provide glazing stops.

2.3 Exterior Window, Mechanics Shop 129

.1 Thermally broken hollow metal frame, 50 mm face width, 121 mm depth, fabricated of galvanized steel sheet to ASTM A526-80 with Z275 zinc coating, with base metal thickness of 1.28 mm minimum.

.2 Interior and exterior frame sections separated by a polyvinyl chloride thermal break without penetrating fastenings.

.3 Welded assembly so arranged that welds do not provide thermal bridge between interior and exterior frame components.

.4 To accept 23 mm thick insulating glass units.

.5 Glazing stops formed of galvanized steel sheet with base metal thickness of 1.63 mm minimum, with Z275 zinc coating. Mitre at corners. Secured with countersunk, oval-head, stainless steel machine screws at centres not exceeding 150 mm.

.6 Shop phosphatize for field painting. Prime welds with zinc rich primer.

PART 3 - EXECUTION

3.1 Installation

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Fill exterior hollow metal frames with tightly packed mineral fibre insulation.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Final cleaning: Section 01710

.2 Caulking between frames and other building components: Section 07900

.3 Aluminum windows: Section 08520

.4 Supply of finish hardware: Section 08710

1.2 Samples

.1 Submit one 300 x 300 mm corner sample of each type door and frame, in accordance with Section 01340. Provide similar samples of curtain walling and framing for sloped glazing skylights.

.2 Show corner detail, glazing detail, reinforcement, and finish.

.3 Frame sample to show glazing stop, door stop, jointing detail, finish, trim.

.4 Submit 150 x 150 mm sample of heat absorbing glass.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate each type of door, frame and screen, extrusion profiles, method of assembly, section and hardware reinforcement, locations of exposed fasteners, finishes, etc.

.3 Supplement with catalogue details in accordance with Section 01340 for each type of door and framing illustrating profiles, dimensions and methods of assembly.

1.4 Maintenance Data

.1 Provide maintenance data for cleaning and maintenance of aluminum finishes for incorporation into maintenance manual specified in Section 01730.

1.5 Protection

.1 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.

1.6 Guarantee

*.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that the aluminum doors, framing, curtain wall, screens, and sloped skylights are guaranteed against leakage and malfunction under normal usage for a period of three years from the date of Interim Completion of entire contract.

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*.2 In addition provide a written guarantee, signed and issued in the name of Her Majesty the Queen in Right of Canada guaranteeing insulating glass units against failure of seal of enclosed air space and deposits on inner faces of glass detrimental to vision, in accordance with GC.24 but for a period of five years from the date of Interim Completion of entire contract.

Pg. 14 Addendum #1

PART 2 - PRODUCTS

2.1 Materials

.1 Aluminum extrusions: Aluminum Association alloy AA6063-T5.

.2 Sheet aluminum: Aluminum Association alloy AA1100.

.3 Steel reinforcement: to CSA G40.21-M1978, grade 300W, hot dip galvanized with minimum coating of 0.4 kg/sq m to CSA G-164-1965 (R1972).

.4 Fasteners: aluminum, cadmium plated steel, or stainless steel, finished to match adjacent material.

.5 Weatherstrip: backed pile.

.6 Isolation coating: alkali resistant bituminous paint or epoxy solution.

.7 Glazing materials: in accordance with Section 08800.

.8 Sealants: in accordance with Section 07900 paragraph 2.1.4.2, colour selected by Engineer.

.9 Galvanize steel sheet; commercial quality to ASTM A526-80 with Z-275 zinc coating.

2.1 Materials (Cont'd)

.10 Glazing:

.1 Exterior and interior aluminum doors, where so indicated: Clear, tempered, polished plate or float glass to CAN2-12.3-M79, Type 2, Class B. Minimum thickness: 6 mm.

.2 Curtain wall framing: Hermetically-sealed insulating glass units to CAN2-12.8-M76 composed as follows:

.1 Exterior light: 6 mm thick heat-absorbing glass to CAN2-12.4-M76, tinted blue-green. Visible light transmission: 74%; shading coefficient: 0.68.

.2 Interior light: 5 mm thick clear float glass to CAN2-12.3-M76.

.3 Air space: 13 mm.

.3 Sloped glazed skylights: mechanically double glazed with exterior light of 6 mm clear, tempered float glass to CAN2-12.3-M79, Type 2, Class B; inner light of 6 mm, clear, laminated safety glass to CAN2-12.3-M79, Type 1, Category 1.

.4 Transoms:

.1 Exterior: Hermetically sealed insulating glass as specified in Paragraph 2.1.9.2 above.

.2 Interior: Single glazed with 6 mm thick clear float glass.

.5 Sidelights:

.1 Exterior: Hermetically sealed insulating glass of two lights of 6 mm clear tempered float glass.

.2 Interior: Single glazed with 6 mm clear tempered float glass.

2.2 Finishes

.1 For anodized finish aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes - 1973:

.1 Clear anodic finish: designation AA-A31.

.2 For aluminum components with applied finish: low-gloss, factory-applied thermosetting acrylic enamel with minimum dry film thickness of 0.25 micromillimeters in colour indicated on Finish and Colour Schedule.

.3 Finish steel clips and reinforcing steel with 380 g/sq m zinc coating to CSA G164-1965(R1972).

2.3 Fabrication

.1 Construct doors, transom panels, frames and screens to profiles and maximum face sizes as shown. Provide minimum 16 mm bite for factory-sealed double-glazed units.

.2 Design frames and screens in exterior walls to:
.1 Accommodate expansion and contraction within service temperature range of -35 deg C to 75 deg C.
.2 Limit deflection to 1/175th of clear span tested to ASTM E330-79 under wind loads for building locality as ascertained by NBC Supplement No. 1 Climatic Information for Building Design in Canada.
.3 Design framing for sloped glazing skylights to withstand combined dead, live, and wind loads.

.3 Make allowances for deflection of structure. Ensure that structural loads are not transmitted to aluminum work.

.4 Provide structural steel reinforcement for strength, stiffness and connections.

.5 Fit intersecting members to flush hairline, weathertight joints and mechanically fasten together, except where indicated otherwise.

.6 Conceal fastenings from view. Exposed fastenings where indicated.

.7 Form cut-outs, recesses, mortising or milling for finishing hardware to templates supplied. Reinforce with aluminum or galvanized steel plates.

.8 Field apply isolation coating to aluminum in contact with dissimilar metals, cementitious materials.

.9 Provide replaceable weatherstripping at exterior and vestibule door openings. Weatherstrip bottom of doors with pile sweep strip applied to door rail.

.10 Manufacturer's nameplates on doors, frames and screens are not permitted.

2.4 Aluminum Frames

.1 Frames for doors, curtain walling and sloped glazing skylights to be aluminum extrusions with minimum wall thickness of 3 mm; sizes as indicated for flush glazing with applied stops for doors.

.2 Frames for doors and screens to be by same manufacturer as aluminum doors.

.3 Frames for curtain walling and sloped glazing skylights thermally broken within interior and exterior components separated by a compressible polyvinyl chloride seal between members.

.4 Glazing seals of extruded polymer on exterior with extruded neoprene on interior.

.6 Miscellaneous panels, closures, mullion covers, trim of not less than 3 mm thick aluminum sheet in finish to match adjacent components. Fabricate insulated panels extending into recesses of floor convectors of galvanized sheet steel with minimum base metal thickness of 0.8 mm.

.7 Insulation where indicated: semi-rigid gloss fibre insulation, with density of 21 kg/cubic m and an RSI factor of 0.70 per 25 mm of thickness.

.8 Finishes: exposed aluminum:
.1 Exterior door frames as follows:
.1 For Doors 102, 165A, 172A: interior in white acrylic enamel, exterior in acrylic enamel in colour designated as "PT.-2" on Finish and Colour Schedule.
.2 For Doors 123A and 128A: clear anodized aluminum.
.3 Door stops and subframes in curtain wall framing: clear anodized aluminum.
.2 Framing for sloped glazed skylights: as specified in Paragraphs 2.4.8.1. above.
.3 Interior vestibule framing in clear anodized finish.

.9 Frame for opening sash occurring in curtain wall framing. For sash and hardware refer to Section 08520.

2.5 Aluminum Doors

.1 Construct doors of porthole extrusions with minimum wall thickness of 3.2 mm.

.2 Door stiles nominal 90 wide plus or minus 6 mm.

.3 Top rail nominal 90 wide plus or minus 6 mm.

.4 Bottom rail nominal 150 wide plus or minus 6 mm.

.5 Reinforce mechanically-joined corners of doors by welding, spigotting, welding and spigotting or by one piece cast aluminum angle to produce sturdy door unit.

.6 Glazing stops: interlocking snap-in type for dry glazing. Exterior stops: tamperproof type.

.7 Finish: Clear anodized.

PART 3 - EXECUTION

3.1 Installation

.1 Install work plumb, square, level, free from warp, twist and superimposed loads.

.2 Secure work in required position. Do not restrict thermal movement.

.3 Install hardware in accordance with templates.

.4 Adjust operable parts for correct function.

.5 Isolate from cementitious materials.

3.2 Caulking

.1 Where required seal between members of aluminum work.

.2 Apply sealant in accordance with Section 07900. Conceal sealant within the aluminum work except where exposed use is permitted by Engineer.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Steel hollow metal frames: Section 08111

.2 Supply of finish hardware and mounting heights: Section 08710

.3 Glazing: Section 08800

.4 Finishing edges: Section 09900

.5 Supply of door louvers: Section 10200

1.2 Samples

.1 Submit one 300 x 300 mm corner sample of plastic faced wood door in accordance with Section 01340.

.2 Show door construction, core, glazing detail and faces.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate door types and cut outs for lights and louvers. For location and sizes of door louvres refer to mechanical drawings.

1.4 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in Right of Canada stating that the wood doors are guaranteed against defects for a period of three years from the date of Interim Completion of entire contract.

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PART 2 - PRODUCTS

2.1 Materials

.1 Door materials: to CSA 0132.2-M1977.

.2 Laminated plastic: to CSA CAN3-A172-M79, Type 1b, 1.6 mm thick based on solid colour range with texture finish. Colour as shown in material and colour schedule.

.3 Plywood surface: 3 ply, 3 mm thick, cross laminated plywood to CSA 0115-1967.

.4 Adhesive: urea formaldehyde to CSA 0112-M SERIES 1977.

2.1 Materials

.5 Glazing stops and stickings: hardwood with mitred corners.

.6 Core: mat formed particle board to CSA CAN3-0188.1-M78, sanded both sides.

.7 Top and bottom rails: 38 mm softwood.

.8 Stiles: 35 mm combined width of softwood with minimum of 12 mm of clear hardwood as exposed edge.

2.2 Fabrication

.1 Fabricate doors and panels in accordance with CSA 0132.2-M1977.

.2 Finish laminated plastic smooth and flush with edges of door and bevel at 20 degrees.

.3 Prepare doors for louvers and glass. Provide glazing stops and stickings.

PART 3 - EXECUTION

3.1 Installation

.1 Install doors and hardware in accordance with manufacturer's instructions.

.2 Adjust hardware for correct function.

.3 Install louvers and stops.

3.2 Adjustment

.1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1	Steel hollow metal doors:	Section 08110
.2	Steel hollow metal frames:	Section 08111
.3	Steel fire doors and frames:	Section 08100
.4	Supply of finish hardware:	Section 08710
.5	HSS steel door jambs:	Section 05120
.6	Rubber sweep sheet:	Section 09980
.7	Field painting:	Section 09900

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners.

1.3 General Description

.1 This Section comprises large pairs of doors 156D and 158D indicated locations in Shop Wing. Mount doors in openings having HSS tubular steel column jambs. Opening will have no head frame.

PART 2 - PRODUCTS

2.1 Materials

.1 Sheet steel faces: 1.6 mm minimum thickness, commercial grade steel to ASTM A525-80a with Z275 zinc coating, mill phosphatized finish for primer adhesion.

.2 Hollow steel construction with trussed design interior reinforcing designed to transfer loads and stresses to hinge points. Each door leaf provide with 5 heavy, adjustable, industrial hinges supplied under Section 08710. Total door thickness 75 mm.

.3 Internal stiffening and bracing: to manufacturer's design requirements using one of following:
.1 Formed sections of galvanized sheet steel with base metal thickness of 3 mm minimum.
.2 Structural tubular or channel shapes to CAN3-G40.21-M81, Type 300W.

2.1 Materials (Cont'd)

.4 Hardware reinforcement: of not less than 3.4 mm base metal thickness steel with Z-275 zinc coating.

.5 Primer: for shop priming touch up to CGSB 1-GP-181M+Amdt-Mar-78, in grey.

2.2 Fabrication

.1 Fabricate steel doors to indicated sizes as detailed, in accordance with Canadian Steel Door and Frame Manufacturers' Association, "Canadian Manufacturing Specifications for Steel Doors and Frames", 1978 for hollow steel construction, except where specified otherwise.

.2 Mortise, reinforce, drill and tap doors and reinforcements to receive hardware using templates provided by finish hardware supplier. Provide for through bolting of hardware.

.3 On Door 158D only, on side of doors facing into Washdown Area 160, and 300 mm above floor level provide horizontal clamping strip for 6 mm rubber sweep sheet supplied and installed under Section 09980. Clamping strip of minimum of 4.8 x 38 mm galvanized steel flat bar drilled at200 mm centres and countersunk for 4.8 mm flat-head machine screws. Provide similar coinciding internal door reinforcing drilled and tapped for screws. Provide corrosion-resistant machine screws.

.4 Touch up doors with primer where galvanized finish damaged during fabrication.

PART 3 - EXECUTION

3.1 Installation

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions. Drill and tap HSS column jambs for hinge mounting.

.2 Adjust operable parts for correct function.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Field painting: Section 09900

.2 Steel door frame: Section 05120

.3 Electrical power supply: Section 16010

1.2 Reference Standards

.1 Fabricate and install sliding metal fire door to NFPA 80-1975 and ULC S-104 except where specified otherwise.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate construction, thicknesses, dimensions, arrangement of hardware, required clearances and electrical connections.

1.4 Maintenance

.1 Provide data for maintenance of sliding fire operator and door hardware in accordance with Section 01730.

PART 2 - PROOUCTS

2.1 Materials (Cont'd)

.1 Horizontal sliding door: galvanized hollow metal flush type; 2 hour fire rating to NFPA 80-1975 and ULC S-104. Provide Certificate of Construction.

.2 Sheet Metal: commercial quality to ASTM A526-80 with Z275 zinc coating. Minimum base metal thickness of door faces: 1 mm.

.3 Hardware: ULC labelled sliding fire door hardware to NFPA 80-1975 and ULC S-104.

.4 Primer: to CGSB 1-GP-105M in grey-white colour.

2.2 Door Design

.1 Design door to:
.1 Operate electrically
.2 Open horizontally, sliding to both sides (bi-parting).

.2 Provide headrail track for installation horizontally for emergency closing with counterweights. Provide counterweight enclosure.

2.2 Door Design (Cont'd)

.3 Equip fire door for actuation by fire alarm system through electrically operated release mechanism which disengages electrical operator.

.4 Provide full height safety edging on leading edges of both door leafs which will instantly reverse closing action upon contact with any object up until door reaches closed position.

.5 Provide door electrically actuated interlocking device which will prevent electrical operator from opening door when spray painting equipment is in operation.

.6 Provide electrically released latching device which remains in locked mode when power is off to electrical operator thus preventing door being opened when spray painting equipment is in operation. Provide for mechanical release of latch.

.7 Cope door to fit around penetrating monorail and provide rubber gasketting to close space between monorail and metal of door.

2.3 Electrical Operator

.1 Electrical motors, controller units, remote pushbutton stations, relays and other electrical components: to CSA and ULC approval with NEMA Type 4 enclosures.

.2 Power supply: 600 V, 3 phase, 60 Hz.

.3 Controller unit: with integral motor reversing starter, 3 heater elements for overload protection and interlock and control relays as applicable.

.4 Operation:
.1 Remote push button station: surface mounted, in Washdown Area 160, with "OPEN-STOP-CLOSE" push buttons, without pilot light.
.2 Motor size to suit door weight, driving heavy duty drive chain with adjustable shock-absorbing inertia spring, through system of case hardened spur gears mounted on self-aligning shafts. All bearings sealed and self-lubricating. All gears, belts, and chains completely enclosed. Equipped with slip-clutch. Provide shear link in drive chain. Motor and drive mounted to side of opening.
.3 Each door panel suspended on heavy-duty 4-wheel trolleys with hardened steel races and permanently lubricated, sealed ball bearings, ravelling in no-sag steel box track. Track and drive chain with baked enamel finish.

2.3 Electrical Operator (Cont'd)

.5 Manual safety release: wire cable leading from door panel to drive, when pulled during power failure, to free door for manual operation.

.6 Control transformer: for 24 V AC control voltage.

.7 Provide all hardware, including shock-absorbing binders, latch binder, adjustable stay rollers, steel flame baffle, perimeter seals, and all brackets and fasteners.

PART 3 - EXECUTION

3.1 Installation

.1 Install door in accordance with manufacturers' instructions.

.2 Install electrical motors, controller units, push button stations, relays and other electrical equipment required for door operation.

.3 Installation includes electric wiring from power supply located near door opening.

.4 Adjust door operating components to ensure smooth opening and closing of door.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Steel plate door frames: Section 05500

.2 Electrical power supply for power operated doors: Section 16010

1.2 Requirements of Regulatory Agencies

.1 Fabricate rolling metal fire doors to NFPA 80-1975 and ULC-S-104 except where specified otherwise.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate each type of door, arrangement of hardware, required clearances, electrical characteristics including voltage, size of motors, auxiliary controls and wiring diagrams.

1.4 Maintenance Data

.1 Provide data for maintenance of rolling metal doors and hardware for incorporation into maintenance manual specified in Section 01730.

PART 2 - PRODUCTS

2.1 Materials

.1 Steel sheet metal: commercial grade to ASTM A526-80 with Z275 zinc coating.

.2 Primer: to CGSB 1-GP-105M.

2.2 Motor-operated Doors

.1 Fabricate rolling metal fire doors to NFPA 80-1975 and ULC-S-104 with 3/4 hr fire rating for C class opening and bearing ULC label.

.2 Assemble rolling door curtain of roll formed steel interlocking slat sections.

.3 Rivet continuous end locks to slat ends.

.4 Provide bottom bar of double equal weight angles.

.5 Form guides of metal angles of sections of 5 mm minimum thickness for face of wall installation.

2.2 Motor-operated Doors (Cont'd)

.6 Construct counterbalance assembly of heat treated torsion spring with 25% overload factor. Enclose spring in steel pipe to support door curtain and counterbalance mechanism with maximum deflection of 1/360th of opening width. Provide ball bearings at rotating points. Provide spring tension adjusting wheel, accessible for setting.

.7 Support counterbalance assembly on 5 mm minimum thickness steel plate brackets, forming end enclosures.

.8 Enclose counterbalance assembly with galvanized steel sheet formed hood.

.9 For fire doors attach to hood sheet metal flame and smoke baffle to drop in place automatically when automatic closing device is activated.

.10 Equip door for locking from inside with slide bolts on bottom bar with provision for padlocking.

2.3 Operation

.1 Equip door for operation by electrical operator.

.2 On fire doors install fire alarm activated automatic closing device to close door at controlled slow even speed in case of fire. Door reset by manually raising into open position and re-engaging release device.

.3 On fire doors arrange automatic closing device to permit manual lifting of curtain for emergency exit after automatic closing with curtain returning to closed position when released.

.4 Connect automatic closing device on fire doors to heat detection equipment.

2.4 Electrical Operator

.1 Electrical motors, controlled units, remote pushbutton stations, relays and other electrical components: to CSA and ULC approval, with CEMA enclosures Class Type 1.

.2 Power supply: 600 V, 3 phase, 60 Hz.

.3 Controller units with integral motor reversing starter, 3 heater elements for overload protection, including control relays as applicable.

.4 Operation:

.1 Remote push button stations: flush mounted, in locations, with "OPEN-STOP-CLOSE" push buttons.

2.4 Electrical Operator (Cont'd)

.5 Design brake to stop and hold doors in any position.

.6 Include hand chain interlocked auxiliary operator to disconnect motor mechanically and electrically when engaged.

.7 Provide combination roll rubber safety switch with limit switches for full length of bottom rail of bottom section of door, enabling door to reverse to open position when coming in contact with object on closing cycle.

.8 Manual safety release: wire cable leading from door panel to drive yoke, when pulled during power failure, to free door for manual operation.

.9 Door speed: 300 mm per second.

.10 Mounting brackets: galvanized steel, size and thickness to suit conditions.

.11 Control transformer: for 24 V AC control voltage.

.12 On fire door provide safety device in the form of a governor of excapement type, inoperative during motor operation or manual chain operation, which shall control the speed of the curtain upon automatic release so as to prevent injury to persons.

2.5 Manual Crank Operated Door

.1 At Door 191B provide 1-1/2 hour labelled overhead rolling steel fire shutter which will normally remain open unless released by fire alarm actuated relerase or lowered by manual crank operation.

.2 Curtain balanced by helical springs within spring barrel with springs anchored to tension rod held in place by adjustable wheel assembly. Complete with hood with drop hood closing against the coil when door is automatically released.

.3 Provide safety device in the form of a governor of escapement type, inoperative during manual operation, but which shall control the speed of the curtain upon automatic closing operation so as to avoid injury to persons.

.4 Manual operation and raising of curtain after automatic release by removable hand crank through reduction gearing system.

.5 No locking function required.

2.5 Manual Crank Operated Door (Cont'd)

.6 Other requirements as specified for motor-operated doors.

PART 3 - EXECUTION

3.1 Installation

.1 Install doors in accordance with manufacturer's instructions. Do all drilling and tapping required for installation. Provide all auxiliary mounting plates and brackets.

.2 Install electrical motors, controller units, pushbutton stations, relays and other electrical equipment required for door operation.

.3 Installation includes electric wiring from power supply located near door.

.4 Adjust door operating components to ensure smooth opening and closing of doors.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Steel door frames: Section 05120

.2 Finish painting: Section 09900

.3 Electrical power supply: Section 16010

1.2 Design Criteria

.1 Design exterior door assembly to withstand windload of 1 kPa with a maximum horizontal deflection of 1/240 of opening width.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate materials, operating mechanisms, required clearances and electrical characteristics, including motor size, auxiliary controls, and wiring diagrams.

1.4 Maintenance Data

.1 Provide operation and maintenance data for overhead door and hardware for incorporation into operation and maintenance manual specified in Section 01730.

PART 2 - PRODUCTS

2.1 Materials

.1 Galvanized steel sheet: commercial quality to ASTM A526-80 with Z275 zinc coating.

.2 Steel sheet: commercial quality to ASTM A366-72(79) with Class 1 matt finish.

.3 Primer: to CGSB 1-GP-105M for steel and CGSB 1-GP-181M+Amdt-Mar-78, for galvanized steel surfaces.

.4 Insulation: flame retardant, rigid polyurethane, injected and foamed in place between door skins, to provide a total RSI for door of 2.65.

.5 Glazing: Double glazed with two lights of 6 mm thick clear polycarbonate sheet glazing.

2.2 Doors

.1 Fabricate 51 mm thick, insulated, flush door panels of roll formed galvanized steel inner and outer skins, manufactured in a continuous process whereby foamed in place insulation is injected between two steel skins with no metal to metal contact between skins. Panels roll-formed into tongue-and-groove joint with thermal break of 20 mm, with a closed-cell neoprene gasket laminated in place to form air tight seal between door panels. Ends of panels finished with 1.5 mm thick galvanized steel end caps and reinforced as required to secure roller carriers, hinges, corner brackets, and locking devices.

.2 Outer and inner skins: minimum base metal thickness of 0.56 mm to Paragraph 2.1.1 of this Section, chemically treated for paint adhesion, then coated with two layers stoved finish on acrylic base, in grey-white finish.

.3 Glazing: vision panels as indicated glazed with double skin polycarbonate with thermal cavity, set in jointless rubber gasket.

.4 Weatherstripping:
.1 Lintel: special lintel weatherstripping of EPDM rubber retained in aluminum extrusion. Adjustable.
.2 Jambs: specially constructed and mounted on a full height extruded aluminum mounting base and equipped with EPDM seals, refrigeration type.
.3 Bottom: continuous roll rubber with limit switches for full length of bottom rail of door, retained and secured to bottom section.

2.3 Hardware

.1 Track: with 75 mm size, 2.5 mm core thickness track for torsion spring lifting and include ancillary hardware items. Inclined full vertical lift hardware for Doors 143C and 143D. Straight high-lift hardware for other doors.

.2 Rollers: full floating hardened steel, ball bearing, size to suit track.

.3 Roller brackets: adjustable, minimum 2.5 mm galvanized steel.

.4 Hinges: heavy duty, bolted-on.

2.3 Hardware (Cont'd)

.5 Accessories:
.1 2.3 mm core thickness continuous steel angle track supports.
.2 5 mm thick formed sheet 1500 mm high track guards.
.3 Pusher springs.
.4 Double contact extruded neoprene weatherstrip for door sill section, full width.
.5 Provide electrically interlocked bolts which lock door in closed position and disconnect power supply to operator when in locked position.
.6 Except for Doors 143C and 143D provide each door with purpose-made 100 mm diameter exhaust ports with swing-away, gasketted covers. Provide two in each door installed in bottom panel.

.6 Finish ferrous hardware items with minimum zinc coating of 300 g/sq m to CSA G164-1965(R1972).

2.4 Operators

.1 Equip doors for operation by:
.1 Electrical side, shaft mounted operator.
.2 Emergency chain hoist with galvanized chain.

2.5 Electrical Operator

.1 Electrical motors, controller units, remote pushbutton stations, relays and other electrical components: to CSA and ULC approval with NEMA Type 1 enclosure.

.2 Power supply: 600V, 3 phase, 60 Hz.

.3 Controller units with integral motor reversing starter, 3 heater elements for overload protection, including three pushbuttons and control relays as applicable. On Doors 143C and 143D provide electrical interlock between door operator and the electrically operated hydraulic dock ramp for that door, such that door operator will not lower the door if dock ramp is in a raised position.

.4 Operation:
.1 Remote pushbutton station: surface mounted, in indicated location, with "OPEN-STOP-CLOSE" pushbuttons, without pilot light.

.5 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom section of door, to reverse door to open position when coming in contact with object on closing cycle.

2.6 Electrical Operator (Cont'd)

.6 Manual safety release operator: operable from floor level to free door for hand chain operation. Power must be cut-off to operator by a cut-off switch.

.7 Door speed: 300 mm per second.

.8 Control transformer: for 24 V AC control voltage.

.9 Mounting brackets: galvanized steel, size and gauge to suit conditions.

PART 3 - EXECUTION

3.1 Installation

.1 Install doors and hardware. Do all drilling and tapping of steel frame required for installation.

.2 Touch-up doors with primer where finish damaged during fabrication.

.3 Install electrical motors, controller units, pushbutton stations, relays and other electrical equipment required for door operation.

.4 Installation includes electric wiring from power supply located near door opening to all controls, operators, a wiring for interlock from door to dock ramp.

.5 Adjust operable parts for correct function.

.6 Adjust weatherstripping to form a weathertight seal.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Steel door frames:	Section 05120
	.2	Multileaf Vertical Lift Metal Overhead Hangar Door:	Section 08372
	.3	Fixed transoms over adjacent man door:	Section 08110
	.4	Finish painting:	Section 09900
	.5	Electrical power supply:	Section 16010

1.2 Design Criteria

.1 Design exterior door assembly to withstand windload of 1 kPa with a maximum horizontal deflection of 1/240 of opening width.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate materials, operating mechanisms, required clearances, electrical characteristics including voltage, size of motors, auxiliary controls, and wiring diagrams.

1.4 Maintenance Data

.1 Provide operation and maintenance data for overhead door and hardware for incorporation into operation and maintenance manual specified in Section 01730.

PART 2 - PRODUCTS

2.1 Materials

.1 Galvanized steel sheet: commercial quality to ASTM A526-80 with Z275 zinc coating.

.2 Steel sheet: commercial quality to ASTM A366-72(79), with Class 1 matt finish.

.3 Primer: to CGSB 1-GP-181M+Amdt-Mar-78, for galvanized steel surfaces in grey-white colour.

.4 Insulation: Foamed-in-place urethane insulation with RSI value of 1.06 per 25 mm thickness.

.5 Glazing: Double glazed with two lights of 6 mm thick clear polycarbonate sheets.

2.2 Blades

.1 Fabricate door blades with steel frame fabricated of structural steel channel construction to withstand design loads. Face exterior of door blades with 1.6 mm thick galvanized sheet steel. Inner skin of panels: 1 mm thick galvanized steel.

.2 Panel thickness fitted with insulation, to be such as to provide a total RSI for panel of 2.26 and as required to accommodate panel height.

.3 Install glazing for vision panels. Sizes and number of vision panels as indicated.

.4 Assemble components by means of spot or arc welding or coated rivet system.

.5 Apply shop coat of primer after fabrication of door.

.6 Supply and install fixed panels at head of overhead door, and above overhead doors, respectively. Panel construction as specified for door blades but with thickness to provide total RSI = 3.0. Provide and install stops, fastening, and sealing gaskets for fixed panels.

.7 Provide 100 mm diameter exhaust ports, with swing away, gasketted covers, in indicated locations in bottom door blade, with a minimum of two per door.

2.3 Guides

.1 Provide steel channel guides for bottom leaf and steel angle guides for other leaves.

.2 Mount one set of guides to weight box and attach other set to structural steel channel or reinforced plate to form guide assembly.

.3 Provide 6 mm thick steel base plate to bottom of guide assembly and secure assembly to door jamb opposite to weight box.

2.3 Guides (Cont'd)

.4 Install heavy duty channel spreader joining guides at top.

.5 Insulate guide jambs to RSI 2.6. Protect insulation with 1.6 mm thick galvanized sheet steel.

2.4 Weight Box

.1 Construct weight box from 3.4 mm thick steel plate and 6 mm thick base plate.

.2 Reinforce weight box with formed horizontal stiffeners. Make weight box cover removable for servicing and maintenance. Provide full height weight box cover.

.3 Design for vertical loads to be carried by weight box and guide assembly.

2.5 Counterbalance

.1 Counterbalance blades utilizing individually counter-balanced weight for standard operation.

.2 House cast iron weights in weight box with angle guides for each weight set.

.3 Attach counterweights to elaves with preformed, galvanized aircraft cable having minimum of 7 to 1 safety factor.

.4 Use 4 cables for bottom leaf and 2 cables for other leaves above bottom leaf.

.5 Suspend cables over series of sheaves with machined grooves, rotating on sealed ball bearings mounted on cold rolled steel shaft.

.6 Secure bottom leaf cables to malleable iron threaded drums, rotating on self aligning sealed bearing.

2.6 Hoisting Mechanism

.1 Provide hoisting mechanism consisting of suitably formed chain sprocket, driven through gearing by electric motor.

.2 Provide geared reduction hoist, galvanized hand chain complete with chain keeper and chain guards for emergency manual operation.

2.7 Electrical Operator

.1 Electrical motors, controller units, remote pushbutton stations, relays and other electrical components: to CSA and ULC approval with enclosure type as follows:
.1 Door 161B: NEMA Type 7.
.2 Door 160B: NEMA Type 4.
.3 Other doors: NEMA Type 1.

.2 Power supply: 600V, 3 phase, 60 Hz.

.3 Controller units with integral motor reversing starter, 3 heater elements for overload protection, including three pushbuttons and control relays as applicable.

.4 Operation.
.1 Remote pushbutton station: flush mounted, in indicated location "OPEN-STOP-CLOSE" pushbuttons, without pilot light.

.5 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom leaf of door, to reverse door to open position when coming in contact with an object on closing cycle.

.6 Manual safety release for operator: to free door for manual operation.

.7 Door speed: 300 mm per second.

2.8 Accessories

.1 Install vinyl sealing gaskets for meeting edges of door leaves, lintel closure, all blades at jambs and steel stopper with foam rubber pad for bottom of each angle guide.

.2 Finish ferrous hardware items with minimum zinc coating of 300 g/sq m to CSA G164-1965(R1972).

.3 Provide electrically interlocking bolt which locks door in closed position and disconnects power supply.

.4 Provide fail safety device that will automatically lock both sides of the bottom blade, while simultaneously cutting power to motor operator, in the event of cable or chain breakage.

2.9 Mounting

.1 Provide and install all required steel plates, hangers, brackets, and fasteners required for installation.

PART 3 - EXECUTION

3.1 Installation

.1 Install doors and hardware. Do all drilling and tapping of steel frame required for installation.

.2 Touch up doors with primer where galvanized finish damaged during fabrication.

.3 Install electrical motor, controller units, pushbutton stations, relays and other electrical equipment for door operation.

.4 Installation includes electric wiring from power supply located near door opening.

.5 Adjust operable parts for correct function.

.6 Adjust weatherstripping to form weathertight seal.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Steel door frames:

.2 Smaller Multileaf Vertical Metal Overhead Door:

.3 Electrical wiring from mand electrical interlock to doo monitoring system:

.4 Finish painting:

.5 Electrical power supply:

(Also Spec. for Fender connecting)

1.2 Design Criteria

.1 Design exterior door assembl 1 kPa with a maximum horizon opening width.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate materials, operating mechanisms, required clearances, electrical characteristics including voltage, size of motor, auxiliary controls, and wiring diagrams.

1.4 Maintenance Data

.1 Provide operation and maintenance data for overhead door and hardware for incorporation into operation and maintenance manual specified in Section 01730.

1.5 Qualifications of Manufacturer

.1 Manufacturer shall be of recognized standing with a proven record of at least five years of Canadian experience in the successful manufacture and installation of doors of size, type, and quality shown and specified, and shall be able to demonstrate being in possession of plant facilities, skilled labour, and equipment needed for the work.

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* .2 Submit with Tender evidence, satisfactory to the Engineer, of above qualifications, including list of projects successfully completed with project name, location, and references.

Submit evidence to Engr. upon request after opening of tenders etc.

PART 2 - PRODUCTS

2.1 Materials

.1 Galvanized steel sheet: commercial quality to ASTM A526-80 with Z275 zinc covering.

.2 Steel sheet: commercial quality to ASTM A366-72(79), with Class 1 matt finish.

.3 Primer: to CGSB 1-GP-181M+Amdt-Mar-78, for galvanized steel surfaces in grey-white colour.

.4 Insulation: Foamed-in-place urethane insulation with RSI value of 1.06 per 25 mm thickness.

.5 Glazing: Double glazed with two lights of 6 mm thick clear polycarbonate sheets.

2.2 Blades

.1 Fabricate door blades with steel frame fabricated of structural steel channel construction to withstand design loads. Face exterior of door blades with 1.6 mm thick galvanized sheet steel. Inner skin of panels: 1 mm thick galvanized steel.

.2 Panel thickness fitted with insulation, to be such as to provide a total RSI for panel of 2.26 and as required to accommodate panel height.

.3 Install glazing for vision panels. Sizes and number of vision panels as indicated.

.4 Assemble components by means of spot or arc welding or coated rivet system.

.5 Apply shop coat of primer after fabrication of door.

2.3 Guides

.1 Provide steel channel guides for bottom leaf and steel angle guides for other leaves.

.2 Mount one set of guides to weight box and attach other set to structural steel channel or reinforced plate to form guide assembly.

.3 Provide 6 mm thick steel base plate to bottom of guide assembly and secure assembly to door jamb opposite to weight box.

.4 Install heavy duty channel spreader joining guides at top.

.5 Insulate guide jambs to RSI 2.6. Protect insulation with 1.6 mm thick galvanized sheet steel.

2.4 Weight Box

.1 Construct weight box from 3.4 mm thick steel plate and 6 mm thick base plate.

.2 Reinforce weight box with formed horizontal stiffeners. Make weight box cover removable for servicing and maintenance. Provide full height weight box cover.

.3 Design for vertical loads to be carried by weight box and guide assembly.

2.5 Counterbalance

.1 Counterbalance blades utilizing individually counter-balanced weight for standard operation.

.2 House cast iron weights in weight box with angle guides for each weight set.

.3 Attach counterweights to elaves with preformed, galvanized aircraft cable having minimum of 7 to 1 safety factor.

.4 Use number of cables for bottom leaf and for other leaves above bottom leaf to provide specified safety factor.

.5 Suspend cables over series of sheaves with machined grooves, rotating on sealed ball bearings mounted on cold rolled steel shaft.

.6 Secure bottom leaf cables to malleable iron threaded drums, rotating on self aligning sealed bearing.

2.6 Hoisting Mechanism

.1 Provide hoisting mechanism consisting of suitably formed chain sprocket, driven through gearing by electric motor.

.2 Provide geared reduction hoist, galvanized hand chain complete with chain keeper and chain guards for emergency manual operation.

2.7 Electrical Operator

.1 Electrical motors, controller units, remote pushbutton stations, relays and other electrical components: to CSA approval with NEMA Type 1 enclosure.

.2 Power supply: 600V, 3 phase, 60 Hz.

.3 Controller units with integral motor reversing starter, 3 heater elements for overload protection, including three pushbuttons and control relays as applicable.

.4 Operation.
.1 Remote pushbutton station: flush mounted, in indicated location "OPEN-STOP-CLOSE" pushbuttons, without pilot light.

.5 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom leaf of door, to reverse door to open position when coming in contact with an object on closing cycle.

.6 Manual safety release for operator: to free door for manual operation.

.7 Door speed: 300 mm per second.

2.8 Accessories

.1 Install vinyl sealing gaskets for meeting edges of door leaves, lintel closure, all blades at jambs and steel stopper with foam rubber pad for bottom of each angle guide.

.2 Finish ferrous hardware items with minimum zinc coating of 300 g/sq m to CSA G164-1965(R1972).

.3 Provide electrically interlocking bolt which locks door in closed position and disconnects power supply.

.4 Provide fail safety device that will automatically lock both sides of the bottom blade, while simultaneously cutting power to motor operator, in the event of cable or chain breakage.

2.9 Mounting

.1 Provide and install all required steel plates, hangers, brackets, and fasteners required for installation.

2.10 Mandoor

.1 Provide mandoor in bottom section as indicated. Approximate size: 864 mm wide, 1676 mm high of similar construction to that of hangar door panels. Complete with 1-1/2 pair of two-bearing, non-ferrous hinges, 114 x 100 mm, with non-rising pins, in dull nickel finish; heavy duty mortise lockset to CGSB 69-GP-13M, function 1315D, keyed to building master-keying system. Provide manufacturer's standard closer, sill, and weatherstripping.

2.11 Electrical Interlock

.1 Special electrical interlock: provide mandoor with electric interlock cutting power to electrical hangar door operator, thus preventing opening of hangar door if man door is in open position. Provide relay connected to same interlock to actuate signal to door monitoring system if mandoor is opened.

PART 3 - EXECUTION

3.1 Installation

.1 Install doors and hardware. Do all drilling and tapping of steel frame required for installation.

.2 Touch up doors with primer where galvanized finish damaged during fabrication.

.3 Install electrical motor, controller units, pushbutton stations, relays and other electrical equipment for door operation.

.4 Installation includes electric wiring from power supply located near door opening.

.5 Adjust operable parts for correct function.

.6 Adjust weatherstripping to form weathertight seal.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Final cleaning: Section 01710

.2 Wood blocking: Section 06100

.3 Caulking of joints between frames and other building components: Section 07900

.4 Aluminum doors, frames, curtain walls, sloped glazing skylights: Section 08120

1.2 Samples

.1 Submit one representative model of aluminum window in accordance with Section 01340.

.2 Show frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Include 150 mm long samples of head, jamb, sill, mullions to indicate profile.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate materials and large scale details for head, jamb and sill, profiles of components, elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes and fasteners.

.3 Include shop and installation drawings of remote window operators.

1.4 Certificates

.1 Submit manufacturer's certificate, certifying compliance with specification requirements, for:
.1 windows fixed and operating.
.2 anodized and enamelled aluminum finish
.3 infiltration/exfiltration rates.
.4 thermal transfer resistance of frames.

1.5 Maintenance Data

.1 Provide maintenance data for cleaning and maintenance of aluminum windows for incorporation into maintenance manual specified in Section 01730.

1.6 Guarantee

*.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that the aluminum windows are guaranteed against leakage, defects and malfunction under normal usage for a period of three years from the date of Interim Completion for entire contract.

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*.2 In addition provide a written guarantee, signed and issued in the name of Her Majesty the Queen in Right of Canada guaranteeing insulating glass units against failure of seal of enclosed air space and deposits on inner faces of glass detrimental to vision, in accordance with GC.24 but for a period of five years from the date of Interim Completion of entire contract.

Addendum #1

PART 2 - PRODUCTS

2.1 Materials

.1 Extruded aluminum: Aluminum Association Alloy AA6063-T5.

.2 Interior and exterior metal sills, aluminum facings: brake formed aluminum sheet metal of profiles shown with size to suit job conditions; minimum 3 mm thick, complete with joint covers, jamb drip deflectors, anchoring devices. Exterior components in factory applied acrylic enamel to match window finish. Interior components in clear anodic finish.

.3 Sealants: in accordance with Section 07900, paragraph 2.1.4.2 colour selected by Engineer.

.4 Glazing materials: in accordance with Section 08800.

.5 Bedding compound: to CGSB 19-GP-14M.

.6 Isolation coating: alkali resistant bituminous paint.

.7 Thermal break: to meet the test requirements for -8 deg C temperature differential.

.8 Bolts, screws and fastenings: hot dip galvanized steel or cadmium plated steel or 302 stainless steel exposed screws in glazing stops, flat head, recessed hexagonal socket drive, countersunk flush.

.9 Paint: bituminous, on steel, CGSB 1-GP-108c.

2.1 Materials (Cont'd)

.10 Loose thermal insulation: friction fit glass fibre insulation for packing voids.

.11 Rigid insulation: rigid fibrous glass with density of 72 kg/cu m, 2.64 KSI.

.12 Joint filler: foamed polyethylene rope.

.13 Glazing: hermetically sealed insulating glass units as specified in Paragraph 2.1.9.2 of Section 08120 except for windows in Winch House. Single glaze Winch House windows with 6 mm wired glass to CAN2-12.11-M76, Type 1, Style 3.

.14 Sealant: conform to Section 07900. Test for compatibility with glazing tape. Use only a compatible sealant with tape. Use one component polysulphide with insulated glass units.

.15 Glazing tape: vulcanized butyl tape with 3 mm diameter neoprene continuous spacer.

.16 Setting blocks: Neoprene, ASTM C542-71 hardness 80, ASTM 02240 method A.

.17 Glazing wedge: neoprene ASTM C542 continuous pressure type, sized for gap between glass and interior stop.

2.2 Design

.1 General: Design and fabricate windows insulated panels, brackets and anchorage devices so that when installed they will:
.1 Compensate for unevenness and dimensional differences in structure to which they are secured.

.2 Allow full expansion and contraction of window framing members without causing stress within the window assembly as a result of such expansion and contraction.

.3 Tolerate structural deflection and distortion of structure, under design criteria conditions, without imposing load on window assembly. Provide deflection type head framing.

.4 Adequately sustain themselves and superimposed wind and rain loads without allowing window framing members to deflect more than 1/175 of span under design criteria wind load.

2.3 Design Criteria

.1 Design windows to withstand safely a wind and rain force as listed in Ontario Building Code for Sudbury based on 30 year probability and wind gust at 2.5 factor of safety.

.2 Deflection of members when under full loads shall maintain adequate clearances for glass. Maximum deflection shall be not more than 1/175 of the span of any member.

.3 Design windows on rain screen principle.

.4 Principle:
.1 The entire exterior skin execution shall be based on the "Rain Screen" principle.
.2 Such gaskets, baffles, overlaps and seals as required to provide a "Rain Screen" barrier to effectively deter rain water entry into the cavities of the system.
.3 The necessary "air-seals" to minimize air passage from the system cavities into the building and vice-versa, to assure adequate equalization of the system cavities with the outside.
.4 The "air and vapour seals" required to minimize air borne vapour exfiltration from the building into the system cavities.

2.4 Fabrication

.1 Frames and sash-Winch House.
.1 Frames for side hung casements: extruded sections without thermal break, with 22.2 mm face and depth of 50.8 mm.
.2 Side hung casements: tubular sections with 57.2 mm face width and depth of 50.8 mm with interior snap-in glazing stops to suit 6 mm single glazing. High quality neoprene weathering. Interior neoprene wedge glazing gaskets.

.2 Other aluminum windows:
.1 Frames: extruded aluminum thermally broken; face width: 32 mm; depth: 88.9 mm. Mullions of tubular construction with face width of 57.2 for standard mullions, and 63.5 mm for coupling mullions, with interior mullion face width of 19.1 mm and 25.4 mm for coupling mullions. Provide separate deflection head trim and anchors for all windows. Provide coupling mullions every 3 units.
.2 Fixed windows with lock-in extruded, aluminum, screwless glazing stops to suit insulating glass units, with interior neoprene wedge. Weathering and glazing splines in neoprene.

2.4 Fabrication

.2 (cont'd)
.3 Sash: projected out; of extruded tubular construction with lock-in, screwless, aluminum glazing stops. Weathering of opening sash by at least two lines of neoprene gaskets compressed when sash is locked.
.4 At sash shown in curtain wall framing provide auxiliary frame members and trim to accommodate sash and hardware for opening windows. Supply and install sash.

.3 Make entire assembly weathertight and airtight throughout. Assemble in shop to greatest extent possible.

.4 Assemble members with concealed fastening and fitted to hairline joints. Reinforce joints to prevent deformation in use.

.5 Provide for drainage of condensation to exterior.

2.5 Finishes

.1 Finish all exposed aluminum components with factory applied acrylic enamel as specified in Paragraph 2.2.2 of Section 08120. Interior in white exterior in colour to match colour designated as "PT.-2" on Finish and Colour Schedule.

2.6 Isolation Coating

.1 Isolate aluminum from following components, by means of isolation coating:
.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
.2 Concrete, mortar and masonry.
.3 Wood.

2.7 Window Hardware

.1 Side-hung casements-Winch House: equip each window with following:
.1 Manufacturers standard extruded aluminum hinges with stainless steel pin.
.2 Roto-operator: manufacturer's standard meeting requirements of CGSB 69-GP-7M, Type 7-50.
.3 Claw handle: manufacturer standard to seat sash firmly against weathering.

2.7 Window Hardware (Cont'd)

.2 Projected out sash: equip each window with following:
.1 Friction arms to meet requirements of CGSB 69-GP-7M, Type 7-12.
.2 Except at roof monitor windows also provide following:
.1 Satin white bronze bronze locking handles. Provide two per sash, capable of seating sash firmly against weathering.
.2 Centrally mounted satin white cast bronze pull.
.3 Remote operators for opening sash in monitor windows: to suit bottom projected out sash, consisting of:
.1 Window operating mechanism: chain type, all metal to provide 250 mm projection. Complete with case, gearing, mounting hardware.
.2 Flexible conduit enclosed flexible operating cable complete with conduit connectors, conduit saddles. Provide low friction conduit lining. Cable helical wound.
.3 Control operating mechanisms complete with surface mounted enclosure, finished face plate, and 125 mm handle. Equipped with "no-back" clutches for security and wind loading. Gearing designed to provide maximum operation at vent with minimum handle revolutions, consistent with number of vents operated by each operator. Locations of control operators as shown on drawings.
.4 All components heavy duty.

PART 3 - EXECUTION

3.1 Window Installation

.1 Install windows in accordance with CGSB 63-GP-3M and in accordance with drawings.

3.2 Sill Installation

.1 Install metal sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use lengths as long as possible at each location.

.2 Cut sills to fit window opening.

3.2 Sill Installation (Cont'd)

.3 Fasten expansion joint cover plates and drip deflectors with self tapping stainless steel screws.

.4 Maintain 6 to 9 mm space between butt ends of continuous sills. For sills over 1200 mm in length, maintain 3 to 6 mm space at each end.

3.3 Remote Window Operator Installation

.1 Install remote operating system for monitor windows in strict accordance with manufacturer's directions and installation drawings. Use recommended bending and cutting tools and methods. Secure cable to structure at recommended intervals.

.2 Upon completion check operation, make adjustments, and leave in proper operating condition.

3.4 Caulking

.1 Seal joints between frame members and other non-operating components with sealant to provide weathertight seal at outside and air, vapour seal at inside.

.2 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in bedding compound. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.

.3 Apply sealant in accordance with Section 07900. Conceal sealant within aluminum work except where exposed use is permitted by Engineer.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Supply and installation of hardware for:

.1	Sliding fire door:	Section 08310
.2	Rolling doors:	Section 08346
.3	Sectional overhead doors:	Section 08362
.4	Multileaf vertical lift doors:	Section 08365 and 08372
.5	Windows:	Section 08520

.2 Installation only of hardware for:

.1	Cabinetwork and shelves:	Section 06200
.2	Aluminum doors:	Section 08120
.3	Conventional doors:	Section 06200

1.2 Reference Standards

.1 Standard hardware location dimensions in accordance with with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

1.3 Requirements of Regulatory Agencies

.1 Use ULC listed and labelled hardware for doors in fire separations and exit doors.

1.4 Samples

.1 Submit samples of each type hardware specified, in accordance with Section 01340.

.2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.

1.5 Hardware List

.1 Submit hardware schedule in accordance with Section 01340.

.2 Indicate hardware proposed, including make, model, material, function, finish and other pertinent information.

.3 Engineer will review hardware schedule based on group arrangement and not for each individual door.

1.6 Maintenance Data

.1 Provide maintenance data, parts list, and manufacturer's instructions for each type door closers, locksets, door holders and fire exit hardware for incorporation into maintenance manual specified in Section 01730.

.2 Brief maintenance staff regarding proper care, cleaning, and general maintenance.

1.7 Maintenance Materials

.1 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

1.8 Delivery and Storage

.1 Store finishing hardware in locked, clean and dry area.

.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.3 Maintain inventory list with hardware schedule.

PART 2 - PRODUCTS

2.1 Hardware Items

.1 Only door closers, listed on CGSB Qualified Products List are acceptable for use on this project.

.2 Use one manufacturer's products only for all similar items.

2.2 Door Hardware

.1 Hinges: to CGSB 69-GP-1M +Amdt-May-79, type numbers and sizes listed. Provide non removable pins (NRP) for exterior outward opening doors and interior doors opening toward locked side. Finish C15 (Satin nickel).

.2 Mortise locks and latch sets: to CGSB 69-GP-13M C32D, function as indicated in schedule, (stainless steel) lever handles only: 140 mm x lever x 50 mm rose x 75 mm projection lever to be of cast material: design as shown on Page A-135 of Door Schedule. N.B. Provide proper fire labelled latchbolts on mortise locks where applicable. The fire stop is furnished within the lock case to prevent the weight of the lever handle from retaining the latch bolt during a fire.

.3 Closers: to CGSB 69-GP-11M and 10M as indicated in hardware s hedule.

2.2 Door Hardware (Cont'd)

.4 Push Plates: to CGSB 69-GP-6M 6-312, 1.3 mm, C32D (bevelled edge).

.5 Kickplates: to CGSB 69-GP-6M 6-321, 1.3 mm C32D (bevelled edge).

.6 Pulls: to CGSB 69-GP-6M 6-335 C32D.

.7 Flush Pulls: to CGSB 69-GP-6M 6-244 C15.

.8 Pulls: (special) to CGSB 60-GP-6M, stainless steel x 32D. Centre to centre 300 mm with 57 mm offset. Example: Ferrum Metals #AF-2 x C32D.

.9 Pulls for Wire Mesh Partition Door: stainless steel x 32D. Grey iron casting: 155 mm x 45 mm.

.10 Edge pulls: for pocket door to CGSB 69-GP-6M 6-250 C26D.

.11 Flush bolts: manual, lever type: to CGSB 69-GP-6M 6-52 C15 for use in hollow metal doors. CGSB 69-GP-6M 6-50 C15 for use with wood doors.

.12 Flush bolts: Automatic Model No. 1040 Ansi 6-3/4" x 1" standard 12" from top or bottom of door to centre line of front. Ansi top strike can be surface applied complete with 2 rub strips surface applied to the edge of the active door.

.13 Coordinator: flush bolt reversible cast bronze C26D. N.B. flush bolt coordinator, used with fire exit, hardware to prevent active door from closing before inactive door. Gravity action.

.14 Pocket door frame: to CGSB 69-GP-6M 6-272 use with 45 mm thick door.

.15 Overhead Holders and Stops: Brass or bronze material to CGSB 69-GP-6M, Type 6-100 (concealed hold-open); Type 6-100 (concealed stop-only); Type 6-107 (surface hold-open).

.16 Door Stops: Floor stop to CGSB 69-GP-6M Type 6-175 wall type; to CGSB 69-GP-6M Type 6-150 C15. Floor type to CGSB 69-GP-6M Type 6-169 C15. Floor type to CGSB 69-GP-6M Type 6-164 C15.

.17 Robe Hooks: to CGSB 69-GP-8M Type 8-56, C15.

.18 Thresholds: to CGSB 69-GP-6M Type 6-340 Aluminum.

2.2 Door Hardware (Cont'd)

.19 Sweeps: Block sponge neoprene complete with anodized extruded aluminum 44.45 mm x 6.35 mm.

.20 Weatherstripping: Black sponge neoprene complete with anodized extruded aluminum 33.33 mm x 6.35 mm.

.21 Surface bolts: ULC listed, steel bolt x C26D, size 200 mm. N.B. When door is specified over 2134 mm use 610 mm high (top bolt only). Bolt to be 25 mm square complete with concealed screws and mountings to make it tamperproof.

.22 Signage: Supply each washroom with an international Pictogram 3" x 6" colour to be selected by architect, 4.8 mm acrylic.

.23 Panic devices: rim type design with cold drawn stainless steel covers, pressure formed non-ferrous alloy chassis, forged brass or stainless steel arms, crossbar to be minimum 1" stainless steel tubing .062". Must bear ULC label for exit and ULC label for fire labelled openings as required. Type 1A: rim device for single doors prepared for outside cylinder. Type 1B: rim device for single doors prepared for thumblatch and cylinder. Type 1C: rim device for single doors prepared for thumblatch and no cylinder locking. Type 1D: rim device for pair doors vertical rod complete with thumblatch. Type 1E: rim device for single doors for exit only, no exterior trim or cylinder. Type 1F: rim device narrow line use with Aluminum doors complete with cylinder function only,

.24 Removable mullions: aluminum or steel with a prime coat finish. Compatible with panic device manufacturer. Use approved ULC mullion for fire labelled openings.

.25 Key control cabinet: key capacity 275 complete with instruction booklets, index cards, signature receipt forms, permanent and duplicate key markers, key gathering envelopes and brass receipt holder. Surface mounted steel cabinet with locking door, baked enamel finish.

.26 Special six way hinges: Extra heavy-weight corrosion resistant, cast malleable iron pintels and hinge straps. Lifetime lubricated oilite bronze thrust and radial bearings assure finger tip operation. Standard offset permits door to be mounted flush with face of frame (special offsets available upon request). Hinges furnished completely assembled with mounting screws ready for installation. Standard finish Prime. Refer to Page A-136 of Door Schedule.

2.2 Door Hardware (Cont'd)

.27 Industrial Hardware: Cane Bolts - 69-GP-6M Type 6-6. Heavy wrought steel, Japanned rod 19 mm x 600 mm.

.28 Padlocks: non-ferrous body with hardened steel shackle with diameter of at least 8.7 mm. 6-pin cylinder master keyed to building keying system. Provide three change keys for each padlock. Equal to Sargent #756 HS. Deliver padlocks and keys directly to appointed representative of Canadian Coast Guard.

2.3 Cabinet Hardware

.1 Provide for each cupboard and drawer as applicable:
.1 Hinges: to CGSB 69-GP-8M-8-107 C26D.
.2 Catches: to CGSB 69-GP-8M 8-45 Aluminum.
.3 Pulls drawers and cupboards: to CGSB 69-GP-8M C32D stainless steel 10 mm round by 90 mm in length,
.4 Shelf supports: CGSB 69-GP-8M Style "A", Zinc use with Style No. 8-20 Pilaster.
.5 Pilasters: CGSB 69-GP-8M 8-20 x length required.
.6 Drawer slides: CGSB 69-GP-8M 8-96 x length required.
.7 Drawer or cupboard lock: 5 pin tumbler cylinder, keyed alike in any one area, C26D, master keyed to keying system. N.B. Location only in First Aid Room 183.
.8 Closet rod: CGSB 69-GP-8M 8-50, install one in each closet, except closet in Guard House 194. In closet in Guard House 194 provide hanging rod equal to KV-1 Clothing Carrier x 300 mm by Knape & Voght.
.9 Track and hangers for sliding tackboards in Multi-Purpose Room 176. Full length of valence. Track and hangers to CGSB 69-GP-6M x 6-262.

2.4 Fastenings

.1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.2 Exposed fastening devices to match finish of hardware.

.3 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.4 Use fasteners compatible with material through which they pass.

2.5 Keying

.1 Door locks to be keyed differently, master keyed and grand master keyed. Submit keying schedule for approval after consultation with Engineer.

.2 Provide change keys in triplicate for every lock in this Contract.

.3 Provide three grand masterkeys and six masterkey for each MK group.

.4 Stamp keying code numbers on keys and cylinders. No bitting codes shall appear on keys or cylinders. Provide visual coding only.

.5 Construction keying shall not be used. Supply 20 cylinders to be used for site security during construction. These cylinders shall be withdrawn at time of take-over and replaced by cylinders prepared for client use. Temporary cylinders shall be property of Contractor. Permanent cylinders shall be installed under the direct supervision of the Engineer and appointed representative of the Canadian Coast Guard. Deliver permanent change keys, master keys, and grand master key directly to above representative through Engineer and obtain signed receipt for same. Submit copy of receipt with final documentation.

PART 3 - EXECUTION

3.1 Installation Instructions

.1 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.2 Furnish manufacturers' instructions for proper installation of each hardware component.

.3 Install hardware to following heights from finished floor to centre line of item.
Pulls: 1140 mm
Push plate: 1140 mm
Door bar: 1070 mm
Door knob (lever): 1015 mm
Dead lock: 1525 mm
Panic bar: 1015 mm

.4 Where door stop contacts door pulls, mount stop to strike bottom of pull.

3.1 Installation Instructions (Cont'd)

.5 Pack down door holders to ensure that arms do not interfere with weatherstripping at head of frame.

3.2 Schedule of Hardware Groups

.1 Hardware groups: hardware groups listed herein as "Group 1" etc., refer to designation appearing under "HDW Group" column of Door Schedule.

.1 Group "1":

4 pr butts	TB211-114 x 101 mm NRP	C15
1 lockset	1315A	C32D
1 surface bolt top	610 mm	C26D
1 surface bolts bottom	200 mm	C26D
2 door closers	10M-4 cush	SBL
1 Z-astragal steel		
2 kickplates	6-321 300 mm x dr width	C32D
1 threshold	6-340	AL.
2 sets weatherstrip		AL./Neoprene
2 door sweeps		

.2 Group "2":

1-1/2 pr butts	TB311 114 x 101 mm NRP	C15
1 lockset	1315D	C32D
1 door closer	10M-4 cush	SBL
1 kickplate	6-321 300 x dr width	C32D
1 threshold	6-340	AL.
1 set weatherstrip		AL./Neoprene

.3 Group "3":

2 pr butts	TS311 114 x 101 mm NRP	CP
1 panic set	#1E - ULC	C15/32D
1 door closer	11M-5	SBL
1 kickplate	6-321 x 300 x dr width	C32D
1 threshold	6-340	AL.
1 set weatherstrip		
1 door sweep		

.4 Group "4":
Hardware by others.

.5 Group "5":

1-1/2 pr butts	TB311 114 x 101 NRP	C15
1 panic set	1F	C15/32D
1 door pull	Special, See 2.2.8	C32D
1 door closer	11M-4	SB1
1 drop plate	#4	SBL
1 overhead stops	concealed 6-100	C26D
1 threshold	6-340	AL.
weatherstrip by Door Manufacturer.		

3.2 Schedule of Hardware Groups (cont'd)

.1 (Cont'd)

.6 Group "6":

1-1/2 pr butts	TS311 114 x 101 mm	C15
2 door pulls	Special, see 2.2.8 back to back mounting	C32D
push plates	Engrave Push and Pull	
1 door closer	10M Size 3	SBL
1 kickplate	6-321 203 x dr width	C32D
1 wall stop	6-150	C15

.7 Group "7":

1-1/2 pr butts	TS111 114 x 101 mm	C15
1 lockset	1302	
1 wall stop	6-150	C15
1 floor stop	6-164 (for 217 only)	C15

.8 Group "8":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 privacy set	1309	C32D
1 wall stop	6-150	C15
1 robe hook	8-56	C15
1 door sign: washroom International Symbol		
1 door sign: Shower Door #117, International Symbol		

.9 Group "9":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 lockset	1302	C3
1 door closer	10M-3 cush	SBL
1 kickplate	6-321 x 200 x dr width	AL.

.10 Group "10":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 door pull	6-335	C32D
1 push plate	6-312 125 x 510	C32D
1 door closer	10M Size 3	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 wall stop	6-150	C15
1 door sign	International Symbol	

.11 Group "11":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 door pull	6-335	C32D
1 push plate	6-312 125 x 510	
1 door closer	10M-3 Delayed Action	SBL
1 kickplate	6-321-203 x dr width	C32D
1 wall stop	6-150	C15
1 door sign	International Symbol	

3.2 Schedule of Hardware Groups (cont'd)

.1 (Cont'd)

.12 Group "12":

1-1/2 pr butts	TS311 114 x 101 mm	C15
1 lockset	1315D	
1 door closers	10M Size 4	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 wall stop	6-150	C15

.13 Group "13":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 door pull	6-335	C32D
1 push plate	6-312 125 x 510	C32D
1 door closer	10M Size 3	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 wall stop	6-150	C15

.14 Group "14":

3 pr butts	TS311 114 x 101 mm	C15
1 lockset	1315D RH	
2 flush bolts	Automatic 1040 LH	C15
1 Co-ordinator	1836 RH	C15
2 door closers	10M Size 4 cush	SBL
2 kickplates	6-321 x 203 x dr width	C32D
1 Astragal	Steel LH	

.15 Group "15":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 latchset	1311 ULC	C32D
1 door closer	10M Size 3 PA	
1 kickplate	6-321 x 300 x dr width	C32D
1 wall stop	6-150	C15

.16 Group "16":

1-1/2 pr butts	TB211 114 x 101 mm NRP	C15
1 lockset	1304D	C32D
1 door closer	10M Size 4 cush and H90 deg	SBL
1 kickplate	6-321 x 300 x dr width	C32D
1 threshold	6-340	AL.
1 set weatherstrip		AL./Neoprene

.17 Group "17":

1-1/2 pr butts	TS311 114 x 101 NRP	C15
1 panic set (for Door 101A)	1B c/w thumblatch and cyl	C15/32D
1 panic set	1E exit only (door 101B)	C15/32D
1 door closer	10M Size 4 cush	SBL
1 kickplate	6-321 x 300 x dr width	C32D
1 threshold	6-340	AL.
1 door sweep		

3.2 Schedule of Hardware Groups (cont'd)

.1 (Cont'd)

.18 Group "18":

1-1/2 pr butts	TB311 114 x 101 NRP	C15
1 panic set	1E exit only	C15/32D
1 door closer	10M Size 4	SBL
1 kickplate	6-321 x 300 x dr width	C32D
1 overhead stop	6-100 Stop only	C26D
1 threshold	6-340	AL.
1 set weatherstrip		AL./Neoprene
1 door sweep		

.19 Group "19":

1-1/2 pr butts	TB311 114 x 101 mm NRP	C15
1 lockset	1315D	C32D
1 door closer	10M Size 4 cush	SBL
1 kickplate	6-321 x 300 x door width	C32D
1 threshold	6-340	AL.
1 set weatherstrip		
1 door sweep		

.20 Group "20":

1-1/2 pr butts	TS311 114 x 101 mm	C15
1 lockset	1315D ULC	C32D
1 door closer for door 160	10M Size 3 parallel arm only	SBL
1 closer	10M Size 3 Reg.	SBL
1 kickplate	6-321 x 300 x dr width	C32D
1 wall stop	6-150	C15

.21 Group "21":

4 pr butts	TS311 114 x 101 mm	C15
2 door pulls	6-335	C32D
2 push plates	6-312 x 300 x dr width	C32D
2 overhead holders	6-107 holdopen C26DC	
1 set weatherstrip	x width height of door	Neoprene/AL.
2 door sweeps		
2 meeting Astragals	400 x 400 P x door height	

.22 Group "22":

1-1/2 pr butts	TS311 114 x 101 mm	C15
2 door pulls	AF-2 Engrave "pull" and "push" back to back mounting	C32D
1 door closer	11M Size 4	SBL
1 drop plate	11M	SBL
1 wall stop	6-150	C15

3.2 Schedule of Hardware Groups (cont'd)

.1 (Cont'd)

.23 Group "23":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 lockset	1315D	C32D
1 door closer	10M Size 3	SBL
1 kickplate	6-321 x 300 x dr width	C32D
1 wall stop	6-150	C15

.24 Group "24":

4 pr butts	TS311 114 x 114 mm	C15
1 deadlock	1350	
1 top surface bolts	610 mm	C26D
1 bottom surface bolt	200 mm	C26D
2 door pulls	6-335	C32D
2 push plates	6-312 x 300 x dr width	C32D
2 kickplates	6-321 x 300 x dr width	
2 overhead holders	6-107 hold open	C26D

.25 Group "25":

3 pr butts	TS211 114 x 101 mm	C15
1 lockset	1315D RH	
2 surface bolts	LH	C26D
1 Z-astragal LH		
2 door closers	10M Size 3	SBL
1 overhead stop		
2 floor stops	6-164	C15

.26 Group "26":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 panic set	1C ULC	C15/32D
1 door closers	10M Size 3 cush	SBL
1 kickplate	6-321 x 203 x dr width	C32D

.27 Group "27":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 latchset	1311	C32D
1 door closers	10M Size 3 cush	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 floor stop	6-164 c/w 1/2 riser	C15

.28 Group "28":

1-1/2 pr butts	TS311 114 x 101 mm	C15
1 lockset	1315D	C32D
1 door closer	10M Size 3	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 floor stop	6-164 x 1/2 riser	C15

3.2 Schedule of Hardware Groups (cont'd)

.1 (Cont'd)

.29 Group "29":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 latchset	1311	C32D
1 door closer	10M Size 3	SBL
20 feet weatherstrip	All 4 sides Neoprene/Alum	

.30 Group "30":

3 pr butts	TS211 101 x 101 mm	C15
1 deadlock	1352 LH	C15
2 surface bolts	GJ1631 x GJ1632 (RH)	C26D
4 door pulls	RW 81-1	

.31 Group "31":

4 pr butts	TS311 114 x 101 mm	C15
1 deadlock	1352 RH	C15
1 top surface bolt	610 mm LH	C26D
1 bottom surface bolt	203 mm LH	C26D
2 door pulls	6-335	C32D
2 push plates	6-312 x 300 x dr width	C32D
2 kickplates	6-321 x 300 x dr width	C32D
2 overhead holders	6-107	C26D

.32 Group "32":

4 pr butts	TB311 114 x 101 NRP	C15
2 panic sets	1F	C15/32D
2 removable mullions		
2 door pulls	Special	C32D
2 door closers	11M Size 4	SBL
2 drop plates	11M	SBL
2 overhead stops	6-100 concealed stop only	C26D
1 threshold	6-340	AL.
2 sets weatherstrip by Alum. dr supplier.		

.33 Group "33":

4 pr butts	TS311 114 x 101 mm	C15
4 door pulls	Special Back to back mounting	C32D
2 door closers	11M Size 4	SBL
2 drop plates	11M	SBL
2 overhead stops	6-100 Stop only	C26D
2 floor stops	6-164 c/w 1/2" riser	C15

3.2 Schedule of Hardware Groups (cont'd)

.1 (Cont'd)

.34 Group "34":

1-1/2 pr butts	TS311 114 x 101 mm	C15
1 latchset	1311 ULC	C32D
1 door closer	10M Size 3 Delay action	SBL
1 kickplate	6-321 x 300 x dr width	
1 wall stop	6-150	C15
1 door sign	International Symbol 1 men/1 women	

.35 Group "35":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 lockset	1302	C32D
1 door closer	10M Size 3	SBL
1 kickplate	6-321 x 300 x dr width	C32D

.36 Group "36":

2 pr butts	TS311 114 x 101 mm	C15
1 lockset	1315D ULC	
1 closer	10M Size 4 parallel arm Dr #173	SBL
1 door closer	10M Size 4 Dr. 177	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 wall stop	6-150	C15

.37 Group "37":

1-1/2 pr butts	TS311 114 x 101 mm	C15
1 panic set	1C ULC	C15/32D
1 door closer	10M Size 4	SBL
1 kickplate	6-321 x 300 x dr width	C32D
1 wall stop	6-150	C15

.38 Group "38":

1 pocket door frame	6-272 for use with 45 mm x 910 x 2134 Door size	
2 flush pulls	6-244	C26D
1 edge pull	6-250	C26D

.39 Group "39":

3 pr butts	TS211 114 x 101 mm	C15
1 latchset	1311 LHR	C32D
2 flush bolts	6-52	C15
1 wall stop	6-150 LHR	C15

3.2 Schedule of Hardware Groups (Cont'd)

.1 (Cont'd)

.40 Group "40":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 locksets	1315D	C32D
1 door closer	10M Size 3	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 floor stop	6-164 x 1/2 riser	C15

.41 Group "41":

2 pr butts	TS211 114 x 101 mm	C15
1 lockset	1302	C32D
1 floor stop	6-164	C15

.42 Group "42":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 latchset	1311 ULC	C32D
1 door closer	10M Size 3	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 wall stop	6-150	C15

.43 Group "43":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 lockset	1315D ULC	C32D
1 door closer	10M Size 3 parallel arm	SBL
1 kickplate	6-321 x 300 x dr width	C32D
1 wall stop	6-150	

.44 Group "44":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 lockset	1302	C32D
1 door closer	10M Size 3	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 wall stop	6-150	C15

.45 Group "45":

1-1/2 pr butts	TB211 114 x 101 mm NRP	C15
1 lockset	1304D	C32D
1 door closer	10M Size 4 cush PA	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 threshold	6-340	AL.
1 set weatherstrip		AL./Neoprene
1 door sweep		

.46 Group "46":

1-1/2 pr butts	TS211 114 x 101 mm	C15
1 lockset	1319D	C32D
1 door closer	10M Size 3	SBL
1 kickplate	6-321 x 203 x dr width	C32D
1 wall stop	6-150	C15

3.2 Schedule of Hardware Groups (Cont'd)

.1 (Cont'd)

.47 Group "47":

3 pr butts	TB211 114 x 101 mm NRP	C15
1 lockset	1315D 37 (RHR)	C32D
2 Surface bolts	(LHR)	C26D
2 door closers	10M Size 4 Cush 90 deg	SBL
2 kickplates	6-321 x 300 x dr width	C32D
1 threshold	6-340	AL.
1 set weatherstrip		
2 door sweeps		
1 Astragal	RHR	

.48 Group "48":

1-1/2 pr butts	TS311 114 x 101 mm	C15
1 lockset	1316	C32D
1 door closers	10M Size 3 Parallel arm	SBL
1 kickplates	6-321 x 300 dx dr width	C32D
1 wall stop	6-150	C15

.49 Group "49":

1-1/2 pr butts	TB211 114 x 101 mm NRP	C15
1 lockset	1304D	C32D
1 door closers	10M Size 3	SBL
1 wall stop	6-150	C15

.50 Group "50":

1 continuous hinge to CGSB 69-GP-1M, Type 140, 38 x 760 C15

1 flush trap door ring with 57 mm od x 9.5 mm lift ring mounted in 89 x 95 x 2 mm plate. Bright galvanized finish. Secure with through bolts.

1 friction type door holder to CGSB 69-GP-6M, Type 60-107 C15

.51 Group "51":

1-1/2 pr butts	TS411 114 x 101 mm	C15
1 panic set	1C ULC	C15/32D
1 door closer	10M Size 4 cush	AL.
1 kickplates	6-321 x 300 mm x dr width	C32D
1 wall stop	6-150	C15

.52 Group "52":

5 pr butts	TS311 127 x 114 mm	C15
2 panicsets	1F Vertical rod no-locking	C15/32D
2 door closers	11M Size 6	
2 floor stops	6-175	C15

3.2 Schedule of Hardware Groups (Cont'd)

.1 (Cont'd)

.53 Group "53":

4 pr butts	TS311 114 x 114 mm	C15
1 lockset	13M 1315D ULC RH	C32D
1 top surface bolt	610 mm LH	C26D
1 bottom surface bolt	200 mm with LH	C26D
1 Z-astragal installed LH	by HM Supplier	
2 door closers	10M Size 5	
2 kickplates	6-321 300 mm x dr width	C32D
2 floor stops	6-175	C15

.54 Group "54":

1-1/2 pr butts	TB211 114 x 101 mm	C15
1 lockset	1315D	C32D
1 door closer	10M Size 4	AL.
1 kickplate	6-321 300 mm x dr width	C32D
1 threshold	6-343 x dr width	AL.
1 set weatherstrip		

.55 Group "55":

3 pr butts	TS111 88 x 76 mm	C15
2 roller latches	#6-81	
2 pulls	8-85-125 mm	C32D

.56 Group "56":

2 pr T-hinges	170 x 150 mm x 106 mm	CP
2 barrel bolts	6-4 x 150 mm	C15
2 pulls	See 2.2.9	
	(interior and exterior on same door)	

.57 Group "57":

Special Hardware see Detailed Doors
Hdwe per pair
10 only six way adjustable hinges: (5 hinges per door)
2 Cane bolts Type 6-60 (on large leaf) with strike for concrete slab
1 latch RW 125 (LH)
1 steel surface bolt-equal to Ives 360 x 300 m x C15 with padlocking facility; 19 x 19 mm bolt with 32 mm throw. Mount with through-bolts.
1 Padlock #756 HS.
On Door 156D mount bolt on Machine Shop 158 side
On Door 158D mount bolt on Washdown Area 160 side
For each door leaf provide suitable length of chain to stop door leaf at closed position. Chain shall extend from steel wall bracket, supplied under Section 05500, to top of door leaf. Chain galvanized passing link chain, electrically welded, of 5 mm steel, with 13 links per 300 mm.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Glass and glazing of:
.1 Aluminum doors, frames curtain wall and sloped glazing skylights: Section 08120
.2 Sectional metal overhead doors: Section 08362
.3 Multi-leaf vertical lift overhead doors: Section 08365 and 08372
.4 Aluminum windows: Section 08520
.5 Glazed office partitions, second floor, Administration Wing: Section 09250

.2 Mirrors: Section 10800

1.2 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in Right of Canada guaranteeing insulating glass units against failure of seal of enclosed air space and deposits on inner faces of glass detrimental to vision, in accordance with GC.24 but for a period of five years from the date of Interim Completion of entire contract.

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PART 2 - PRODUCTS

2.1 Glass Materials

.1 Clear sheet glass: to CAN2-12.2-M76+Amdt-Aug-76, glazing quality.

.2 Polished plate or float glass: to CAN2-12.3-M76+Amdt-Jan-80, glazing quality of thickness indicated.

.3 Wired glass: to CAN2-12.11-M76, type 1, wire mesh style 3, 6 mm thick.

.4 Insulating glass units:
.1 To CAN2-12.8-M76+Amdt-Jun-79, with outer pane of 5 mm thick clear tempered glass and inner pane of 5 mm thick clear tempered glass with 23 mm total thickness.
.2 Only insulating glass units listed on CGSB Qualified Products List are acceptable for use on this project.

.5 Plastic glazing: to CAN2-12.12-M79 clear polycarbonate sheet 6 mm thick, light transmission of 70% minimum.

2.1 Glass Materials (Cont'd)

.6 Glazing for exterior steel framed windows, Mechanics Shop 129: insulating glasss units to CAN2-12.8-M76 + Amdt-Jun-79 with outer pane of 6 mm thick heat-absorbing glass as specified in Paragraph 2.1.9.1 of Section 08120, and inner light of 6 mm thick wire glass of type specified in Paragraph 2.1.3 of this Section. Total thickness not less than 23 mm.

2.2 Glazing and Sealing Compound Materials

.1 Only compounds listed on the CGSB Qualified Products Products List are acceptable for use on this project.

.2 Sealant compound exterior glazing: one component silicone rubber, to CGSB 19-GP-9Ma+Amdt-Oct-80, gun grade, colour as selected by Engineer.

.3 Sealant compound interior glazing: one component polysulphide base, to CGSB 19-GP-13M, gun grade, colour as selected by Engineer.

.4 Glazing tape: preformed, self-shimming, butyl tape, 10-15 durometer hardness, paper release, black colour.

.5 Setting blocks: neoprene, Shore "A" durometer hardness 70-90, 100 mm long x 6 mm high x width to suit glass thickness.

.6 Spacer shims: neoprene, Shore "A" durometer hardness 40-60, 75 mm long x 2.4 mm thick x 9 mm high.

.7 Primer-sealers and cleaners: to glass manufacturer's standard.

PART 3 - EXECUTION

3.1 Workmanship

.1 Remove protective coatings and clean contact surfaces with solvent and wipe dry.

.2 Apply primer-sealer to contact surfaces.

.3 Place setting blocks as per manufacturer's instructions.

.4 Install glass, rest on setting blocks, ensure full contact and adhesion at perimeter.

.5 Install removable stops, without displacing tape or sealant.

3.1 Workmanship (Cont'd)

.6 Provide edge clearance of 3 mm minimum.

.7 Insert spacer shims to center glass in space. Place shims at 600 mm oc and keep 6 mm below sight line.

.8 Apply cap bead of specified sealant at exterior void.

.9 Apply sealant to uniform and level line, flush with sightline and tooled or wiped with solvent to smooth appearance.

.10 Do not cut or abrade tempered, heat treated, or coated glass.

.11 Provide adequate edge clearances for plastic glazing sheets in accordance with manufacturer's instructions.

3.2 Exterior Glazing

.1 Combination method - tape/sealant:
.1 Cut glazing tape to proper length and set against permanent stops, 5 mm below sightline. Install horizontal strips first, extend over entire width of opening before applying vertical strips. Weld corners together by butting tape and dabbing with sealant.
.2 Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass but not more than 10 mm below sightline.

3.3 Interior Glazing

.1 Combination method - tape/sealant:
.1 Cut glazing tape to proper length and install against permanent stop, projecting, 1.5 mm above sightline.
.2 Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass to uniform and level line.
.3 Trim off excess tape to sightline.

3.4 Finishing

.1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.

**********END**********

3.3 Interior Glazing

.1 Combination method - tape/sealant:
.1 Cut glazing tape to proper length and install against permanent stop, projecting, 1.5 mm above sightline.
.2 Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass to uniform and level line.
.3 Trim off excess tape to sightline.

3.4 Finishing

.1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Lath and metal furring: Section 09201

.2 Gypsum board: Section 09250

PART 2 - PRODUCTS

2.1 Materials

.1 Stud framing for gypsum board and miscellaneous bracing and framing:
.1 Non-load bearing channel studs: to ASTM C645-76; drawings: roll formed from 0.53 mm thickness electrogalvanized steel sheet; for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.
.2 Floor and ceiling tracks: to ASTM C645-76; in widths to suit stud sizes, 30 mm flange height.

.2 Stud framing for metal lath and plaster:
.1 Non-loadbearing truss studs: sizes as indicated on drawings, truss-type bent rod web with double rod chords or 12 x 6 mm x 1.2 mm channel chords; welded together at contact points. Make rod of minimum 4.5 mm diameter cold drawn steel wire having tensile strength of 620 MPa. Design studs for wire tying of metal lath.
.2 Floor track: snap-in type formed to hold studs securely in place at 50 mm intervals; fabricated from 0.5 mm thick steel sheet; size to suit studs.
.3 Ceiling track: channel shaped track for use with stud shoes and 1.2 mm diameter double wire ties; size to suit studs.
.4 After fabrication apply one shop coat of CGSB 1-GP-40M primer to steel surfaces. Descale and clean surfaces before painting.

.3 Metal channel stiffener: 19 x 12 mm size, 2 mm thick cold rolled steel, coated with rust inhibitive coating.

.4 Acoustical sealant: to CGSB 19-GP-21M.

PART 3 - EXECUTION

3.1 Erection

.1 Align partition tracks at floor and ceiling and secure at 600 mm oc maximum.

.2 For partitions place studs vertically at 600 mm oc except where indicated otherwise, and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions. Around Telecom and Electronics 210 and at fire rated steel stud and plaster partition, install studs at 400 mm centres.

.3 Erect metal studding to tolerance of 1:1000.

.4 Attach studs to bottom track using crimp method.

.5 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.6 Co-ordinate erection of studs with installation of door and special supports or anchorage for work specified in other Sections.

.7 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.8 Erect track at head of door opening to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.9 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures to steel stud partitions. Install special mounting plates supplied under Section 10800 for grab bars.

.10 Install steel studs or furring channel between studs for attaching electrical and other boxes.

3.1 Erection (Cont'd)

.11 Extend partitions to ceiling height except where noted otherwise on drawings.

.12 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.

.13 Install two continuous beads of acoustical sealant behind studs and tracks around perimeter of sound control partitions.

.14 Construct door pocket for sliding Door 177A, building-in overhead track supplied under Section 08710 and door frame supplied under Section 08111.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Suspension systems for Gypsum board ceilings: Section 09250

.2 Suspension system for metal linear ceilings: Section 09514

.3 Suspension system for coffered ceiling system: Section 13500

.4 Acoustical units: Section 09511

.5 Trim for recessed light fixtures: Section 16801

1.2 Reference Standards

.1 Fabrication: to ASTM C635-78.

.2 Installation: to ASTM C636-76 except where specified otherwise.

1.3 Design Criteria

.1 Maximum deflection: 1/360th of span to ASTM C635-78 deflection test.

PART 2 - PRODUCTS

2.1 Materials

.1 Heavy duty system to ASTM C635-78.

.2 Basic materials for suspension system: commercial quality cold rolled steel zinc coated.

.3 Suspension system for ceilings designated "AC.U.-1" and "AC.U.-4": non fire rated, two directional exposed tee bar grid.

.1 Exposed tee bar grid components: shop painted satin sheen white. Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.

2.1 Materials (Cont'd)

.3 (cont'd)
.2 Hangers: galvanized soft annealed steel wire, 2.6 mm thick.
.3 Accessories: splices, clips, wire ties, retainers and wall moulding to complement suspension system components, as recommended by system manufacturer.

.4 Suspension system for ceilings designated "AC.U.-2" and "AC.U.-3": concealed system, to provide 20% accessibility.
.1 Concealed H & T suspension components: system fabricated of formed commercial quality cold-rolled steel, zinc coated consisting of concealed "H" runners, concealed tee splines, flat steel splines. Wall moulding to suit system with satin sheen white exposed face.
.2 Carrying channels: 38 x 19 x 1.5 mm galvanized steel at right angles to "H" runners and spaced at centres not exceeding 1200 mm and not more than 150 mm from walls.
.3 Hangers: galvanized soft-annealed steel wire 3.6 mm thick.
.4 Accessory components as required to provide specified accessibility.
.5 Install accessible panels after consultation with Divisions 15 and 16 as to required locations.
.6 Provide appropriate fixture frames for recessed light fixtures.

PART 3 - EXECUTION

3.1 Installation

.1 Do not erect ceiling suspension system until anchors, blocking, sound or fire barriers, electrical and mechanical work above ceiling have been inspected and approved by Engineer.

.2 Lay out center line of ceiling both ways, to provide balanced borders at room perimeter with border units not less than 50% of standard unit width and in accordance with reflected ceiling plans.

.3 Ensure suspended system is co-ordinated with location of related components.

.4 Install wall mould to provide correct ceiling height. Finished ceiling system to be level within 1:1200.

3.1 Installation (Cont'd)

.5 Support suspension system, main runners, carrying channels at 1.2 m oc maximum with hanger wire from building structural system. Completed assembly to support super-imposed loads, such as lighting fixtures, diffusers, grilles and speakers.

.6 Support recessed fluorescent light fixtures with supplemental hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.7 Interlock cross members to main runner to provide rigid assembly.

.8 Install suspension assembly to manufacturer's instructions.

.9 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

3.3 Cleaning

.1 Touch up scratches, abrasions, voids and other defects in painted metal surfaces. Replace components where touch up is not satisfactory to the Engineer.

.2 Remove and replace improperly installed or fitted components.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Metal stud system: Section 09111

.2 Furring and lathing: Section 09201

.3 Gypsum board: Section 09250

1.2 Reference Standards

.1 Do plastering work to CSA A82.30-M1980 except where specified otherwise.

PART 2 - PRODUCTS

2.1 Materials

.1 Basecoat plasters:
.1 Gypsum neat plaster hardwall: to CSA A82.22-M1977.
.2 Gypsum mill aggregated plaster: to CSA A82.22-M1977 and CSA A82.57-M1977.
.3 Gypsum bonding plaster: to ASTM C28-80.

.2 Finishing plaster:
.1 Hydrated finishing lime Type N: to CSA A82.44-1950(R1971)
.2 Hydrated finishing lime Type S: to CSA A82.46-1962(R1972).

.3 Sand, Perlite, Vermiculite aggregate for use in basecoat plasters: to CSA A82.57-M1977.

.4 Water: potable.

.5 Polyethylene film: to CAN2-51.33-M80 type 2.

.6 Bonding agent: to CSA A261-1970.

2.2 Mixes

.1 Mix plasters in accordance with CSA A82.30-M1980.

.2 Plaster on fire-rated steel stud and metal lath partitions directly to masonry, and for circular column enclosures. Three coats to total thickness of 19 mm minimum. Scratch coat, one part neat gypsum hardwall base plaster to 2 parts sand. Brown coat one part neat gypsum hardwall plaster to 3 parts sand.

2.2 Mixes (Cont'd)

.2 (Cont'd)
Final coat one part gauging plaster to three parts lime putty by volume. For plastering directly to masonry add bonding agent to scratch coat mix in proportion recommended by manufacturer.

.3 Cement plaster for fire rated beam protection: 2 coat application to total thickness of 22 mm. Scratch coat with 1 part portland cement to 2 parts sand by volume. Final coat with 1 part portland cement to 3 parts sand by volume. Use proprietary plasticizing admixture in proportions recommended by manufacturer in lieu of lime.

PART 3 - EXECUTION

3.1 Preparation

.1 Prepare surfaces to receive plaster to CSA A82.30-M1980.

.2 Ensure grounds, screeds, beads and accessories are in place and conduits, pipes, cables and outlets are properly plugged, capped or covered before commencing work.

.3 Where plaster abuts exposed masonry walls, insert 1 m wide strip of polyethylene before applying plaster to protect masonry. Cut polyethylene neatly at junction with plaster when plastering completed.

.4 Do not plaster adjacent to aluminum or other finished work until such work is masked.

.5 Apply bonding agent to masonry surfaces in accordance with manufacturer's instructions.

3.2 Workmanship

.1 Apply plaster finish level and plumb to maximum variation of 3 mm in 2.5 m in any plane.

.2 Form small vee groove where plaster finish is flush with bases, window frames, glazed wall tiles or similar construction.

.3 Cut base coats free of bucks, frames and grounds to allow for movement. Cut plaster free of electrical outlet boxes and other openings.

.4 Finishes
.1 Cement plaster: smooth wood float finish.

3.3 Fire Rated Assemblies

.1 Carry baseboat and brown coat on fire rated partitions to underside of structure above ceiling.

.2 Apply finish coat plaster to exposed plaster surfaces.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1	Expansion joint covers:	Section 05805
.2	Rough carpentry:	Section 06100
.3	Suspension system for acoustical ceilings:	Section 09130
.4	Gypsum plaster:	Section 09150
.5	Gypsum board including metal furring:	Section 09250
.6	Metal stud system:	Section 09111
.7	Access doors for mechanical work:	Section 15010

1.2 Reference Standards

.1 Furring and lathing work: CSA A82.30-M1980.

PART 2 - PRODUCTS

2.1 Materials

.1 Metal furring channels, hangers, tie wire, inserts, anchors: CSA A82.30-M1980.

.2 Metal lath: CSA A82.30-M1980 Table 1, of type and weight to suit plaster system and support spacing.

.3 Gypsum lath: CSA A82.27-M1977 Type X. Thickness to suit plaster system and support spacing.

.4 Plaster reinforcement over rigid insulation: 0.9 mm steel wire, galvanized, 25 mm hexagonal mesh.

.5 Polyethylene film: CAN2-51.33-M80, Type 2, 0.15 mm thick.

.6 Metal accessories corner beads, base screeds, cornerite, casing beads: CSA A82.30-M1980.

.7 Expansion joint assemblies: back-to-back casing beads to CSA A82.30-M1980 plus polyethylene loop continuous air seal or specially fabricated 0.45 mm thick copper bearing or zinc coated sheet steel assembly complete with flexible air seal.

2.1 Materials (Cont'd)

.8 Picture mould: profile as shown fabricated of galvanized steel sheet with minimum base metal thickness of 0.3 mm with Z-275 zinc coating.

.9 Channel mould: extruded aluminum, mill finish, for 19 mm thick plaster and providing 19 mm wide channel; 22 mm wide flanges. Minimum wall thickness of extrusion: 1.3 mm.

PART 3 - EXECUTION

3.1 Furring and Lathing Generally

.1 Furring indicated on drawings is schematic. Do not regard as exact or complete.

.2 Use galvanized supports, members, angles and metal lathing in wet areas, exterior walls and exterior soffits.

.3 Do not lath over bucks, anchors, blocking, electrical and mechanical work until they are inspected and approved by Engineer.

.4 Leave finished work rigid, secure, square, level, plumb, curved to detailed radius and erected to maintain finish plaster line dimensions and contours. Make allowance for thermal movement.

.5 Provide clearance under beams and structural slabs to prevent transmission of structural loads to vertical furring.

3.2 Metal Lathing

.1 Apply metal lath taut. Locate end joints over framing members; stagger end joints on alternate courses; on vertical surfaces lap lower sheet over upper sheet.

.2 At fire rated steel stud partitions extend metal lath to underside of floor structure above ceiling.

3.3 Fire Rated Metal Lath and Plaster Beam Protection

.1 One hour protection with beam furred with 19 mm x 10 mm x 1.5 galvanized furring channels at centres not exceeding 400 mm secured and braced. Apply metal lath weighing not less than 1.63 kg/sq. m., wired to furring channels. Install casing bead at junction with masonry walls and corner bead at external corner Leave ready to receive 22 mm of cement plaster under Section 09150.

3.4 Furring and Lathing Circular Column Enclosures

.1 At second floor of Administration wing provide furring and metal lath to provide circular profile to detail.

.2 Extend enclosure to a minimum of 150 mm above finished ceiling.

.3 Where steel columns are spray fireproofed do not attach furring to column. Attach to floor slab and attached to, or braced to floor construction above ceiling. Be responsible for cost of making good any sprayed fireproofing damaged, loosened, or displaced during this work.

3.5 Reinforcement

.1 Where plaster is to be applied directly to masonry, install 150 x 450 mm metal lath strips diagonally at each corner of openings exceeding 0.1 sq m.

.2 Apply cornerite to internal angles to be plastered. Fasten to retain position during plastering. Do not secure to framing members.

.3 Lath across junctures of dissimilar materials to be plastered with strip of metal lath at least 200 mm wide.

3.6 Accessories

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 200 mm oc.

.2 Install corner beads on external angles.

.3 Install casing beads wherever plaster abuts or joins a dissimilar exposed surface such as masonry, concrete, wood, metal; where edges of plaster are exposed; where plaster on a non-structural member butts plaster on a structural member; and elsewhere as indicated.

.4 Install metal screeds at top of bases and dadoes.

3.7 Expansion and Control Joints

.1 Construct control joints of two back-to-back casing beads set in plaster and supported independently on both sides of joint.

.2 Provide continuous polyethylene air seal behind and across expansion/contraction joints.

.3 Locate control joints at butting structural elements, at dissimilar walls and ceilings at changes in substrate construction, over control joints in block walls, at line of door jambs from top of door frame to ceiling, at approximately 9 m spacing on long corridor runs, and at indicated locations at sidewall extending into roof monitor in Administration Wing. Refer to Detail EL2/25/22.

.4 Install control joints straight and true.

3.8 Access Doors and Plaster Rings

.1 Install rings and frames for electrical and mechanical fixtures.

.2 Rigidly secure rings and frames to furring and lathing systems.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1	Wood framing/grounds:	Section 06100
.2	Gypsum board under protected roofing membrane:	Section 07550
.3	Metal stud system:	Section 09111
.4	Doors in aluminum door frames:	Section 08213
.5	Door hardware:	Section 08710
.6	Glazing of aluminum frames:	Section 08800
.7	Access doors:	Section 15010

1.2 Reference Standards

.1 Do work in accordance with CSA A82.31-M1980 except where specified otherwise.

PART 2 - PRODUCTS

2.1 Gypsum Board

.1 To CSA A82.27-M1977 as follows:
.1 Plain gypsum board: standard, 12.7 mm thickness unless otherwise indicated, 1200 mm wide x maximum practical length. Edges tapered for exposed surfaces or where thin finish is to be applied. Square edge where concealed within construction or where covered by subsequent layers of gypsum board.
.2 Fire-rated gypsum board: Type X, 12.7 mm minimum thickness except where thicker material is indicated. 1200 mm wide x maximum practical length. Tapered edges for single layer work and for final layer of multilayer applications. Square edges for concealed layers. Use for all fire rated partitions, bulkheads, column and beam enclosures.
.3 Water resistant board: to CSA A82.27-M1977 Type X 12.7 mm thick, 1200 mm wide x maximum practical length. Use in areas where ceramic tile is scheduled.

2.2 Metal Furring and Suspension Systems

.1 Metal furring runners, hangers, tie wires, inserts, anchors: to CSA A82.30-M1980, galvanized.

.2 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

2.3 Fastenings and Adhesives

.1 Drywall screws: to ASTM C646-76, Type S. Length to provide minimum of 10 mm penetration into steel framing.

.2 Laminating compound: to CSA A82.31-M1980, asbestos-free.

2.4 Accessories

.1 Casing beads, corner beads fill type: 0.5 mm base thickness commercial grade sheet steel with G90 zinc finish to ASTM A525-80A; perforated flanges. One piece length per location.

.2 Cornice cap: 12.7 mm deep x partition width, of 1.6 mm base thickness galvanized sheet steel, prime painted. Include splice plates for joints.

.3 Sound insulating blankets: for sound resistant partitions 50 mm thick glass fibre blankets with density of 16 kg/cubic m.

.4 Sound isolating gasketting: 6 mm thick x 38 mm wide, self-adhesive, closed cell neoprene sponge. Shore hardness: 25-35.

.5 Acoustic sealant: to CGSB 19-GP-21M.
.1 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Panel for joint sealants.

.6 Joint compound: to CSA A82.31-M1980, asbestos free.

.7 Sheet metal closures: to profiles shown, of galvanized steel sheet with minimum base metal thickness of 0.6 mm.

.8 Aluminum channel: 50 x 12 x 3.17 mm extruded aluminum angle, mill finish. Secure with countersunk, flat head aluminum screws. Refer to Detail 97/20 on Drawing A-20.

2.4 Accessories (Cont'd)

.9 Sound and firestop insulation: provide and install between ceiling runners for partitions and bulkheads and underside of metal deck. Compressed mineral fibre firestopping material labelled by ULC as meeting ULC 40 U 18.7, and factor preformed to fit flutes of steel deck. Installed compressed thickness not more than 75% of uncompressed thickness. Width to provide required fire protection but not less than 89 mm.

2.5 Prefabricated Aluminum Door Frames and Glazing Frames

.1 For indicated office areas on Second Floor of Administration Wing.

.2 As manufactured for demountable stud-type partitions.

.3 Glazing frames: to true metric module of 1500 mm. Extruded aluminum with concealed fastening or snap-in glazing stops, for single 6 mm glazing. Furnish neoprene or vinyl glazing gaskets.

.4 Door frames: extruded aluminum to accommodate doors listed on Door Schedule. Complete with door stop with continuous vinyl door seal. Prepare for hardware supplied under Section 08710.

.5 Aluminum components of alloy AA6063-T5 with exposed surfaces in clear anodic finish, designation AA-A-31.

.6 Dimensions of door frames, glazing frame to suit partition thickness.

.7 Incorporate components into regular steel stud partitions around offices. Infill panels with steel studs and gypsum board.

.8 Provide and install 6 mm clear sheet glass to CAN2-12.2-M76 +Amdt-Aug-76, glazing qualit.

PART 3 - EXECUTION

3.1 Suspended Framing and Furring

.1 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with CSA A82.31-M1980 except where specified otherwise.

.2 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.3 Install work level to tolerance of 1:1200.

.4 Frame to detail with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.5 Furr for gypsum board faced vertical and sloping bulkheads, for light valences, stair balustrades.

.6 Furr above suspended ceilings for gypsum board fire and sound stops as indicated. Provide similar bulkhead inside convector enclosures where fire rated or sound resistant partitions intersect exterior walls. Construct openings for ductwork with fire dampers to detail shown on drawings.

.7 Frame for and supply supports for recessed power-operated projection screen in Multipurpose Room 177.

.8 Framing and furring shown on drawings is schematic and included to establish dimensions, profile, and profiles. Provide additional members and bracing as required to provide secure, rigid installation.

3.2 Gypsum Board Application

.1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply layer gypsum board to metal furring or framing using screw fasteners for first layer, laminating adhesive and screw fasteners for subsequent layers. Maximum spacing of screws 300 mm oc.

.3 Apply gypsum board to concrete block surfaces, where indicated, using laminating adhesive.

3.2 Gypsum Board Application (Cont'd)

.4 Apply type X gypsum board where indicated, to obtain fire rated partitions, bulkheads, fire stops, column enclosures, ceiling membranes.
.1 Construct to ULC Design numbers indicated on drawings, with furring materials and construction as required by the designated Design.
.2 Carry fire-rated column enclosures from floor slab to underside, or slightly below, of intersecting horizontal steel beams. At top of enclosure close off re-entrant space between gypsum board enclosure and steel column with furring and gypsum board like vertical enclosure and fitted tightly to column profile, ready to receive sprayed fireproofing above.

.5 Sound resistant partitions: with two layers of 12.7 mm gypsum board on each side of steel studs with 50 mm sound absorbing blanket between studs. Set floor and ceiling track with sound isolating gaskets. Attach first layer of gypsum board horizontally by screw attachment. After one side is in place install sound absorbing blanket fitted tightly to studs and stapled to gypsum board at 600 mm centre to hold in place. Offset joints on opposite side of partition in first layers. Seal all perimeter joints in first layers and around all penetrations with acoustic sealant. Apply finishing layers vertically by combination of laminating compound and screw fastening.

.6 1 hour fire-rated partitions: one layer of 12.7 type X gypsum board on each side of steel studs, with sound absorbing blanket between studs. Where partition is indicated to be both fire-rated and sound resistant construct as in Paragraph 3.4.5 above but use type X gypsum for first layer on each side of steel stud. Construct openings for ductwork with fire dampers to detail shown on drawings.

.7 Sound stop and fire stop bulkheads: to detail using combination of laminating adhesive and screw fastening wih metal members as indicated. Construct similar fillets between ends of partitions and abutting window mullions. Use sound isolating gaskets at abutting surfaces.

3.3 Accessories

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm oc.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

3.4 Control Joints

.1 Construct control joints of two back-to-back casing beads set in gypsum baord facing and supported indepedently on both sides of joint.

.2 Provide continuous polyethylene dust barrier behind and across control joints.

.3 Locate control joints at changes in substrate construction, at approximately 10 m spacing on long corridor runs, at approximately 15 m spacing on ceilings.

3.5 Cornice Caps

.1 Install cornice cap where gypsum board partitions do not extend to ceiling.

.2 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm oc.

.3 Splice corners and intersections together and secure to each member with 3 screws.

3.6 Access Doors

.1 Install access doors to electrical and mechanical fixtures specified in respective Sections.

.2 Rigidly secure frames to furring or framing systems.

3.7 Taping and Filling

.1 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.2 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.3 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after painting is completed.

.4 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.5 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Caulking: Section 07900

.2 Parged concrete block substrate: Section 04100

.3 Gypsum board substrate: Section 09250

.4 Toilet and bath accessories: Section 10800

1.2 Reference Standards

.1 Do tile work in accordance with Installation Manual 200-1979, "Ceramic Tile", produced by Terrazzo Tile and Marble Association of Canada (TTMAC), except where specified otherwise.

1.3 Samples

.1 Submit samples of each colour, texture, size, and pattern of tile, in accordance with Section 01340. Submit 300 x 300 mm sample of marble.

1.4 Environmental Conditions

.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 10 deg C for 24 hours before, during and 24 hours after installation.

PART 2 - PRODUCTS

2.1 Floor Tile

.1 Ceramic tile: to CAN2-75.1-M77, Type 3, Class MR.2, 100 x 200 x 9.5 mm size cushion edges, slip resistant surface, pattern as selected by Engineer. Colours as shown on Finish and Colour Schedule.

.2 Ceramic mosaic tile: to CAN2-75.1-M77, Type 2, Class MR.1, 25 x 25 x 6 mm, cushion edges, unglazed surface. Colour as approved by Engineer to match colour of 100 x 200 mm floor tile. Provide for shower receptor in Shower 190 and for drainage troughs in Shower Room 187. Provide all coved in-angles and bull-nosed out-angles required.

2.2 Wall Tile

.1 Ceramic tile: to CAN2-75.1-M77, Type 5, Class MR.4, 100 x 100 x 6 mm size, cushion edges, matt glazed surface. Pattern as selected by Engineer. Colour as shown on Finish and Colour Schedule. Provide matching 100 x 100 mm high coved base.

2.3 Mortar and Adhesive Materials

.1 Cement: grey to CAN3-A5-M77, type 10.

.2 Sand: to CSA A82.56-M1976.

.3 Lime: to CSA A82.43-1950(R1971).

.4 Latex: formulated for use in cement mortar.

.5 Water: Potable and free of minerals which may discolour mortar.

.6 Adhesive for all floor tile: two-part epoxy adhesive, or epoxy modified mortar to CGSB 71-GP-30M.

.7 Organic adhesive for wall tile: to CGSB 71-GP-22M+Amdt-Jun-78, Type 1.

2.4 Grout

.1 Grout for wall tile in Shower 187 and Shower 190: three part epoxy resin base grout in white.

.2 Grout for other wall tile: proprietary, premixed, dry-cure modified acrylic grout in white.

.3 Grout for floor tile: proprietary, multi-component, epoxy resin based grout, water-washable, in colours selected by Engineer to match or blend with floor tile colour.

2.5 Accessories

.1 Divider strips: 6 mm thick brass with depth to suit application.

.2 Recessed ceramic soap, grabs, shower rooms. Semi-recessed glazed ceramic soap dish and grab bar, 165 x 188 mm face. Colour to match wall tile. Provide one unit at each shower head location.

.3 Sealant for control joints: multi-component, chemical curing to CGSB 19-GP-24M, suitable for joints on horizontal surfaces, colour to match ceramic tile.

2.6 Mortar and Adhesive Mixes

.1 Fill mortar: 1 part cement, 1/5 to 1/2 part lime to suit job conditions, 4 parts sand, 1 part water. All measurements by volume. Adjust water volume to accommodate water content of sand.

.2 Setting mortars and adhesives: mix in accordance with manufacturer's printed instructions.

2.7 Marble Vanity Top

.1 Travertine marble in size, thickness and profiles shown. All exposed faces and edges filled and polished. Submit samples for selection by Engineer.

.2 Setting adhesive counter top: epoxy modified mortar to CGSB 71-GP-30M.

.3 Dowels: 6 mm non-ferrous dowels at 150 mm centres between counter top and backsplash.

.4 Use two-part epoxy adhesive between counter top and backsplash and for setting dowels.

PART 3 - EXECUTION

3.1 Preparation

.1 Clean all substrates of dust, dirt, loose materials.

.2 Clean floor slabs by scrubbing and rinsing with clean water, the allowing slab to dry.

.3 In area where floor slabs are depressed 200 mm to receive tile, clean substrate as above. Apply slurry coat of cement and water, then place mortar fill to level required to set floor tile by thin-set adhesive specified. Accurately place mortar substrates to form drainage slopes, shower receptor, and drainage-troughs. Screed and bring to smooth, wood float surface. Damp cure.

3.2 Workmanship

.1 Apply tile to clean and sound surfaces.

.2 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even.

.3 Maximum surface tolerance 1:800 for walls and floors.

.4 Make joints between tile uniform and approximately 2 mm wide for wall tile and mosaic floor tile, and 5 mm wide for 100 x 200 mm floor tile, plumb, straight true, even and flush with adjacent tile. Align patterns.

.5 Lay out tiles so perimeter tiles are minimum 1/2 size.

.6 Sound tiles after setting and replace hollow sounding units to obtain full bond.

3.2 Workmanship (Cont'd)

.7 Make internal angles square, external angles bullnosed.

.8 Use bullnose edged tiles at termination of wall tile panels, except where panel butts projecting surface or differing plane.

.9 Install divider strips at junction of tile flooring and dissimilar materials.

.10 Allow adequate time for adhesive to set before grouting.

.11 Remove excess adhesive and grout as work progresses.

.12 Carry out final cleaning of installed tile surfaces after installation and grouting has cured.

.13 Provide tile base at locker bases.

.14 In Male Locker Room 185 provide control joint around perimeter of room between coved base and floor tile and in field of floor tile coinciding with any control joints in concrete slab. Make joint width same as joints in ceramic tile. Keep free of adhesive and grout. Fill with sealant tooled to match grouted joints. Remove excess sealant from face of tile as work progresses.

.15 Marble vanity top:
.1 Take field dimensions prior to fabrication.
.2 Fabricate and assemble vanity top and backsplash to greatest practical extent.
.3 Top in one piece. Backsplash at rear and returning at sides.
.4 Shop prepare openings for lavatory, lavatory fittings, counter mounted soap dispenser.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Precast terrazzo: Section 09420

.2 Entrance Foot Grilles: Section 12672

1.2 Reference Standards

.1 Do terrazzo work in accordance with CSC (SWAC) Architectural Specification Study on Terrazzo (Portland Cement) 1976, produced in cooperation with Terrazzo, Tile and Marble Association of Canada (TTMAC), except where specified otherwise.

1.3 Samples

.1 Submit duplicate 300 x 300 x 20 mm thick samples of each colour terrazzo, in accordance with Section 01340.

1.4 Maintenance Data

.1 Provide maintenance data as set out in TTMAC publication for terrazzo work for incorporation into maintenance manual specified in Section 01730.

1.5 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that the precast terrazzo surfaces will remain sealed for a period of five years from the date of Interim Completion of entire contract.

1.6 Environmental Requirements

.1 Maintain air temperature and structure base temperature at terrazzo installation area above 10 deg C for 24 hours before, during and 24 hours after installation.

PART 2 - PRODUCTS

2.1 Materials

.1 Cement: to CAN3-A5-M77 type 10 grey for underbed and white for topping.

.2 Sand, fine and coarse aggregates to CAN3-A23.1-M77.

.3 Water: potable.

2.1 Materials (Cont'd)

.4 Marble chips: to CSA A194.1-1967 for uniformity, soundness and abrasion resistance. Grade chips in accordance with TTMAC standard. Provide proportions of Canadian and imported chips and in colours required by selected TTMAC colour plate numbers indicated on finish and colour schedule.

.5 Pigments: non-fading mineral pigments in selected colours.

.6 Divider strips: 3 mm thick zinc with depth of 32 mm. Provide 6 mm thick brass strips at doorways and at junction of terrazzo with other floor finishes.

.7 Accessories: base caps and base divider strips, separator strips, purpose made and of same material to match divider strips.

.8 Curing compound: to manufacturers' standard.

.9 Cleaning compound: to TTMAC standard 1001.

.10 Sealing compound: to TTMAC standard 2001.

.11 Finishing compound: to TTMAC standard 3001.

2.2 Mixes

.1 Slurry coat: cement and water mixed to creamy paste.

.2 Underbed: 1 part cement to 4 parts sand by volume.

.3 Terrazzo topping: to match TTMAC colour plate numbers indicated on finish and colour schedule.

PART 3 - EXECUTION

3.1 Workmanship

.1 Apply terrazzo after concrete slabs have cured 28 days.

.2 Install divider strips true and level to detailed pattern.

.3 Produce terrazzo finished surfaces consisting of 70% of marble chips to match samples.

3.2 Floors

.1 Bonded terrazzo: provide 16 mm minimum terrazzo topping bonded to underbed to TTMAC detail No. 1.

3.3 Bases

.1 Terrazzo bases: to TTMAC detail No. 6.

.2 Where bases are at steel stud partitions construct to details shown on drawings. Supply and install zinc coated metal lath weighing a minimum of 1.6 kg/sq. metre to receive under bed. Apply underbed in two coats.

3.4 Sealing

.1 Clean, seal and finish terrazzo surfaces to TTMAC recommendations.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Portland cement terrazzo: Section 09410

1.2 Reference Standards

.1 Do precast terrazzo work to CSC Architectural Specification Study on Terrazzo Portland Cement 1976, produced in co-operation with Terrazzo, Tile and Marble Association of Canada (TTMAC), except where specified otherwise.

1.3 Maintenance Data

.1 Provide maintenance data as set out in TTMAC publication for terrazzo work for incorporation into Maintenance Manual specified in Section 01730.

1.4 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that the precast terrazzo surfaces will remain sealed for a period of five years from the date of Interim Completion of entire project.

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PART 2 - PRODUCTS

2.1 Materials

.1 Cement: to CAN3-A5-M77 type 10 grey for backing and mortar beds and white for topping.

.2 Sand, fine and coarse aggregates to CAN3-A23.1-M1977.

.3 Water: potable.

.4 Marble chips: to CSA A194.1-1967 for uniformity, soundness and abrasion resistance. Grade chips in accordance with TTMAC standard.

.5 Pigments: non-fading mineral pigments in selected colours.

.6 Welded steel wire fabric: to CSA G30.5-1972(R1979), 50 x 50 x 1.6 mm wire, galvanized, in flat sheets only.

.7 Non-slip material for inserts: fine aluminum oxide and epoxy cement mixture in selected colours.

2.1 Materials (Cont'd)

.8 Setting mortar: epoxy resin-based bedding mortar to 71-GP-30M.

.9 Cleaning compound: to TTMAC standard 1001.

.10 Sealing compound: to TTMAC standard 2001.

.11 Finishing compound: to TTMAC standard 3001.

2.2 Mixes

.1 Precast terrazzo backing: use concrete mix designed to produce 20 MPa minimum compressive strength at 28 days and containing 6 to 9 mm maximum size coarse aggregate with water cement ratio to produce stiff mix.

.2 Terrazzo topping: to match TTMAC colour plate numbers indicated on finish and colour schedule.

.3 Mortar bed mix: to manufacturer's directions.

2.3 Casting Units

.1 Manufacture units accurately in moulds using compression or vibratory process.

.2 Precast stair treads: as detailed on drawings. Minimum thickness of terrazzo topping mix on exposed faces: 16 mm.

.3 Reinforce stair treads with single layer of welded steel wire fabric.

.4 Form channels in tread for non-slip inserts. Fill with non-slip mixture after shop finishing of terrazzo.

.5 Form treads with holes on underside to engage steel studs attached to steel tread pan.

.6 Wet cure units for 14 days.

.7 Shop finish, clean, and seal precast units to TTMAC recommendations.

PART 3 - EXECUTION

3.1 Installation of Stair Treads and Risers

.1 Install treads on steel stairs using epoxy mortar bed. Set in full mortar bed, taking care to grout in steel in steel studs on metal pan into holes in bottom of precast tread.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Suspension system: Section 09130

.2 Coffered Ceiling System: Section 13500

1.2 Samples

.1 Submit duplicate full size samples of each type acoustical units in accordance with Section 01340.

1.3 Environmental Conditions

.1 Commence installation after building enclosed and dust generating activities completed.

.2 Permit wet work to dry before commencement of installation.

.3 Maintain uniform minimum temperature of 15 deg C and humidity of 20 - 40% before and during installation.

.4 Store materials in work area 48 hours prior to installation.

PART 2 - PRODUCTS

2.1 Materials

.1 Acoustic units designated AC.U.-2 on Room Finish Schedule: for concealed suspension system: to CAN2-92.1-M77, mineral tile, fine fissured pattern, flame spread rating 25 or less, smoke developed 50 or less, 305 x 305 x 20 mm, flat with square edges, kerfed and cut back to accommodate concealed suspension, matt white finish in factory applied washable vinyl latex paint. NRC designation .65-.70.

.2 Acoustic units designated AC.U.-3 on Room Finish Schedule: for concealed suspension system: to CAN2-92.1-M77, perforated aluminum pan with baked white satin finish, with dense mineral fibre core, flame spread rating 25 or less, smoke developed 50 or less, 305 x 305 x 16 mm, edges kerfed and cut back to accommodate concealed suspension, NRC designation .55-.65.

.3 Acoustic units designated AC.U.-4 on Room Finish Schedule: for exposed T & T suspension system to CAN2-92.1, perforated aluminum pan with baked white satin finish, with dense mineral fibre core, flame spread rating 25 or less, NRC designation .50-.65. Size: 600 x 600 x 16 mm.

2.1 Materials (Cont'd)

.4 Acoustic lay-in units designated lay-in AC.U.-1 on Room Finish Schedule: for exposed T & T suspension system: to CAN2-92.1-M77, type 3, pattern textured c/f, flame spread rating of 25 or less, smoke developed 50 or less, 600 x 600 x 25 mm, with square edges. Pebbled white finish with light reflectance range of 75%. NRC designation .85. Prefabricated with vinyl covered fabric on fibrous glass core weighing 112 kg/cubic metre, with edges rounded and hardened. Surfaced on exposed face with perforated 0.05 mm polyvinyl chloride film with textured finish. Install also in coffered ceiling system in 1500 mm metric module.

.5 Adhesive: type recommended by acoustic unit manufacturer. Use for securing AC.U.-1 acoustic units to cover of power-operated projection screen in Multipurpose Room 176.

.6 Aluminum edge trim: use around perimeter of acoustic units attached to access panel and door on power-operated projection screen. Extruded aluminum plaster moulding to accommodate 19 mm thick acoustic unit, 25 mm leg for fastening, 5 mm edge lap over tile edge. Mill finish. Minimum thickness 1.3 mm. Mitre corners and fit to hairline joint.

PART 3 - EXECUTION

3.1 Installation

.1 Commence installation when all anchors, blockings, sound or fire barriers and mechanical and electrical work above ceiling has been inspected by Engineer.

.2 Install acoustical units parallel to building lines with edge unit not less than 50% of unit width, with directional pattern running in same direction. Refer to reflected ceiling plan.

.3 Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.

.4 Install flush edge moulding at junction of acoustic unit ceiling and other materials around entire length of joint. Secure to construction. Butt joints neatly, square and true in alignment.

3.2 Completion

.1 Remove and replace with new material any acoustic panels and tiles which are damaged, stained, or improperly cut or fitted.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Sprinklerheads: Section 15510

.2 Air diffusers: Section 15870

.3 Light fixtures: Section 16806

1.2 Samples

.1 Submit one representative module of metal linear ceiling and soffit system in accordance with Section 01340.

.2 Sample module to show basic construction and assembly, treatment at walls, recessed fixtures, splices, finishes.

1.4 Environmental Conditions

.1 Commence installation after building enclosed and dust generating activities completed, and after work above by other trades has been installed and tested.

PART 2 - PRODUCTS

2.1 Materials

.1 Basic materials:
.1 Aluminum sheet: Aluminum Association alloy AA1100.

.2 Linear strips: 84 mm wide by 16 mm deep channel shaped strips of minimum 0.5 mm aluminum, to suit 110 mm module. Edge round.
.1 Face plain.
.2 On interior of building space between strips to be open. At exterior soffits space between strips to be closed with recessed metal closures in black.
.3 Finish: baked enamel. Finish to meet or exceed requirements of CGSB 93-GP-1a, 1974.

.3 Carrier: manufacturer's standard exterior and interior carrier with integral clips for snap-on installation of linear strips to 110 mm module, fabricated from aluminum with black baked enamel finish. Provide flexible type carriers for curved ceiling sections.

.4 Hangers: straight lengths of 2.5 mm diameter, galvanized, soft annealed steel wire commercial quality. Centres as recommended by ceiling manufacturer.

2.1 Materials (Cont'd)

.5 At exterior soffits prevent wind uplift by securing a 38 x 12 x 1.5 mm galvanized furring channel full height to each hanger.

.6 Tie wires: 1.6 mm diameter, galvanized, soft annealed steel wire.

.7 Accessories: splices, clips, end closers, side closers as indicated and recommended by ceiling system manufacturer. Provide all special trim, closures, shapes for complete installation. Colour to match linear strip colour.

2.2 Finishes

.1 Baked enamel: manufacturer's standard 2 coat matt finish in special colours as indicated on Finish and Colour Schedule.

PART 3 - EXECUTION

3.1 Erection

.1 Erect ceiling after mechanical and electrical work above ceiling has been approved by Engineer.

.2 Maximum spacing of hangers or supports: 1200 mm oc along carrier and 300 mm from ends. Maximum spacing of carriers: 1200 mm oc and 150 mm from ends of linear strips. Support each strip on at least 3 carriers. Stagger end joints.

.3 Lay out linear strips in direction indicated and according to reflected ceiling plan. Provide balanced borders at room perimeter. Fit recessed light fixtures and diffusers exactly into ceiling module. Provide hanger at each corner of fixture or diffuser.

.4 Terminate strip ends 25 mm from walls and other vertical surfaces. Use factory made closed end units where ends exposed to view.

.5 Install edge trim at perimeter, and penetrations.

.6 Use manufacturer's field cut-off device for 90 deg and 45 deg end cuts.

.7 Form curved sections with smooth profile to indicated radii. Form carriers to uniform curve, securely braced, and fastened.

3.1 Erection (Cont'd)

.8 At light valences and at roof monitor window provide special metal closures as indicated at top of curved linear metal bulkheads and provide recessed closures between strips to extent necessary to prevent light penetration into ceiling spaces.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Finishing of concrete floors: Section 03345

.2 Floor Drains: Section 15421

.3 Floor access covers: Section 15423

1.2 Samples

.1 On request by Engineer submit duplicate samples of tile in size specified, 300 mm long base, and edge strips, in accordance with Section 01340.

1.3 Maintenance Data

.1 Provide data for maintenance of resilient flooring for incorporation into Maintenance Manual specified in Section 01730.

1.4 Maintenance Materials

.1 Deliver 2% to nearest full carton of each colour, and pattern flooring material required for this project for maintenance use. Store where directed. Clearly identify each box.

.2 Maintenance materials to be same production run as installed materials.

1.5 Environmental Requirements

.1 Maintain minimum 20 deg C air temperature at flooring installation are for 3 days before, during and for 48 hours after installation.

PART 2 - PRODUCTS

2.1 Materials

.1 Vinyl asbestos tile: to CSA A126.1-1977, Type A, 3 mm thick, 300 x 300 mm size, in colours indicated in schedule.

.2 Resilient base: continuous top set coved and toeless, 3 mm thick, rubber 100 mm high including premoulded end stops and external corners at coved base of colour indicated in schedule. Provide toeless base in carpeted areas.

.3 Primers and adhesives: waterproof, recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.

2.1 Materials (Cont'd)

.4 Sub-floor filler: white premix latex requiring water only to produce cementitious paste.

.5 Metal edge strips: aluminum extruded, smooth, mill finish with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.

.6 Vinyl edge strips where resilient tile floor finish ends at exposed concrete floor finish provide and install vinyl reducer strip with minimum width of 32 mm and butting thickness matching tile thickness. Colour as selected by Engineer to harmonize with flooring colour.

.7 Reducer thresholds: extruded rubber in colours selected by Engineer to match or blend with flooring colour.

.8 Sealer: to CGSB 25-GP-20, Type 2.

.9 Wax: to CGSB 25-GP-16M.

.10 Polyethylene sheet: to CAN2-51.33-M77, Type 2.

PART 3 - EXECUTION

3.1 Inspection

.1 Ensure concrete floors are dry, by using test methods recommended by tile manufacturer, and exhibit negative alkalinity, carbonization or dusting.

3.2 Sub-floor Treatment

.1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured.

.3 Prime concrete to flooring manufacturer's recommendations.

3.3 Tile Application

.1 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.

.2 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.

.3 Install flooring to ashlar/staggered pattern with continuous joints flowing with direction of mottle with pattern grain parallel for all units and parallel to length of room.

.4 As installation progresses, roll flooring in two directions with 45 kg roller to ensure full adhesion, taking care not to displace tile.

.5 Cut tile and fit neatly around fixed or excessively heavy objects.

.6 Install flooring in pan type floor access covers. Maintain floor pattern.

.7 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.

.8 Install vinyl reducer strips at unprotected or exposed edges where flooring terminates.

.9 Reducer thresholds:
.1 Where resilient tile abutts ceramic floor tile which finishes above tile level possible 10 mm x 44 mm extruded rubber reducing threshold strips.
.2 At Doors 135 and 136 where ceramic tile finishes higher than concrete floor in Corridor 127, provide and install 13 mm x 150 mm extruded rubber reducing threshold strip.

3.4 Base Application

.1 Set base in adhesive tightly against wall and floor surfaces. Base joints at maximum length available or at internal or premolded corners.

.2 Install straight and level to variation of 1:1000.

.3 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush doorframes.

3.4 Base Application (Cont'd)

.4 Miter internal corners. Use premoulded sections for external corners at coved base. Wrap around toeless base at external corners.

.5 Install toeless type base before installation of carpet on floors.

3.5 Cleaning and Waxing

.1 Remove excess adhesive from floor, base and wall surfaces without damage.

.2 Clean, seal and wax floor and base surface to flooring manufacturer's instructions. In carpeted areas clean, seal and wax base surface before carpet installation.

3.6 Protection of Finished Work

.1 Prohibit traffic on floor for 48 hours after installation.

.2 Protect new floors with 0.15 mm thick polyethylene cover from after initial waxing until just before final inspection.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Resilient base: Section 09660

1.2 Samples

.1 Submit duplicate 1 m square pieces of carpet specified, duplicate 125 x 75 mm pieces for each colour selected, 150 mm lengths of carpet mouldings, including edge caps and T-caps, in accordance with Section 01340.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate locations and lengths of seams and cross joints for carpeted areas, open edges and other details required by Engineer to clarify work.

1.4 Maintenance Data

.1 Provide maintenance data for carpet maintenance for incorporation into Maintenance Manual specified in Section 01730.

1.5 Maintenance Materials

.1 Deliver 12 sq m of each type, pattern and colour of carpet required for this project for maintenance use. Store where directed. Clearly identify each roll as to colour, dye lot, location used in building. Wrap and seal in 10 mil polyethylene transparent sheet.

.2 Maintenance materials to be in one piece and same production run as installed materials.

.3 Maintenance material to be in addition to normal, "overage". Leave such surplus carpet on site, packaged and identified as specified for maintenance material.

1.6 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that carpeting work of this Section is guaranteed against deterioration of backing, delamination, failure of seams, stretching or wrinkling, fading or other defects of materials or workmanship detrimental to appearance or performance for a period of five years from the date of Interim Completion of entire contract.

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PART 2 - PRODUCTS

2.1 Materials

.1 Carpets required to have flame spread rating or smoke developed classification to be tested in accordance with CAN 4-S102.2-79 for floor surface covering and be certified by ULC. Test data from other laboratories may be approved upon submission to Fire Commissioner of Canada.

.2 Tufted carpet: to CGSB 4-GP-129 except as noted.
- .1 Top effect: loop pile, high-low rib. Colour as indicated on Colour Schedule.
- .2 Fibre type: 100% nylon, permanent, integral static control.
- .3 Yarn:
  - .1 Dyed from single dye lot.
  - .2 Yarn size: 450 tex x 1 450 tex x 2.
- .4 Pile height: 7 mm and 5 mm.
- .5 Tuft bind: 66.7 N, average.
- .6 Stitch count: 37.8/10 cm.
- .7 Machine gauge: 25.2/10 cm.
- .8 Yarn weight: 1085 g/sq m, minimum.
- .9 Pile density: 12.9 kilotex/sq cm.
- .10 Width: 366 cm.
- .11 Static control: maximum of 3.0 KV at 21 deg C and 20% R.H.
- .12 Primary backing: Polypropylene.
- .13 Laminate: Latex, 1356 g/sq m.
- .14 Secondary backing: Jute
- .15 Flame spread: 50 maximum.
- .16 Smoke developed: 90 maximum.

.3 Edging, thresholds: aluminum with snap-in coloured vinyl cap to suit glue-down installation; to suit carpet thickness. Vinyl cap colours as approved by Engineer to blend with carpet colour. Adhesive as recommended by manufacturer.

.4 Adhesive: non-release type of brand recommended by carpet manufacturer.

.5 Polyethylene film: to CAN2-51.33-M80, Type 2, 0.15 mm thick.

.6 Subfloor filler: white premix latex requiring only water to produce cementitious paste.

PART 3 - EXECUTION

3.1 Workmanship

.1 Install carpet by direct glue-down in accordance with CGSB 4-GP-156.

.2 Install carpeting after finishing work is completed but before demountable office partitions and telephone and electrical pedestal outlets are installed.

.3 Finish installation to present smooth wearing surface free from conspicuous seams, burring and other faults.

.4 Ensure colour, pattern and texture match within any one area.

3.2 Preparation

.1 Prepare floor surfaces in accordance with CGSB 4-GP-156.

.2 Ensure toeless type resilient base is installed before proceeding with carpeting.

3.3 Carpet Edge Binder and Thresholds

.1 Install trim to conform to high and low spots in floor, using carpet gripper cement, concrete nails or approved stud driver.

.2 Use carpet metal edge trim at all exposed carpet edges. Center thresholds under doors in door openings.

3.4 Carpet Installation

.1 Install carpet in accordance with shop drawings. Hot melt seams and cross-joints. Maintain constant pile direction.

.2 Install carpet tightly and fit neatly around architectural, mechanical, electrical and furniture fitments, around perimeter of rooms into recesses, and around projections through floor.

.3 Seal edges of cut-outs with latex.

3.5 Protection of Finished Work

.1 Vacuum carpets clean. Protect traffic areas of carpeted floors with polyethylene drop sheets. Tape joints to prevent shifting.

**********END**********

Painting

PART 1 - GENERAL

1.1 Related Work

.1 Sealants: Section 07900

.2 Painting: Section 09900

1.2 Samples

.1 Submit duplicate 400 x 200 mm samples of each colour and texture of wall coating applied to porous concrete block, in accordance with Section 01340.

1.3 Maintenance Data

.1 Provide maintenance data for wall coating for incorporation into maintenance manual specified in Section 01730.

1.4 Environmental Requirements

.1 Do not apply unless uniform min 10 deg C air temperature at installation area for 24 hours prior to and after application.

.2 Provide adequate ventilation or isolation measures to protect against toxic fumes.

PART 2 - PRODUCTS

2.1 Materials

.1 High build glaze coatings:
.1 high build glazed coating materials: to CGSB 1-GP-186 in selected colours.
.2 Filler compound: cementitious type to CGSB 1-GP-186, compatible with coating.
.3 Glaze coat: semi gloss pigmented.
.4 Colours as indicated on Finish and Colour Schedule.

.2 Epoxy high gloss coatings:
.1 Two-component epoxy coating material to CGSB 1-GP-153M, 1978.
.2 Filler and primer as recommended by Manufacturer.
.3 Colours as indicated on Finish and Colour Schedule.

2.2 Mixes

.1 Mix coatings according to manufacturer's instructions.

PART 3 - EXECUTION

3.1 Preparation of Surfaces

.1 Prepare surfaces in accordance with CGSB 1-GP-186 and coating material manufacturer's instructions.

.2 Mask surrounding surfaces to provide neat, clean juncture lines.

.3 Protect adjacent surfaces and equipment from damage by overspray.

.4 Trade work penetrating the substrate to be completed before installing the wall coating.

3.2 Coating Application

.1 High build glazed coating:
.1 Apply high build glazed coating to produce smooth surface, uniform in sheen, colour and texture, free from marks, dirt, particles, runs, crawls, curling, holes, airpockets and other defects and to achieve smoothness index as per CGSB 1-GP-186 Paragraph 4.4.11. Total dry film thickness 0.5 mm.
.2 Apply filler coats to porous surfaces. Tint to colou of decorative coat.
.3 Apply intermediate decorative coat.
.4 Apply top glaze coat.

.2 Epoxy coating:
.1 Apply filler coat to porous surfaces.
.2 Apply two finish coats in accordance with manufacturer's directions to total dry film thickness of 0.1 mm.

3.4 Schedule of Areas

.1 High build glazed coating: all walls full height including doors, frames, screens, in following areas:
.1 Helicopter Hangar 101
.2 Fine Workshop 109
.3 Oil Room 113
.4 Mechanics Shop 129
.5 Yard Equipment 130
.6 Marine Emergency 131
.7 Workshop 132
.8 Construction Equipment 142
.9 Shipping and Receiving 143

3.4 Schedule of Areas (Cont'd)

.1 (Cont'd)
.10 Electrical Parts 144
.11 Central Stores 146
.12 Aids Technicians Mechanics Shop 153
.13 Test Room 154
.14 Carpentry Shop 156
.15 Machine Shop 158
.16 Washdown Area 160
.17 Spray Paint 161
.18 Electrical 163

.2 Epoxy high gloss coating: all walls full height, including doors and frames, in following areas:
.1 Battery Room 114
.2 Battery Charging 155

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1	Pavement markings:	Section 02618
.2	Shop priming structural steel:	Section 05120
.3	Shop priming steel joists:	Section 05210
.4	Shop painting miscellaneous metals:	Section 05500
.5	Shop painting metal stairs:	Section 05510
.6	Painting of mechanical piping:	Section 15010
.7	Colour code marking bands for identification of piping and ductwork:	Section 15010
.8	High build glazed and epoxy coatings:	Section 09815

1.2 Submitals

.1 Submit shop drawings of graphics on exterior of overhead helicopter hanger door, in accordance with Section 01340.

.2 Provide scaled drawing showing lettering and symbols, including sizes, spacing and layout. Include full scale drawing of symbols.

1.3 Environmental Requirements

.1 Do not apply paint finish in areas where dust is being generated.

.2 Carry out exterior painting only when surface and ambient air temperatures are within range recommended by paint manufacturer. Do not apply to wet, icy surfaces or during inclement weather conditions.

PART 2 - PRODUCTS

2.1 Materials

.1 Qualified products: only paint materials listed on the CGSB Qualified Products List are acceptable for use on this project.

.2 Paint materials: to CGSB Standards listed in paragraphs 3.4 and 3.5 of this Section.

.3 Paint materials for each listed finish to be products of a single manufacturer.

PART 3 - EXECUTION

3.1 Preparation of Surfaces

.1 Prepare wood surfaces to CGSB 85-GP-1M.
- .1 Use CGSB 1-GP-126M-Amdt-Jul-78 vinyl sealer over knots and resinous areas.
- .2 Apply wood paste filler to nail holes and cracks.
- .3 Tint filler to match stains for stained woodwork.

.2 Touch up shop paint primer on steel with CGSB 1-GP-40M to CGSB 85-GP-14M.

.3 Prepare galvanized steel and zinc coated surfaces, including steel deck, to CGSB 85-GP-16M.

.4 Prepare masonry, stucco and concrete surfaces to CGSB 85-GP-31M.

.5 Prepare plaster and wallboard surfaces to CGSB 85-GP-33M.

.6 Vacuum insulation covering surfaces.

.7 Prepare copper piping and accessories to CGSB 85-GP-20M.

3.2 Application

.1 Sand and dust between each coat to remove defects.

.2 Finish bottoms, edges, tops and cutouts of doors after fitting as specified for door surfaces. Finish on inside surfaces of woodwork to match outside finish.

.3 Finish tops of cabinets and projecting ledges, both above and below sight lines as specified for surrounding surfaces.

.4 Finish closets and alcoves as specified for adjoining rooms.

.5 Apply only additional finish coat to surface of deep, dark or accented colours called for on scheduels and for graphics.

.6 All colours as shown on Finish and Colour Schedule.

3.3 Mechanical and Electrical Equipment

.1 Paint exposed conduits, pipes, hangers and other mechanical and electrical equipment occurring in finished areas as well as inside cupboards and cabinet work. Colour and texture to match adjacent surfaces, except as noted otherwise.

3.3 Mechanical and Electrical Equipment (Cont'd)

.2 Paint piping, conduits, ductwork and other unfinished equipment in boiler room, mechanical rooms, and electrical rooms. In other unfinished areas leave equipment, piping, conduits, hangers etc., in original finish and touch up scratches and marks.

.3 Keep sprinkler heads free of paint.

.4 Paint inside of ductwork where visible with primer and one coat of matt black paint.

.5 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.6 Paint both sides and edges of plywood backboards for equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.4 Interior Finishes

.1 For concrete block and poured concrete walls apply:
one coat block filler CGSB 1-GP-188M
one coat primer sealer CGSB 1-GP-119M-Amdt-Sep-80
two coats semi-gloss enamel CGSB 1-GP-57M.

.2 For plaster and gypsum board walls apply:
one coat primer sealer CGSB 1-GP-119M-Amdt-Sep-80
two coats semi gloss enamel CGSB 1-GP-57M.

.3 For plaster and gypsum board ceilings apply:
one coat primer sealer CGSB 1-GP-119M-Amdt-Sep-80
one coat semi gloss enamel CGSB 1-GP-57M.

.4 For wood to receive paint finish apply:
one coat enamel undercoat CGSB 1-GP-38M
two coats low gloss alkyd enamel CGSB 1-GP-202M, type 2, eggshell.

.5 For painted wood trim, etc. apply:
one coat enamel undercoat CGSB 1-GP-38M
two coats semi-gloss enamel CGSB 1-GP-57M.

.6 For primed ferrus metal surfaces apply:
one coat spot priming CGSB 1-GP-40M
one coat enamel undercoat CGSB 1-GP-38M
two coats semi-gloss enamel CGSB 1-GP-57M.

.7 For galvanized and zinc coated metal apply:
one coat vinyl wash primer CGSB 1-GP-121M
one coat enamel undercoat CGSB 1-GP-38M
two coats semi-gloss enamel CGSB 1-GP-57M.

3.4 Interior Finishes (Cont'd)

.8 For zinc coated metal decking apply:
one coat vinyl wash primer CGSB 1-GP-121M
one coat enamel undercoat CGSB 1-GP-38M
one coat flat paint CGSB 1-GP-100M.

.9 For woodwork to receive natural finish apply:
one coat paste-filler
one coat shellac CGSB 1-GP-16M-Amdt-Feb-81, Type 2
two coats varnish gloss CGSB 1-GP-36M, Type 1
one coat varnish semi-gloss CGSB 1-GP-36M, Type 2.

.10 For insulation covering apply:
one coat tinted enamel undercoat CGSB 1-GP-38M.
one coat semi-gloss enamel CGSB 1-GP-57M.

.11 For copper piping and fittings apply:
one coat vinyl wash primer CGSB 1-GP-121M
one coat tinted enamel undercoat CGSB 1-GP-38M
one coat semi-gloss enamel CGSB 1-GP-57M.

3.5 Exterior Finishes

.1 For wood to receive paint finish apply:
one coat exterior primer CGSB 1-GP-189M
two coats exterior house paint, semi gloss,
CGSB 1-GP-28M-Amdt-Feb-81.

.2 For primed ferrous metal surfaces apply:
one coat spot priming CGSB 1-GP-40M
one coat lead primer CGSB 1-GP-140M
two coats exterior enamel CGSB 1-GP-59M

.3 For galvanized and zinc coated metal apply:
one coat vinyl wash primer CGSB 1-GP-121M
one coat steel primer CGSB 1-GP-40M
two coats exterior enamel CGSB 1-GP-59M.

3.6 Exterior Face: Helicopter Hanger Overhead Door

.1 Paint field of door in schedule colour as specified in Paragraph 3.5.2 of this Section.

.2 Apply accent colours and symbols as shown in scheduled colour applying additional finish coat to those specified in Paragraph 3.5.2 of this Section.

.3 Be responsible for graphics in form of Canadian Coast Guard Symbols and lettering on door. Obtain details of symbols from Canadian Coast Guard and be responsible for preparing full scale details. Submit for approval prior to carrying out field work. Employ qualified sign painter for lettering and graphics.

3.7 Exterior of Existing Ships' Stores Building

.1 Identified as "Ships' Stores (Existing Building) on Drawing A-07. Paint exterior walls, doors, windows, trim, and facia of roof overhang.

.2 Clean existing surfaces. Remove loose and defective paint. Remove gloss from existing surfaces using light abrasion or proprietory deglossing solution.

.3 Touch up bare spots with zinc rich primer.

.4 Apply two coats of exterior alkyd, semi-gloss, to CGSB 1-GP-59M in colours shown on Finish and Colour Schedule.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Painting: Section 09900

1.2 Samples

.1 Submit duplicate 280 x 215 mm samples of scheduled colour and texture of wall covering in accordance with Section 01340.

1.3 Maintenance Data

.1 Provide maintenance data for wall covering for incorporation into maintenance manual specified in Section 01730.

1.5 Environmental Requirements

.1 Air temperature and structural base temperature at wall covering installation area must be above 20 deg C for 72 hours before, during and 48 hours after installation.

.2 Unwrap wall covering and allow to acclimatize in installation area for 24 hours before application.

PART 2 - PRODUCTS

2.1 Materials

.1 Wall covering: to CGSB 41-GP-30M, Type 1, 1380 mm width. Texture, colour as indicated on Finish and Colour Schedule, ULC labelled. Fabric weight: 44 g/sq. m. Total weight: 90 g/sq. m.

.2 Sealer: type recommended by wall covering manufacturer.

.3 Adhesive: as recommended by wall covering manufacturer.

PART 3 - EXECUTION

3.1 Preparation of Surfaces

.1 Ensure surfaces are firm, smooth and dry, free from loose material and lime burn, and as recommended by wall covering manufacturer.

.2 Work penetrating substrata to be completed before installing wall covering.

.3 Size and treat wall surfaces to receive wall covering.

3.2 Wall Covering Installation

.1 Installation sequence:
.1 Use rolls in consecutive numerical sequence of manufacture.
.2 Place panels consecutively in exact order they are cut from roll including spaces above or below windows, doors or similar penetrations.

.2 Trim additional selvage where required to achieve colour and pattern match at seams.

.3 Apply adhesive to wall using a rolelr or paste brush.

.4 Hang non-matched patterns by overlapping edges and double cutting through both thicknesses with 1 or 1.5 mm thick zinc or aluminum strip back-up to prevent cutting substrata.

.5 Wrap fabric 150 mm beyond inside and outside corners. No cutting at corners permitted, unless pattern or colour changes.

.6 No horizontal seams permitted.

.7 Install wall covering before installation of plumbing fixtures, electrical equipment, casings, bases, cabinets.

.8 Use stiff bristled brush or flexible broad knife to eliminate air pockets and secure fabric to substrata.

.9 Remove excess adhesive with damp sponge from seams as work progresses, and wipe clean and dry with cloth towel.

.10 Leave completed work smooth, clean, without wrinkles, gaps, overlaps or air pockets.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Steel supporting assembly at masonry walls: Section 05500

1.2 Samples

.1 Submit duplicate 150 x 150 mm sample of rubber material of colour and thickness specified, in accordance with Section 01340. Accompany sample with manufacturer's specification information giving physical characteristics including Shore Hardness.

PART 2 - PRODUCTS

2.1 Materials

.1 Rubber sheet: precured natural rubber purposely manufactured to resist mechanical wear, abrasion, and corrosion. Provide sheet with special bonding layer where sweep sheet is to be adhered to face of Door 158D and for batten strips over joints. Minimum requirements as follows:

- Thickness: 6 mm
- Width: 2000 mm
- Shore Hardness: 45 shore +/- 5
- Heat resistance: 100-120 deg C
- Colour: orange or off-white

.2 Adhesives: as recommended by rubber manufacturer.

PART 3 - EXECUTION

3.1 Installation

.1 Install rubber sheet to 3 m height at all masonry walls in Washdown Area 160 extending from metal hanging, clamping assembly to floor.

.2 Provide holes along top edge of sheets to suit 12.7 mm stud bolts at 300 mm centres in clamping assembly. Hang sheets with edges butting and secure at top with clamping strip and nuts on stud bolts.

.3 Cover joints between sheets with 75 mm wide batten strips using recommended adhesive and procedures.

.4 At door 158D install rubber sheet to extend to a point 300 mm above floor and 100 mm onto floor surface. Prepare metal face of door in accordance with rubber manufacturer's recommendation and adhere rubber using recommended adhesive and procedures. Fasten top of rubber sheet mechanically using clamping strip provided by door manufacturer.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Strapping and grounds: Section 06100

.2 Finish carpentry: Section 06200

1.2 Samples

.1 Submit 300 x 300 mm sample of chalkboard and 300 mm long sample of trim in accordance with Section 01340.

1.3 Maintenance Data

.1 Provide maintenance data for chalkboards for incorporation into maintenance manual specified in Section 01730.

.2 Affix removable maintenance instruction labels to chalkboards.

PART 2 - PRODUCTS

2.1 Basic Materials

.1 Sheet steel: commercial grade to ASTM A526-71(1975) with G90 commercial galvanized zinc finish to ASTM A525-80.

.2 Laminating adhesive: to manufacturer's standard.

.3 Joint reinforcement: concealed mechanical jointing system to provide straight, rigid, continuously supported, tight butt, flush joints at surface.

.4 Mounting adhesive: panel adhesive to manufacturer's standard.

.5 Anchor clips and brackets, fasteners, etc: concealed type recommended by manufacturer for fixed mounting.

2.2 Chalkboard

.1 Sandwich type, factory-laminated construction consisting of face sheet, core, and balancing rear sheet as follows:

.1 Writing surface: 0.45 mm enamelling steel base with a porcelain enamel writing surface fused to a ground coat of not less than 0.076 mm nor more than 0.727 after firing at temperatures between 800 deg C and 900 deg C, manufactured in accordance with Porcelain Enamel Institute Standards P.E.I. S104 as regards durability, smoothness of texture, colour continuity. Gloss factor of 6 to 8 as measured by 45 deg glossometer. Colour as shown on Finish and Colour Schedule.

2.2 Chalkboard (Cont'd)

.2 Core: 11.1 mm impregnated, sound absorbing fireboard to CSA 247-M1978, laminated under heat and pressure to face and back panels.

.3 Back up balancing sheet: 0.45 mm thick base metal, galvanized sheet steel in one unjointed section.

.4 Overall chalkboard thickness: 12.7 mm.

2.3 Trim and Framing

.1 Extruded aluminum: Aluminum Association alloy AA6063-T5. Minimum 1.5 mm wall thickness.

.2 Chalkboard trim and framing: perimeter trim or frame, trough, panel dividers, of manufacturer's standard sections appropriate for installation conditions. Finish as shown on Finish and Colour Schedule.

PART 3 - EXECUTION

3.1 Installation

.1 Install chalkboards in accordance with manufacturer's instructions, plumb and level, provide rigid, secure writing surface.

.2 Install trim and framing around chalkboard panels. Make mitres and intersecting joints to hair-line fit, free of rough edges. Use concealed brackets to reinforce and hold joints tight and flush. No exposed fasteners permitted. Overlap trim 6 mm onto panels.

.3 Mechanical attachment:
.1 To concrete or solid masonry use lag screw and expansion bolts or screws and fibre plugs as appropriate for stresses involved.
.2 To hollow masonry use toggle bolts or equivalent.
.3 To wood or sheet metal use screws. Secure into framing members in stud walls.

3.2 Cleaning

.1 Clean all surfaces after installation using manufacturer's recommended cleaning procedures.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Strapping and grounds: Section 06100

.2 Finish carpentry: Section 06200

.3 Chalkboards: Section 10110

PART 2 - PRODUCTS

2.1 Tackboard Materials

.1 Tackboard: factory prelaminated tackboard fabricated to sizes indicated of natural cork, linseed oil, and colour pigment throughout, combined and impregnated with urea-formaldehyde plastic under heat and pressure, and with burlap backing. 6 mm thick, factory laminated to 6 mm thick particle board. Colour as indicated on Finish and Colour Schedule.

2.2 Core Materials

.1 Particle board: to CAN30188.1-M78, Grade R.

2.3 Trim and Framing

.1 Extruded aluminum: Aluminum Association alloy AA6063-T5. Minimum 1.5 mm wall thickness.

.2 Tackboard trim and framing to consist of perimeter trim or frame of manufacturer's standard sections appropriate for installation conditions.

2.4 Trim Finishes

.1 Aluminum components: finish in electrostatically applied baked satin finish enamel in colour indicated in Finish and Colour Schedule.

PART 3 - EXECUTION

3.1 Installation

.1 Install tackboards plumb and level in accordance with manufacturer's instructions, to provide rigid, secure surface.

.2 Install trim and framing around tackboard panels. Make mitres and intersecting joints to hair-line fit, free of rough edges. Use concealed brackets to reinforce and hold joints tight and flush. No exposed fasteners permitted. Overlap trim 6 mm onto panels.

3.1 Installation (Cont'd)

.3 Use fastenings of following types, except where specific type is indicated.
.1 To hollow masonry, plaster and panel surfaces use toggle bolt.
.2 To solid masonry and concrete use expansion shield with lag screw, jute fibre or lead plug with wood screw.

3.2 Cleaning

.1 Clean all surfaces after installation using manufacturer's recommended cleaning procedures.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Toilet and bath accessories: Section 10800

.2 Grab bars: Section 10800

.3 Suspended steel channel supports for ceiling hung compartments: Section 05500

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate fabrication details, plans, elevations, hardware, and installation details.

.3 Take field dimensions prior to fabricating materials.

PART 2 - PRODUCTS

2.1 Materials

.1 Sheet steel: commercial grade, stretcher levelled sheet steel to ASTM A526-71(1975) with G90 zinc coating to ANSI/ASTM A525-79.

.2 Minimum base steel thickness:
.1 Panels and doors: 0.8 mm.
.2 Pilasters: 1.0 mm.
.3 Reinforcement: 3.0 mm.

.3 Stainless steel sheet: to ASTM A666-72(1979) type 302 with No. 4 finish.

.4 Pilaster shoe: 0.8 mm stainless steel.

.5 Attachment: stainless steel tamperproof type screws and bolts.

.6 Hardware:
.1 Hinges: gravity type exposed concealed heavy duty chrome plated non-ferrous casting, adjustable door-open angle.
.2 Latch set: built-in, combination latch, door stop, keeper and bumper chrome plated non-ferrous casting or extrusion. Latches on doors to handicapped compartment must have outside emergency release.
.3 Wall and connecting brackets: chrome plated non-ferrous extrusion or casting.
.4 Coat hook: combination hook and door bumper, chrome plated non-ferrous casting.

2.2 Fabrication

.1 Doors and panels: 25 mm thick, two sheet steel faces pressure bonded to honeycomb core, to sizes indicated. Provide doors on handicapped compartments opening out and a minimum width of 800 mm.

.2 Pilasters: 32 mm thick, constructed same as door.

.3 All partitions ceiling hung.

.4 Pilaster shoes: 75 mm high, die formed stainless steel.

.5 Provide formed and closed edges for doors, panels and pilasters. Miter and weld corners and grind smooth.

.6 Provide internal reinforcement at areas of attached hardware and fittings. Temporarily mark location of reinforcement for grab bars. Provide finished openings for through-partition type tissue dispensers where indicated.

.7 Provide 0.8 mm thick type 316 stainless steel protective shields on urinal side of toilet partition panels next to urinals and on urinal screens. Make protective shields 1000 mm high with top of shield 1200 mm above finished floor. Make shields to full width of partition or screen panel. Fasten with stainless steel screws.

.8 Fabricate free-standing urinal screens and vision screens with outer end supported by a 50 x 50 mm floor to ceiling, one-piece post with floor and ceiling shoes. Panel construction as specified for compartments.

2.3 Shop Finishing

.1 Clean, degrease and neutralize steel components with phosphate or chromate treatment.

.2 Spray apply primer to CGSB 1-GP-81M, 1 coat.

.3 Spray apply finish enamel to CGSB 1-GP-104M, type 2, semi-gloss, 1 coat and bake to smooth, hard finish.

.4 Finish: doors and pilaster panels in colours shown on Finish and Colour Schedule.

PART 3 - EXECUTION

3.1 Partition Erection

.1 Install partitions secure, plumb and square.

.2 Leave 12 mm space between wall and panel or end pilaster.

.3 Attach fixing brackets securely to masonry/concrete surfaces using screws and shields: to hollow walls using bolts and toggle type anchors, to steel supports with bolts in threaded holes.

.4 Attach panel with pilaster to brackets with through type sleeve bolt and nut.

.5 Provide for adjustment of ceiling variations with screw jack through steel saddles made integral with pilaster. Conceal ceiling fixings with stainless steel shoes.

.6 Provide templates for drilling of supporting steel channels. Provide bolts, shims, plates for attachment to channels.

.7 Equip each door with hinges, latch set, and coat hook. Adjust and align hardware for easy, proper function. Set door open position at 30 deg to front.

.8 Coordinate work with that of Sections 09130 and 09511.

.9 Make good baked enamel surfaces damaged during shipment or installation.

3.2 Screen Erection

.1 Provide urinal stall and entrance screens consisting panel and floor to ceiling post.

.2 Anchor screen panels to walls with 2 panel brackets and vertical upright consisting of tubular headrail stock and end sockets anchored to floor and ceiling.

.3 Provide supplementary anchorage above ceiling finish to receive screen vertical upright.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Sealants: Section 07900

.2 Hollow metal doors: Section 08110

.3 Plastic faced wood doors: Section 08213

.4 Louvers connected to ductwork and motorized louvers: Section 15879

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate fabrication and erection details, including anchorage, accessories, and finishes.

PART 2 - PRODUCTS

2.1 Materials

.1 Aluminum extrusions: Aluminum Association alloy AA6063-T5.

2.2 Aluminum Finish

.1 Finish aluminum with factory applied coating of thermosetting acrylic enamel: low gloss with minimum dry film thickness of 0.25 micromillimeters.

.2 Colours:
.1 Exterior louvers: colours: to match adjacent metal siding colour as indicated on drawings and on Finish and Colour Schedule.
.2 Door Grilles: as selected by Engineer to match door colour.

2.3 Screens

.1 Insect screens: 0.3 mm diameter aluminum wire 18 x 14 mesh with 60% free area, secured to aluminum frame.

.2 Birdscreens: intercrimped aluminum wire cloth secured to 2.2 mm thick extruded aluminum frame mitered at corners and secured with corner locks, 12 mm size mesh, 2.7 mm dia. aluminum wire.

2.4 Extruded Aluminum Louvers

.1 Construct louvers from aluminum extrusions of minimum 3 mm thickness.

.2 Arrange blades, mullions and frame extrusions as indicated.

.3 Blades of stormproof pattern with centre watershed in blade.

.4 Thickness (depth): 100 mm unless otherwise indicated. Frame profiles as indicated.

.5 Install concealed vertical stiffeners spaced to meet required loads.

.6 Complete louver assembly to have 40% free area.

.7 Attach bird insect screen to inside face of louver.

2.5 Door Louvers

.1 Construct door louvers from aluminum extrusions minimum 1.3 thick. Minimum free area of 35%. Provide fasteners to suit louver material.

.2 Use sightproof blades.

.3 Provide separate adjustable trim member for clamping louver in opening.

.4 Miter frame and trim members at corners and secure rigidly with corner brackets.

.5 Secure interior frame with countersunk screws.

.6 Refer to mechanical drawings for locations and sizes.

PART 3 - EXECUTION

3.1 Installation

.1 Install louvers in locations and sizes indicated.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Excavating and Backfilling: Section 02220

.2 Cast-in-Place concrete base: Section 03300

1.2 Design Criteria

.1 Design flagpole, base and anchorage devices to resist minimum wind velocity of 145 km/hour unflagged, 100 km/hour flagged.

1.3 Samples

.1 Submit duplicate 50 x 100 mm samples of metal finish for flagpole in accordance with Section 01340.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate dimensions, finishes, base jointing, anchoring and support systems, cleats, halyard boxes, trucks, finials and base collar for flagpoles.

1.5 Delivery and Storage

.1 Spiral wrap each flagpole with heavy kraft paper, wood strip and steel band, or polyethylene wrap and pack in tubing for shipment.

.2 Deliver flagpole in 2 pieces, cross arm in one piece.

PART 2 - PRODUCTS

2.1 Materials

.1 Aluminum: Aluminum Association alloy AA 6063-T5 seamless extruded aluminum tubing.

.2 Isolation coating: alkali-resistant bituminous paint or epoxy resin solution.

2.2 Fabrication

.1 Supply 15240 mm long flagpole as complete including base anchorage and fittings, and 4800 mm long cross arm.

.2 Cone tapered flagpole:
.1 Seamless, uniform, straight line tapered section above cylindrical butt section.
.2 Taper: 25 mm to each 1700 mm of run.
.3 Provide internal splicing, self-aligning sleeve of same material as flagpole for snug fitting, watertight field joints.

2.2 Fabrication (Cont'd)

.2 (Cont'd)
.4 Cross arm of similar cone tapered construction tapering from diameter at centre of 140 mm to a diameter of 100 mm at each end.

.3 Diameter of flagpole at base: 250 mm, diameter at tip 100 mm.

2.3 Aluminum Finishes

.1 Finish exposed surfaces of aluminum components in factory applied duracrylic thermosetting enamel finish in colour shown on Finish and Colour Schedule.

.2 Do welding to appropriate CSA Standard, by welders certified by Canadian Welding Bureau. Finish exposed welds flush and smooth.

2.4 Fittings

.1 Finial: 200 mm diameter ball of 1.6 mm minimum thick aluminum anodized colour gold.

.2 Fixed pulleys: heavy duty cast aluminum fixed pulley assembly and cap, with one 50 mm diameter nylon pulley rotating on a 6 mm stainless steel pin. Provide three: one at apex of main pole and one at each end of cross arm.

.3 Cleats: 230 mm size, one per halyard, cast aluminum, finish to match flagpole.

.4 Halyard: three continuous halyards, 8 mm polypropylene, braided white.

.5 Swivel snaps: two per halyard: chromium plated bronze with neoprene or vinyl covers.

.6 All exposed bolts, fastenings, in stainless steel.

2.5 Mounting

.1 Fabricate ground-set foundation assembly for installation of flagpole as follows:
.1 Low profile tilt anchor base. Pole base in cast aluminum. Template base and hinge assembly in hot-dip galvanized steel, with stainless steel hinge pin of diameter to suit pole height.
.2 Concrete anchors galvanized with ultimate pull out strength to suit design criteria. Complete with lightning spike.
.3 Base cover in spun aluminum alloy 6061 of diameter to suit base with 2.8 mm minimum wall thickness. Finish to match flagpole.

PART 3 - EXECUTION

3.1 Installation

.1 Shop apply isolation coating to metal surfaces that will be encased in concrete.

.2 Install flagpoles, base assemblies and fittings to approved shop drawings and manufacturer's instructions.

.3 Provide ground stakes 2400 mm long, for positive lightning ground for ground set flagpole installation.

.4 Check and adjust installed fittings for smooth operation of halyards.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Wood grounds and nailing strips: Section 06100

.2 Masonry bases: Section 04220

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate thicknesses of metal, fabricating methods, assembled banks of lockers, trim, numbering, filler panels, and end and back panels.

PART 2 - PRODUCTS

2.1 Materials, Fabrication

.1 Lockers: Banks of lockers indicated, 300 mm wide x 457 mm deep x 1830 mm high, single tier free standing and recessed with doors of double wall construction, flush with bright painted metal recessed handle/lock pockets bright metal handles, number plates, one shelf, three coat hooks, wall trim filler panels/false front, K.D. construction, sloping tops, finish end/back panels, in baked enamel finish in colour indicated on Finish and Colour Schedule.

.2 Components:

.1 Sheet steel: commercial grade, stretcher levelled, to ASTM A526-71(1975).

.2 Minimum base steel thickness:

.1 Door: 0.85 mm outer panel and 0.58 mm inner panel in welded rigid box construction.

.2 Door frame: 1.5 mm.

.3 Body: including sides, backs, tops, bottoms, and shelves: 0.45 mm.

.4 Sloping tops, end panels, filler panels, trim: 0.75 mm rigidized and reinforced as required.

.3 Fasteners: bolts or pop rivets.

.4 Coat hooks: round tip plated metal attached with pop rivets.

.5 Locking system: padlocks not in contract.

.6 Hinges: 5 knuckle with non-removeable pin securely welded to frame and attached to door with tamperproof screws.

.7 Number plates: engraved metal or plastic permanently attached. Number lockers in sequence from 1 upwards in each room.

.8 Full length door strike with rubber grommets and nylon friction catch for quiet operation.

2.1 Materials, Fabrication (Cont'd)

.3 Ventilation: louvres in top and bottom frame members and by openings at top and bottom of inner door panel.

PART 3 - EXECUTION

3.1 Installation

.1 Assemble and install lockers.

.2 Securely fasten lockers to wood grounds and nailing strips.

.3 Install wall trim around recessed locker banks.

.4 Install filler panels and false fronts where indicated and where obstructions occur.

.5 Install finished end panels to exposed ends of locker banks.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Supply of door hardware: Section 08710

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate partition panel modules and types, materials, gauges, finishes, door and other openings, hardware, fastening methods to adjacent structure, and assembly methods.

PART 2 - PRODUCTS

2.1 Materials

.1 Wire mesh: 3.4 mm diameter medium-hard, drawn steel wire, electrically welded 50 x 50 mm mesh.

.2 Steel sections and plates: to CSA G40.21-1976, Type 44W.
.1 Posts: 50 x 50 mm hollow steel tubing, minimum wall thickness 2 mm, full height.
.2 Angle frame: 32 x 32 x 3 mm.

.3 Welding materials: to CSA W59-1977.

2.2 Fabrication

.1 Panels: fabricate panels 2400 x 1200 mm and special sizes or shapes as required consisting of wire mesh welded at 100 mm oc to angle frame. Mitre and weld frame corners. Provide 20 x 6 mm flat bars across panels at third points on 2400 mm length.

.2 Posts: ceiling high with floor and ceiling plates for fixing. Include corner, wall, door and other special posts to manufacturer's standard.

.3 Swing doors:
.1 Doors: sizes as indicated. Construct doors of angle frame and wire mesh as indicated. Reinforce door with centre rail and 20 x 6 mm or equivalent flat bar bracing from centre rail to opposite corners on hinge side. Construct centre rail of door of two frame angles as indicated. On active door construct lock pocket of 3 mm steel plate to suit dead lock supplied under Section 08710, full prepared with cut-outs and drilled and tapped mounting holes.

2.3 Shop Finishing

.1 After fabrication, apply 0.4 kg/sq. m zinc coating by hot dip galvanizing process to CSA G164-M1981. Apply one coat CGSB 1-GP-81M primer and two coats 1-GP-104M+Amdt-apr-80, Type 2, semi-gloss enamel. Colour as indicated on Finish and Colour Schedule.

PART 3 - EXECUTION

3.1 Erection

.1 Install mesh partitions and doors in accordance with manufacturer's instructions. Install hardware supplied under Section 08710.

.2 Erect partitions plumb, level, straight, rigidly supported, and securely fastened to abutting surfaces, free from superimposed loads.

.3 Fix to masonry and concrete using lag bolts and shields; to hollow walls using bolts and toggle type anchors; to steel supports with bolts in threaded holes or spot welds. Locate fasteners on interior side where possible for maximum security.

.4 Install doors and adjust for proper closing, locking and smooth operation.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Ceramic bath accessories: Section 09310

.2 Toilet partitions: Section 10162

1.2 Shop Drawings

.1 Submit shop drawings or catalogue illustrations in accordance with Section 01340.

.2 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

PART 2 - PRODUCTS

2.1 Materials

.1 Sheet steel: commercial grade, stretcher levelled sheet steel to ASTM A526-71(1975) with G90 zinc coating to ASTM A525-79.

.2 Stainless steel sheet: to ASTM A666-72(1979) type 302 or 304 with satin finish, minimum 0.8 mm thick.

.3 Stainless steel tubing: AISI Type 304, commercial grade, seamless welded, 1.2 mm minimum wall thickness.

.4 Fasteners: screws and bolts hot dip galvanized. Expansion shields fibre, lead or rubber as recommended by fixture manufacturer for component and its intended use.

2.2 Finishes

.1 Chrome and nickel plating: to ASTM B456-79 satin finish.

.2 Stainless steel: to AISI No. 4 satin lustre finish.

.3 Manufacturer's or brand names on face of units not acceptable.

2.3 Fixtures

.1 Toilet tissue dispensers:
.1 Designated "TT-1": recessed twin roll tissue dispenser with one roll in use and one roll in reserve with reserve roll automatically lowering into position when lower roll is used. Cabinet of all wedled construction of not less than 0.5 mm stainless steel with flange of drawn one-piece construction of not less than 0.8 mm stainless steel. Door of not less than 0.8 mm stainless of all welded construction, and fitted and tumbler lock. All exposed surfaces in No. 4 satin finish.
.2 Designated "TT-2": partition mounted twin roll tissue dispenser of construction as specified above for type "TT-1" but accessible from two toilet compartments.
.3 Designated "TT-3": single roll, semi-recessed, with body, flange and roller holder of stainless steel with No. 4 satin finish on all exposed surfaces. Satin finish plated plastic roller, to suit 133 x 133 mm wall opening.

.2 Paper towel dispensers:
.1 Designated " T-1": surface mounted stainless steel towel dispenser for multi-fold paper towels. Hinged front panel with sloped top, refill indicator, lock and key. All exposed surfaces in No. 4 satin finish.

.3 Combination towel dispenser/waste receptacle units:
.1 Designated "TW-1": recessed wall unit to suit wall opening approximately 315 mm wide, 1315 mm high, 140 mm deep. Wall box of galvanized steel sheet of minimum base metal thickness of 0.8 mm with integral formed channel frame and flush reinforced welded corners. Formed one-piece stainless steel door of 1.3 mm stainless steel with continuous stainless steel piano hinge and double cylinder locks. Self-closing stainless steel waste door. Removable galvanized steel waste container. Universal towel cradle for dispensing folded or roll towelling. All exposed surfaces in No. 4 satin finish.
.2 Designated "TW-2": compact wall unit to suit wall opening approximately 315 mm wide, 615 mm high, and 100 mm deep. Construction as specified for type "TW-1". Unit to dispense multi-fold towels.

2.3 Fixtures (Cont'd)

.4 Feminine napkin disposal bins: Designated "ND", flanged recessed unit of stainless steel construction with removable stainless steel receptacle. Self-closing door with continuous stainless steel hinge. Door etched with "napkin disposal-push". Fitted with clip for deodorizer block. All exposed surfaces in No. 4 satin finish. Provide rough-in frame for steel stud and gypsum board walls.

.5 Soap dispensers:
.1 Designated "SD-1": surface mounted tank type in vertical mode, rectangular shape, for liquid soap. All stainless steel construction with exposed surfaces in No. 4 satin finish. Container of minimum of 0.9 mm stainless steel with 1.14 litre capacity, soap level gauge, and with integral locked filler cap. Stainless steel wall plate bracket mechanically locking into stainless steel wall plate for tamper-proof mounting. Stainless steel piston and valve assembly.
.2 Designated "SD-2": counter top mounted through vanity counter tops. Push-down valve dispenser with cone shaped escutcheon. All metal components including piston assembly of stainless steel. Polyethylene soap container under counter with capacity of 746 ml. Filling from top by use of service key to remove piston-cylinder assembly.

.6 Grab bars: 32 mm dia x 1.6 mm wall tubing of stainless steel, 75 mm diameter wall flanges, concealed screw attachment, flanges welded to tubular bar, provided with steel back plates and all accessories. Knurl bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2 kN. For steel stud framed walls provide concealed anchor plates of 2.7 mm thick steel plate, 75 mm wide, drilled and tapped to receive stainless steel machine screw. Provide machine screws. Length of anchor plate to suit grab bar length. Provide two grab bars at each water closet for use by the handicapped; one centred on wall behind and above water closet--600 mm long and not less than 280 mm above seat; and one horizontally on wall adjacent to water closet--900 mm long and at a height of 800 mm above floor, and with the rear end of bar 350 mm behind front of seat. Secure to concrete unit masonry walls with drilled in toggle bolts.

2.3 Fixtures (Cont'd)

.7 Shower rods: 38 mm dia x 2 mm wall thickness stainless steel tubing of required length with satin chrome finished flanges, shower curtain hooks and curtain hold-back hook and chain. Shower rod material and anchorage to withstand downward pull of 0.9 kN. Install one shower rod at each shower alcove.

.8 Robe hooks: stainless steel construction in No. 4 satin finish. Concealed, tamper-proof wall mounting plate. Hook projection from wall mounting plate. Hook projection from wall 89 mm. Locations:
.1 At each handicapped water closet mount one hook 1.37 m above the floor on a side wall.
.2 At each shower alcove mount two hooks on wall outside shower area.
.3 In Dry 185 mount eight hooks evenly spaced along east wall.

.9 Mirrors:
.1 General requirement for all mirrors: Polycarbonate sheet protected with a clear mar resistant coating to eliminate marring during normal cleaning operations. Distortion free. Mar resistance: Taber abrasion: CS/OF Wheel 500 g, 100 cycles, chanzge in haze less than 5%. Silicon carbide test: 1000 g, change in haze less than 5%. Impact Strength: falling ball impact 270 W. Combustion characteristics: ASTM D-635 less than 25 mm. Thickness: 6 mm. Material shall consist of deposited silver protected with a tough opaque backcoat. Frame with stainless steel edging and support with tamperproof fasteners, concealed of sizes indicated.
.2 Designated "M-1": 457 mm wide x 610 mm high.
.3 Designated "M-2": wall to wall above vanity counters. Take field dimensions before fabricating. Where serving two countertop lavatories mirror may be divided in centre between the two lavatories. Height 914 mm except where indicated otherwise.

2.4 Fabrication

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

2.4 Fabrication (Cont'd)

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot dip galvanize ferrous metal anchors and fastening devices to CSA G164-M1981.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates or rough-in measurements as required.

.9 Provide steel anchor plates and components for installation on studding and building framing.

PART 3 - EXECUTION

3.1 Installation

.1 Install and secure fixtures rigidly in place as follows:
.1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
.2 Hollow masonry units: use toggle bolts drilled into cell/wall cavity.
.3 Solid masonry or concrete:s use bolt with lead expansion sleeve set into drilled hole.
.4 Toilet/shower compartments: use male/female through bolts.

.2 Install grab bars on built-in anchors provided by bar manufacturer. Supply templates, details and instructions for building in anchors in toilet compartments.

.3 Use tamper proof screws/bolts for fasteners.

.4 Fill units with necessary supplies shortly before final acceptance of building.

3.2 Location and Quantity

.1 Locate accessories where indicated and/or specified. Designation of fixtures specified in paragraph 2.3 of this Section of the Specifications refers to designations on floor plans of washrooms.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Support for Screen:	Section 09250
	.2	Acoustic ceiling:	Section 09511
	.3	Electrical power supply:	Section 16010

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Include wiring diagrams and installation details and instructions.

PART 2 - PRODUCTS

2.1 Projection Screen Multi-Purpose Room 176

.1 Electrically operated 1500 x 1500 mm minimum in operating on 115 volt AC, 60 cycle three wire quick reversal motors, especially designed for purpose, ball bearing type, oiled for life, with automatic thermal overload cutout and integral locking gears.

.2 Provide present but accessible limit switches to automatically stop screen fabric in the "up" and "down" position. Stop action to be positive to prevent coasting.

.3 Roller to be 127 mm in diameter, rigid metal, mounted on two cast aluminum brackets, equipped with self-aligning bearings.

.4 Case to be wood with double top for extra rigidity and sound deadening. Metal line motor compartment. Finish case with primer.

.5 Recessed extended mounting permitting application of acoustic tile 19 mm thick to be applied to automatic panel and access panel.

.6 Provide a three position control switch on wall where located complete with cover plate.

.7 Complete screen unit to be listed by Underwriters Laboratories Inc., and bear the U.L. label and listed as approved, and bear the label of C.S.A.

.8 Screen to be glass-beaded with 50 mm masking borders on flame and mildew resistant fabric screen to be minimum 1500 x 1500 mm.

2.1 Projection Screen Multi-Purpose Room 176 (Cont'd)

.9 Provide bottom of case with a section equipped with piano type hinge and connected to drive mechanism so as to open and close automatically when screen is lowered and raised. Provide adjacent full length, removeable access panel.

PART 3 - EXECUTION

3.1 Installation

.1 Install screen in indicated location in accordance with manufacturer's directions and installation drawings. Anchor securely.

.2 Coordinate work with that of Section 09130 installing acoustic ceiling suspension, so that finished installation is flush with finished ceilings.

.3 Do all wiring for connection to power supply provided under Section 16010, and all wiring of controls.

.4 Upon completion test and adjust installation and leave complete and operational.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Field painting: Section 09900

.2 Hydraulic dock ramp: Section 11166

1.2 Samples

.1 Submit samples of loading dock equipment in accordance in accordance with Section 01340:
.1 300 mm long sections of dock bumpers.
.2 300 x 300 mm pieces of door seal covering material.
.3 300 x 300 x 300 mm pieces of door seal foam material.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate fastening methods for dock bumpers and door seals.

PART 2 - PRODUCTS

2.1 Dock Bumpers: Doors 143C and 143D

.1 Make dock bumpers of rubberized fabric truck tires cut to uniform size pads 114 x 300 mm and punch to receive three 20 mm dia steel supporting rods. All steel components hot-dip galvanized.

.2 Provide one 75 x 65 x 6 mm steel angle, 300 mm long at each side of bumper and compress rubber pads under approximately 6.5 kN pressure. Weld angles to steel supporting rods at one end and close with threaded rod and nut at other end. Assemble into bumper with overall rubber compression pad 200 mm wide x 600 mm high, in two sections, and 114 mm thick, for vertical mounting.

.3 Extend anchor leg of angles 65 mm outward from each side of rubber compression element, with three 21 mm diameter holes on each side for anchor bolts to building.

.4 Clean all galvanized metal of grease and oil and shop prime with a coat of zinc rich primer to CGSB 1-GP-18M Nov.1977 (Mar. 1978).

2.2 Door Dock Seal: Door 143C

.1 Construct tapered dock door seal consisting of polyurethane foam cemented to steel channel frames and covered with fabric.
.1 Polyurethane foam: unaffected by moisture, heat or cold and retaining resiliency to -40 deg C.
.2 Covering fabric: min. 1.36 kg/sq.m. vinyl coated polyester, remaining waterproof under static head of 500 mm of water and remaining flexible to -40 deg C.

.2 Provide fabric covered foam jambs and fixed header. Jamb sections 300 mm wide tapering from 250 mm thickness at top to 400 mm at base. Header 300 mm wide x 250 mm thick.

.3 Install air escape holes in fabric cover and provide 125 mm wide integral yellow warning stripes full length of each jamb.

.4 Provide unit with non-adjustable fabric head curtain to door height, fabricated of reinforced 1.36 kg/sq. 1.36 kg/sq. m. fabric with galvanized steel chain in weight pocket.

PART 3 - EXECUTION

3.1 Installation

.1 Install dock bumpers as indicated.

.2 Install loading dock door seals in accordance with manufacturer's instructions and as indicated.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Electric power supply: Section 16010.

1.2 Description of System

.1 Provide two hydraulic dock ramps with maximum capacity of moving or roll over load of 4500 kg when edge of lip resting on floor of vehicle and gross load of 9000 kg when ramp is not supported by vehicle.

.2 Design ramp to travel as follows:
.1 Outer end of ramp total vertical motion not less than 600 mm divided 300 mm above platform level and 300 mm below.
.2 Horizontal movement of ramp from retracted position behind line of platform bumper to fully extended position not less than 450 mm. Provide 150 mm side to side tilt adjustment.

.3 Ramp speed: lifting speed approximately 2400 mm per minute and lowering speed approximately 4500 mm per minute.

.4 Platform: approximately 1800 mm wide by 1500 mm long.

.5 Ramp to be supplied completely assembled with platform and electrical power pack unit consisting of motor, pump, and value assembly, enclosed in a steel box structure which has its own curb angles and concrete anchors, ready to be placed as concrete is poured.

1.3 Certificate

.1 Submit written manufacturer's certificate stating compliance with this specification requirements for operation.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate:
.1 Arrangement of storage tank, pump, jacks mechanical linkages and pipings, with sizes and working pressure.
.2 Details of cylinder, plunger, pump, motor, valves and operating station, showing names of manufacturers, type of style designations, part numbers, and hp and rpm of motor.
.3 Factory test data of cylinder containing complete information covering test, cylinder material, inside and outside diameters and maximum test pressure.
.4 Sizes and required clearances.

1.5 Maintenance Data

.1 Provide operation and maintenance data for dock ramp maintenance for incorporation into maintenance manual specified in Section 01730.

.2 Include:
.1 Complete description and sequence of operation together with wiring diagrams showing electrical connections, switches, etc., manufacturer's instructions covering maintenance requirements, and parts catalogue giving complete list of repair and replacement parts with cuts and identifying numbers.
.2 Dimensioned drawing of ramp installation as installed.

.3 Provide complete set of tools necessary to maintain and adjust every part of ramp. Provide high pressure cartridge refill type grease gun and extra cartridge of recommended lubricant, if equipment pressure gun lubricated.

1.6 Power Supply

.1 Power supply will be 600 V, 3 phase, 60 Hz.

.2 Electrical service specified in Section 16010 includes fused disconnect switch.

PART 2 - PRODUCTS

2.1 Hydraulic Unit

.1 Provide hydraulic unit comprising steel cylinder, steel plunger, oil connections and accessories of adequate size for efficiency and safety.

.2 Make cylinder of seamless steel piping with bore turned and polished and with positive stop ring to prevent plunger from leaving cylinder. Provide top and bottom mountings to ensure positive alignment and to prevent binding in any position of ramp platform.

.3 Equip lifting jack assembly with two bearings for vertical stability, oil inlet connections, stuffing box with suitable packing and plunger wipe, and packing gland.

.4 Have cylinder factory tested at pressure of 2.8 MPa minimum.

2.2 Electric Power Unit

.1 Provide electric power unit consisting of motor and direct-connected pump, wiring, conduit, oil piping and accessories.

.2 Provide overload protection for motor, and pressure relief valve in pump bypassing oil back to reservoir. Provide check valve, continuous-duty solenoid valve and flexible hose.

2.3 Oil Reservoir

.1 Make oil reservoir integral with torque tube assembly or separate welded steel tank, galvanized inside and out or of non-ferrous metal.

.2 Equip reservoir with strainer assembly and overflow and drain connections and protected vent opening.

.3 Provide initial filling of oil for system.

2.4 Ramp Platform

.1 Supply ramp platform of sectional box member construction with automatic compensation for out-of-level vehicles.

.2 Make ramp flexible with sufficient members to compensate for out-of-level vehicle condition of 100 mm maximum with not more than 15 mm differential between any two flexible members in extreme condition.

.3 Use members of heavy structural shapes, rigidly welded and reinforced for concentrated wheel loads. Load carrying members shall accommodate concentrated wheel loads at rated capacity, including out-of-level condition and without affect on equipment function.

.4 Construct platform sections of non-skid steel floor plate, flush with front edge of dock ramp frame in retracted position.

.5 No obstruction may protrude above platform floor surface of leading dock or ramp that will prevent closing of overhead doors installed over dock or ramp platform, or hinder operations.

.6 Make side members of ramp platform to function as protective steel plate skirts on each side of platform, front to back, when ramp platform is in fully raised position.

2.4 Ramp Platform (Cont'd)

.7 Construct underframe of ramp platform of rigid construction and supported by lifting mechanism at two widely separated points to prevent tilting, deflection or distortion of platform when concentrated wheel loads, up to and including maximum moving or roll-over loads, are imposed on any position of platform.

2.5 Weatherstrip

.1 Provide heavy duty neoprene weather seal around platform.

2.6 Operating Station

.1 Install wall mounted operating station where indicated.

.2 Provide on-off selection switch operation button and reset button.

.3 Pushbuttons: stop motion when released.

.4 Operate limit switches or similar devices at extreme positions of ramp travel to protect power system and mechanism from damage.

.5 Provide automatic safety lock to limit downward travel of ramp platform to maximum 100 mm in event trailer or truck moves away from ramp while carrying load up to maximum capacity.

.6 Provide electrical interlock to cut power to overhead door operator if ramp is in a raised position.

2.7 Finish

.1 Paint exposed ferrous metal work unless otherwise specified.

.2 Free surfaces of rust and coat with rust resistant paint.

.3 Apply two coats of CGSB 1-GP-40M surfaces of structural members and frame of ramp excepting finished or working surfaces.

.4 Apply heavy coat of bituminous paint to concealed surfaces before building-in.

PART 3 - EXECUTION

3.1 Installation

.1 Install in accordance with manufacturer's instructions.

.2 Do all wiring from ramp to operating station and from operating station to disconnect switch.

3.2 Operating Tests

.1 Conduct operating tests in factory in presence of Engineer including:
.1 Operation to maximum limits of travel.
.2 Extending ramp to rest on bed of variety of trucks or trailers.
.3 Demonstration of drop limitation.
.4 Demonstration of proper functioning of out-of-level compensation.
.5 Demonstration of proper functioning of compensation for variation in compression of truck or trailer springs.
.6 Any other test required by Engineer to ensure full compliance with specification requirements.
.7 Demonstration of loading capacity.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Finish carpentry: Section 06200

.2 Electrical power supply: Section 16010

1.2 Requirements of Regulatory Agencies

.1 Units shall comply with the requirements of the Canadian Standards Association and shall bear a label attesting to such conformance.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 101340.

.2 Shop drawing may be in the form of catalogue illustrations and specifications. Indicate dimensions, materials, construction and finishes. Provide electrical characteristics required clearances, wiring diagrams.

1.4 Maintenance Data

.1 Provide maintenance data and wiring diagram for incorporation with maintenance manual specified in Section 01730.

PART 2 - PRODUCTS

2.1 Materials

.1 Steel sheet metal: commercial grade to ASTM A526-80 with Z275 zinc coating.

.2 Stainless steel: type 302, with all exposed surfaces in No. 4 satin finish.

2.2 Fabrication

.1 Top of 1.9 mm stainless steel, pan formed with rolled no-spill edges and flange. All corners welded, ground smooth, and polished to match adjacent finish.

.2 Case of 0.9 mm galvanized sheet steel with corners brazed or soldered. Factory finished with one coat of primer to CGSB 1-GP-178A and one coat of silver grey hammerloid.

.3 Two elements of 2100W and 1250W capacity respectively, and of microtube, drop through type.

.4 Elements removable for cleaning. Stainless steel element rings with spill trays.

2.2 Fabrication (Cont'd)

.5 Individual infinite-heat switches, top-mounted.

.6 Integral fusing with fuse and terminal block accessible through element opening. Complete with all integral wiring and fuses.

.7 Power: 120/208, single phase, 3 wire.

PART 3 - EXECUTION

3.1 Installation

.1 Install countertop hot plate units in conformity with manufacturer's installation and wiring instructions, in Crew Room 106, Lunch Room 168, and Lunch Room 214.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Carpentry: Section 06100

1.2 Samples

.1 Submit one (1) complete vertical blind unit in accordance with Section 01340.

1.3 Maintenance Data

.1 Provide maintenance data for maintenance of blinds for incorporation into Maintenance Manuals specified in Section 01730.

1.4 Measurements

.1 Take all field measurements of openings requiring blinds prior to fabrication.

PART 2 - PRODUCTS

2.1 Materials

.1 Head Rail: Extruded aluminum, 6063-T5, full length, one piece, ends capped. Rail will be 44.45 mm wide, 25.00 mm high; openings in rails will be 18.00 mm. Minor variations to suit manufacturer's standard will be considered. Clear anodized finish.

.2 Carrier trucks: made of acetal resin moulded material in natural white colour. Carrier trucks-two wheeled mounted on acetal resin axles. Trucks enclosing acetal resin worm and spurgears, self-lubricating, with gear ratio of not less than 10:1.

.3 Louvres: free hanging:
.1 Rigid poly-vinyl chloride, light stable, to ASTM D1784, Type 1, Grade 2, extruded not less than 0.6 mm thick and of width as shown with beaded edge on each side of not less than 1.29 mm when applied to head and sill hardware. Vinyl to be unperforated. Colour as per Colour Schedule.

.4 Rotation by means of a nickel plated steel bead chain actuating tilt rod which turns geared rotating mechanism.

2.2 Operation

.1 Provide positive mechanical control to revolve louvres 180 deg whether partially or fully drawn and traverse at any angle without binding.

.2 Traverse louvres by means of high quality nylon braided cord with a centre core of non-stretch rayon core. Stack blinds when traversed to not more than 11.11 mm per louvre plus space for end caps and end spacer tubes.

.3 Overlap all louvres not less than 9.5 mm. Provide manual operation in opposite direction from normal traverse with end louvre firmly fixed by a friction spacer or anti-creep pin.

PART 3 - EXECUTION

3.1 Installation

.1 Install vertical blinds in following locations. Secure head rail with aluminum, plated or stainless steel screws. Adjust blinds for proper operation.
- .1 Hangar Building: exterior windows in:
  - .1 Waiting 102
  - .2 Chief Pilot 104
  - .3 Chief Mechanic 105
  - .4 Crew Room 106
  - .5 Fine Workshop 109
- .2 Shop Wing: exterior windows in:
  - .1 Illumination 151
  - .2 Decommissioned Storage 152
- .3 Administration Wing: exterior windows in:
  - .1 Electrical 163
  - .2 Electronics 164
  - .3 Yard Office 167
  - .4 Lunch Room 168
  - .5 Interview 174
  - .6 Multipurpose Room 177
  - .7 All exterior windows on Second Floor
- .4 Exterior windows in Guardhouse.

.2 Where soffit of window openings consist of tubular steel sections do all drilling and tapping required to install head rails of blinds.

3.2 Protection

.1 Protect blinds against defacements, warpage of slats or bending of rails. Remove warped or damaged slats or bent rails from the site immediately and replace. Repair scratching or other defacements at the expense of this Section and as approved by the Engineer.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Steel support for ceiling track in Spray Paint 161: Section 05500

.2 Supply of vertical steel flatbar for securement of fabric at walls of Spray Paint 161: Section 05500

1.2 Samples

.1 Submit following samples in accordance with Section 01340.
.1 300 mm long sample of each type of ceiling track for use in Spray Paint 161 and First Aid 183, respectively. Sample to be complete with one roller carrier, and in the case of Spray Paint 161, complete with sample of master carrier, S-hook for fabric, end pulley set, and sample of cord.
.2 300 x 300 sample of fabric for divider in First Aid 183 showing mesh header, top header seaming, hemming. Accompany with colour samples.
.3 300 x 300 sample of fabric for divider in Spray Paint 161, showing grommets, edge finishes, joint between panels. Accompany with colour samples.

.2 Accompany samples with manufacturer's product specifications, descriptions, illustrations.

PART 2 - PRODUCTS

2.1 Fabric Divider, First Aid 183

.1 Fabrics:
.1 Flame retardant to requirements of CAN2-4.162-M80 and ULC-S109.
.2 Fibre: 100% polyester.
.3 Mesh header: double thickness of open mesh fabric with openings approximately 3 x 6 mm.
.4 Curtain: close woven fabric of opaque quality:
weight: 305 g/sq m minimum.
warp threads: 15/cm
weft threads: 20/cm
.5 Colours and pattern as shown on Finish and Colour Schedule.

2.1 Fabric Divider, First Aid 183 (Cont'd)

.2 Fabrication:
.1 Mesh top approximately 300 mm high; 1" double headings and grommets spaced 150 mm apart.
.2 Hems: 3" double.
.3 Turned fabrics a minimum of 25 mm double on sides.
.4 Divider in one length with fullness of 10% more than track length. Height: from ceiling mounted track to within 100 mm of floor.

2.2 Fabric, Divider: Spray Paint 161

.1 Coated vinyl/polyester fabric with 100% polyester base fabric weighing a minimum of 102 g/sq in, coated with vinyl by mechanical and chemical adhesion. Total weight: 750 g/sq m.

.2 Flame, grease, ultra-violet, and mildew resistance.

.3 Colour as selected by Engineer.

.4 Fabrication:
.1 Take field dimensions before fabricating.
.2 Divider to suit opening approximately 8 metres wide and extending from ceiling mounted track to touch floor. Ceiling height 5.61 metres.
.3 Fabricate in two sections to be drawn to opposite sides from centre.
.4 Divider of sewn construction with hems on top and sides, and 50 mm pocket hem at bottom. Grommets at 200 mm centres along top, and at 150 mm centres at outer edges at walls.
.5 Provide overlap of at least 150 mm at closed position. Provide Velcro fasteners for fastening at overlap. Provide for securement to walls at outer edges with 38 mm wide flat bar.

.5 Provide cut out to fit around steel monorail beam passing through divider immediately below ceiling. Provide additional reinforcing and stiffening around cut-out by additional plies of fabric bonded on each side.

.6 Acceptable product: Style 8218 vinyl/polyester fabric by Soper's Engineered Fabric Products, P.O. Box 277, Chatham Street, Hamilton, Ontario, L8N 3E8, or equal approved by Engineer.

2.3 Track and Hardware First Aid 183

.1 Ceiling mounted track directly to T-bars of acoustic ceiling. Straight wall-to-wall length for hand drawn curtain drawn to one side.

.2 Track of extruded aluminum with minimum thickness of 1.3 mm. Clear anodized finish.

.3 Carriers: button-type nylon slide carriers with zinc-plated pre-attached hook. Provide to accommodate curtain grommets at 150 mm centres.

.4 Acceptable products:
.1 Kirsch #9046 track with $9673 carriers with hook.
.2 Silent Gliss #6170 track with #6083A carriers with hook.
.3 Equal approved by Engineer.

2.4 Track and Hardware: Spray Paint 161

.1 Ceiling mounted track directly to underside of continuous steel angle support at ceiling level. Straight wall-to-wall length for cord drawn divider drawing to two opposite walls from centre.

.2 Heavy duty track of extruded aluminum with minimum thickness of 1.3 mm. Clear anodized finish.

.3 Carriers: of moulded delrin-nylon construction rollers with double row of steel ball bearings. Master carriers with cord clamps. Pre-attached zinc-coated hooks to suit grommet spacing of 200 mm in divider curtain.

.4 Provide end pulley sets with molded Teflon bearings for pulleys.

.5 Card: No. 6 cord of braided nylon with fiberglas centre.

.6 Acceptable product: Kirsch #9050 track; #9056 roller carriers with hooks; #9055 master carriers with hooks; #9052 pulley sets; #9061 cord, or equal approved by Engineer.

.7 Provide and install hold back straps in pockets to restrain divider when in open position.

PART 3 - EXECUTION

3.1 Installation

.1 Install track and hardware in accordance with manufacturer's printed installation instructions and diagrams.

.2 Install tracks level and securely anchored. Provide all fasteners.

.3 In Spray Paint 161:
.1 Do drilling and tapping of steel angle at ceiling for attachment of track.
.2 At walls secure divider with continuous vertical flat bar supplied under Section 05500. Secure through grommets in fabric with stainless steel fasteners into drilled-in expansion shields.

.4 Adjust completed installation for correct and smooth operation.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Concrete: Section 03300

.2 Terrazzo: Section 09410

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Division 1.

.2 Clearly indicate materials, sizes, anchorage, support brackets.

PART 2 - PRODUCTS

2.1 Materials

.1 Aluminum: Extrusions, type 6063-T5 alloy.

.2 Bituminous coating: bituminous paint to CGSB 1-GP-108.

2.2 Fabrication

.1 Foot grilles Vestibule 165 and Vestibule 172:
.1 Fabricate foot grilles to sizes noted on drawings, complete with extruded aluminum frame, mitred to hairline joints at corners, and with continuous anchorage for setting into concrete. To suit 46 mm deep floor recess in level base application.
.2 Fabricate grille of aluminum blades with poly-vinyl serrated top inserts, providing a 20.6 mm wide top, 38 mm high, total bars to be 31.8 mm high x 4.8 mm thick with top splayed to accept insert. Blades to be spaced approximately 25 mm o.c. and bound together precisely parallel and hold together by means of 7.9 mm diameter and 12.7 o.d. spacers, at 300 mm apart. Vinyl insert colour indicated on Finish and Colour Schedule. Provide heavy gauge vinyl support cushions 25 mm long mounted to each tread rail at 600 mm centres.

.2 Floor grilles over floor-recessed heating convectors: Lobby 171, and at convector monitor window above.
.1 Fabricate to details shown on drawings, complete with continuous extruded aluminum perimeter frame, mitred and reinforced at corners to provide hairline joints, and providing edge and intermediate supports for longitudinal rails. Drill vertical legs with 5 mm diameter holes at 300 mm centres for screw attachment to structure.

2.2 Fabrication (Cont'd)

.2 (cont'd)
.2 Fabricate grille of aluminum blades 27 mm high x 5.6 mm wide at top tapering down to 3.2 mm. Space blades to provide 5 mm space between blades at surface. Bind all blades together precisely parallel and held constantly in place by means of cross rods at 150 mm oc distorted by special press. Fabricate in approximately 1200 mm long sections for removal, with joints occurring over transverse supports in framing.

.3 Coat faces of aluminum that will be in contact with concrete or terrazzo with heavy coat of bituminous paint to prevent electrolysis.

.4 Finish on exposed aluminum: mill finish.

PART 3 - EXECUTION

3.1 Installation

.1 Install grilles flush with floor in complete conformity with drawings and manufacturer's recommendations.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Acoustic panels and tiles	Section 09511
	.2	Supply and installation of power supply leads to coffer fixtures including connection to the fixture ballast leads.	Section 16351
	.3	Supply and installation of the flexible duct and connection of duct to the air distribution devices.	Section 15847
	.4	Supply and installation of sprinkler heads and related escutcheons or interface devices.	Section 15510
	.5	Supply and installation of P.A. speakers, smoke detectors.	Section 16520, 16601
1.2 Samples	.1	Submit representative model of the coffer unit in accordance with Section 01340.	
1.3 Shop Drawings	.1	Submit Shop Drawings in accordance with Section 01340.	
	.2	Clearly indicate layout, basic construction and assembly at walls, fixtures, splicing, interlocking, connections with mechanical and electrical work.	
1.4 Concept	.1	Provide a completely engineered and designed system composed of an integrated services coffered (vaulted) ceiling system 230 mm in total depth, complete with all components necessary to provide a functional light, air and sound control system in a 1500 mm x 1500 mm planning grid.	
	.2	Supply all of the integrated ceiling system components, including the grid suspension, metal coffer ends, integrated air handling devices, luminaires and related accessories, from the same manufacturer, to ensure a single source responsibility for the satisfactory performance of the ceiling system as a whole and a satisfactory interface between the individual system components.	

1.4 Concept (Cont'd)

.3 Include all full and partial modules and related flat modules.

.4 Provide knock-outs for both sprinkler heads and power communication pole services.

.5 Integrate fixed partitions with all grid members without obstructing the air distribution function. Provide all necessary Drawings and co-ordination with respective Sections.

PART 2 - PRODUCTS

2.1 Design and Fabrication

.1 Suspension System
.1 Provide suspension system consisting of 3000 mm grid members, pierced, notched and tabbed to assemble in a repeated T-pattern (basket weave) forming 1500 mm x 1500 mm modules. Supply and install additional 1500 mm grid members and accessories to complete perimeter conditions. Provide all members of 0.5 mm C.R.S., electro-galvanized and pre-painted full coat off-white both sides, roll formed in one piece. Provide necessary grid as required for flat surfaced areas as noted.
.2 Fabricate overall flange dimensions of 85 mm with a 50 mm wide regress 12.5 mm in depth and 30 degree upturned edges 5 mm wide on the longitudinal edges of the grid member. Provide all members unslotted, complete with 38 mm diameter sprinkler knock-outs at all grid intersections and at 750 mm from intersections. Provide additional 38.5 mm x 70 mm rectangular power and communication pole knock-outs, 260 mm from the centre of all grid intersections.
.3 Provide companion shadow wall mouldings to match and continue the grid regress feature, and to adequately support the grid members.
.4 Suspend grid members on 2.5 mm prestressed hanger wire at a maximum 150 mm on centre.

.2 Metal Coffer Ends and Air Diffusers:
.1 Form metal coffer ends of 0.75 mm C.R.S., pre-painted with a high reflectance off-white full coat one side, to match the grid system, and a wash coat on the reverse side. Construct the coffer ends to function as the sole integrated support of the coffer light fixtures and the acoustical infill tile. Fabricate coffer ends to form the potential air supply diffuser.

2.1 Design and Fabrication (Cont'd)

.2 Metal Coffer Ends and Air Diffusers: (cont'd)

.2 Fabricate air collar plates from 0.73 mm wiped coat steel and provide gasket and metal end tabs at the track system to minimize air leakage. Fabricate system so air leakage does not exceed 5% of air diffuser flow rate. Fabricate air collars with either a side or top entry collar. Do not include balancing dampers in the air diffusers. Locate dampers upstream from the air diffusers.

.3 Design air supply to provide a horizontal two-way discharge with the capability of discharging from one side only (50% capacity).

.4 Engineer system so that sound power level (PWL) re 10-12 watts of diffuser assembly, does not exceed the following values in the second through sixth octave bands at 94 L/s:

Octave Band	2	3	4	5	6	NCLP
PWL	51	49	44	34	-	31

Sound pressure level (SPL) NC value re 0.0002 microbar is calculated on the basis of 8 dB room absorption.

.5 Handle air return through the coffer end panel assemblies not used for air supply.

.3 Coffer Lighting Fixtures

.1 Fabricate the complete fixture body of 0.73 mm galvanized steel. Complete reflectors with return flanges n two longitudinal sides to accommodate the fixture lens. Construct reflector of 0.73 mm C.R.S. finished both sides with a high reflectance white baked enamel with a minimum reflective index of 85%. Do not accept reflectors constructed from pre-painted steel.

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.2 Provide coffer light fixtures of the type and size designated on the drawings and as a basic (1270 mm) or a tandem (2794 mm) two module type.

.3 Include conversion type socket assemblies which will allow fixture lamp conversion from single lamp to two lamp, or vice versa.

.4 Supply fixture with a 0.93 mm galvanized steel wiring closure plate complete with knock-outs and grounding screws or similar approved system, which will allow the wiring of the fixture, complete with removal of the reflector.

2.1 Design and Fabrication (cont'd)

.3 Coffer Lighting Fixtures (Cont'd)

.5 Provide lens of clear acrylic, light stable, meeting Class "C" IES-NEMA-SPI standards for acrylic materials. Lens to have a pattern comprised of recessed female cone prisms having a square base, with the prismatic cones oriented on a 45 degree axis and the cones located on 4.75 mm centres. Retain lens in the luminaire without mechanical assist and allow for hand removal.

.6 Provide ballasts, CSA approved, rapid start, noise rated A, complete with thermal protection, protected capacitor high power factor (90% or above), 120 volts.

.7 Provide medium bi-pan, tombstone type sockets.

.8 Design the coffered lighting system to meet the I.E.S. criteria for control of direct and reflected glare. Provide an average initial illumination level of 753.474 lux measured at desk height of 760 mm above floor, based on a room cavity ratio of 2.16 with ceiling, wall and floor reflectance of 80, 50, 20 respectively, when utilizing a single 40 watt lamp. Provide a visual comfort probability (V.C.P.) of less than 90 lengthwise to the fixture and not less than 76 crosswise.

.9 Refer to drawings for layout and details of coffered ceiling.

2.2 Service Poles

.1 Provide 20 total, indoor service poles made of extruded aluminum sections, approximately 36 mm x 70 mm with aluminum snap-on covers to provide access to communication channel without declamping unit. Barrier to isolate power from communication systems. Approved by CSA, Ontario Hydro and Bell Canada.

.2 Anodized aluminum finish of 10.16 micrometres thickness.

.3 Fastening accessories at top of pole to secure to side ceiling using set screws to permit relocation. Finished flange at ceiling to conceal wiring.

.4 Nominal length of poles 2600 mm from floor to ceiling, with +/- 50 mm vertical adjustment. Total adjustment 100 mm.

.5 Metal or PVC sleeve in black finish at bottom of pole to conceal vertical adjustment.

2.2 Service Poles (Cont'd)

.6 Reversible gripper pad at the base for non-slip installation on either tiled or carpeted floor.

.7 Poles with two prewired CSA 5.15R duplex receptacles. Knockout holes for 2 telephone amphenols and one for communications.

.8 Cord of #12/3 type SJT cable with moulded 15 A, 125 volt, cap extending 3 m from top of pole.

.9 Cord in flexible fiberglass sleeve from end of pole to cap.

PART 3 - EXECUTION

3.1 Workmanship

.1 Install all components in accordance with the manufacturer's instructions.

.2 Install ceiling to a tolerance of +/- 3 mm in 3600 mm.

.3 Install service poles in locations directed by Engineers. Connect to receptacles above ceiling.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Demolition of Structures: Section 02050

1.2 Regulatory Agencies

.1 Comply with Federal, Provincial, and local requirements pertaining to handling, removal, and disposal of asbestos materials.

1.3 Outline of Work

.1 Demolition of various existing buildings will involve the removal, handling, and disposal of asbestos containing materials, as outlined on Appendix I attached to this Section of the Specifications. Work involves removal of following:

.1 Asbestos-cement sheeting.

.2 Magnesia block insulation and corrugated paper pipe insulation.

.3 Boiler insulation on two small boilers in existing Administration Building.

1.4 Submittals

.1 Before commencing work:

.1 Obtain from the appropriate agency and submit to the Engineer one copy of all necessary permits for transporting and disposal of asbestos waste. (Ensure that dump operator is fully aware of hazardous nature of material being dumped, and proper methods of disposal. Submit proof satisfactory to Engineer that suitable arrangements have been made to receive and properly dispose of asbestos waste.)

.2 Submit certification or proof of experience in this type of work and proof satisfactory to Engineer that all employees have had instruction on the hazards of asbestos exposure, on respirator use, and all aspects of work procedures and protective measures.

1.5 Worker Protection

.1 Instructions: Before commencing work instruct workers in use of respirators, entry and exit from work areas, and all aspects of work procedures and protective measures.

1.5 Worker Protection (Cont'd)

.2 Respirators: Provide workers with personally issued and marked respiratory equipment acceptable to Labour Canada or provincial labour department as suitable for the asbestos exposure in the work area. If disposable type filters are used provide sufficient filters so that workers can install new filters following disposal of used filters as contaminated material and before reentering contaminated areas. Respirators shall have United States National Institute for Occupational Safety and Health approval for asbestos dusts.

.3 Provide a wash basin, water, soap and disposable towels in work area. Require that every worker use washing facilities before leaving work area. Dispose of towels as contaminate material.

.4 Protective Clothing: Provide workers with full body disposable type coveralls. Alternatively, reusable protective clothing may be used if it is left in work area until the end of asbestos abatement work, at which time such items shall be disposed of as asbestos waste. Provide other body protection required under applicable safety regulations.

.5 Do not allow smoking, eating, drinking, tobacco or gum chewing in work area, or while wearing protective clothing which is contaminated.

.6 Provide and post instructions and warning signs in work areas as required or recommended by Regulatory Agencies.

1.6 Visitor Protection

.1 Do not allow entry to work areas by unauthorized persons or by workers not engaged in the work.

.2 Provide protective clothing and approved respirators to authorized visitors to work areas. Instruct authorized visitors in the use of protective clothing and respirators, and in procedures to be followed in entering and leaving work areas.

PART 2 - PRODUCTS

2.1 Materials

.1 Polyethylene: 0.15 mm minimum thickness unless otherwise specified; in sheet size to minimize joints.

.2 Tape: fiberglass reinforced duct tape suitable for sealing polyethylene under both wet conditions using amended water, and dry conditions.

.3 Wetting agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether, or other material approved by Engineer, mixed with water in a concentration to provide adequate penetration and wetting of asbestos-containing material.

.4 Asbestos waste receptors: 200 L capacity metal or fibre drums with tightly fitting lids and 0.15 mm minimum thickness sealable polyethylene liners. Drums shall be labelled in accordance with Occupational Safety and Health Administration, United States Department of Labour (OSHA) Asbestos Regulations (29 CFR 19.10.1001). Labelling shall be in both official languages.

.5 Waste bags: 0.15 mm minimum thickness polyethylene.

.6 Signs: Helvetica Medium type letters, upper case: "CAUTION, ASBESTOS HAZARD AREA" (25 mm), "NO UNAUTHORIZED ENTRY" (19 mm), "WEAR ASSIGNED PROTECTIVE EQUIPMENT" (19 mm), "BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM" (7 mm).

.7 Sprayers: garden reservoir type, low velocity, capable of producing mist or fine spray, with hypodermic typenozzle for penetration through outer covering jackets.

.8 H.E.P.A. vacuum: (High Efficiency Particulate Absolute) filtered vacuum equipment with a filter system capable of collecting and retaining asbestos fibres at 99.97% efficiency for fibres 0.3 microns or larger.

2.1 Materials (Cont'd)

.9 PVC Bags for pipe insulation removal and disposal: prefabricated, purpose made, 0.20 mm minimum thickness, polyvinyl-chloride bags with integral 0.25 mm thick polyvinyl-chloride gloves. Bag equipped with reversible double-pull double throw zipper on top to facilitate installation on pipe and progressive movement along pipe and with straps for sealing ends of bag around pipe, and equipped with valve for insertion of spray nozzle.

.10 Amended water: use for all wetting and spraying. Clean, potable water containing 1.25 mL of wetting agent to 1.0 litre of water.

PART 3 - EXECUTION

3.1 Removal of Asbestos-Cement Sheeting Panels

.1 Remove dust on the interior surfaces of panels with a damp cloth.

.2 Carefully remove panels, intact wherever possible. Avoid breakage. Under no circumstances use power tools. Where non-powered hand tools are used to cut or otherwise abrade asbestos products, wet the materials unless wetting creates a hazard or may cause damage.

.3 Place panels in tied bundles and wrap in a minimum of 2 layers of 0.15 mm thick polyethylene securely taped. Label as asbestos waste.

.4 Clean up all dust created by the removal and handling of asbestos cement panels, using H.E.P.A. vacuum.

.5 Dispose of bundles of asbestos cement panels, cloths, and vacuum waste contents as specified hereinafter for disposal of asbestos waste.

3.2 Pipe Covering Removal

.1 Carry out removal in strict accordance with printed instructions of PVC bag manufacturer.

.2 Fit bag to pipe section, insert all tools and equipment, and seal, all in accordance with manufacturer's directions.

.3 Place hands in gloves and with tools cut insulation section within bag at ends. Remove wire or straps, slit insulation, strip insulation and drop into lower portion of bag.

3.2 Pipe Covering Removal (Cont'd)

.4 Clean pipe surface so exposed with wire brush and water. Wet exposed ends of insulation, upper portion of bag, and waste in bottom of bag using amended water. Insert nozzle of spray equipment in valve and wet down contents.

.5 Without removing waste or equipment, loosen securing straps and slide bag along pipe to next length of insulation. Again seal bag with straps and repeat removal procedure.

.6 When bag is full and contents wetted, remove tools after washing within bag. Place tools in water. Pull waste bag over PVC bag. Release PVC bag from pipe into waste bag. Seal waste bag and label as asbestos waste. Leave contaminated sponges within bag.

.7 Repeat procedure using new PVC glove bags until all pipe covering is removed.

.8 Respirators shall be worn by workers throughout pipe covering removal.

.9 Where ends of pipe covering will be exposed, such as connections to boilers, or at intersections of runs, seal exposed ends with tape.

.10 Dispose of bags of waste as specified hereinafter for disposal of asbestos waste.

3.3 Removal of Existing Boilers Administration Building

.1 As boiler insulation is metal jacketed, it is recommended that boilers be removed, complete with insulation using following procedure.

.2 Remove all surface dust using HEPA vacuum. Wet down insulation where exposed by removal of piping and breeching.

.3 Seal entire assembly with two layers of 0.15 mm thick polyethylene sheet, each layer with joints lapped and sealed with tape, and secured in place by suitable bands or ties. Label as asbestos waste.

.4 Remove boilers, complete with insulation to a waste site approved by the Ministry of the Environment for asbestos waste disposal, and where waste of this size and nature are accepted.

3.4 Completion

.1 Before leaving an area where asbestos removal work has been completed thoroughly clean area of any dust and debris caused by operations with workmen doing clean-up fully protected. Remove all dust with HEPA vacuum and damp cloths, mops, and sponges.

.2 Place all debris, cloths, sponges, contents of vacuum waste container, contaminated respirator filters, contaminated clothing, and other contaminated materials in waste bag. Seal and label as asbestos waste.

3.5 Disposal

.1 Regularly remove sealed and labelled drums containing asbestos waste and dispose of at a waste disposal site approved by the Ministry of the Environment of Ontario for asbestos waste disposal, and in accordance with requirements of disposal authority.

.2 Ensure that each shipment of drums, or other enveloped asbestos waste is accompanied by Contractor's representative who is fully conversant with regulations and guidelines, to ensure disposal is carried out in conformity with such regulations and guidelines.

APPENDIX I

ASBESTOS BUILDING MATERIALS, EXISTING BUILDINGS

Building	Asbestos Material	Asbestos Content	Amount
Shop Building, east of Admin. Building: remaining south wall	A/C Sheeting	Chrysotile, 10-20%	Interior wallboa. d 8' high.
Administration Building	Boiler (2) Insulation	Expected to be Asbestos	2 small boilers
	Pipe Insulation, corrugated paper	Chrysotile, 75%	Approx. 100'
	Pipe Insulation, magnesia block	Chrysotile, 20-30%	Approx. 400'
	A/C Sheeting	Chrysotile, 10-20%	About 50% of exterior and battery room
Storage Shed by fire hydrant	A/C Sheeting	Chrysotile, 10-20%	All exterior
Storage Shed east of propane tank	A/C Sheeting	Chrysotile, 10-20%	All exterior
Machine Shop	A/C Sheeting	Chrysotile, 10-20%	Interior wallboard, 8' high, all perimeter
Marine Emergency Building	A/C Sheeting	Chrysotile, 10-20%	Interior wallboard, 8' high, 50% of . perimeter
Helicopter Hangar	A/C Sheeting	Chrysotile, 10-20%	Interior wallboard, 5' high, all perimeter
Helicopter Workshop between hangar and Pilot's office	A/C Sheeting	Chrysotile, 10-20%	Interior walls an ceiling

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Building-in and grouting frames in concrete masonry: Section 04220

.2 Structural steel rail supports: Section 05120

.3 Steel ladders: Section 05500

.4 Electrical service to terminals of controller panel: Section 16010

1.2 Reference Standards

.1 Do hydraulic elevator work to CSA B44-1975, CSA B44S1-1977, CSA B44S2-1980, local codes and regulations except where specified otherwise.

1.3 Description of System

.1 Provide one holeless hydraulic passenger elevator, hydraulic passenger elevator as follows:
.1 Car platform: 1830 mm wide x 1720 mm deep, minimum.
.2 Rated load: 910 kg exclusive of complete car and plunger.
.3 Travel: from ground floor to second floor, distance of about 5600 mm, serving three landings.
.4 Openings: two front openings, one rear opening.
.5 Speed: 0.51 m/s minimum in up and down direction with rated load and with maximum speed variation +/-5% no load to rated load.

1.4 Single Automatic Operation

.1 Include single automatic elevator operation as follows:
.1 Provide flush-mounted operating devices in car with stainless steel faceplate containing pushbuttons numbered to correspond to landings served, alarm button, emergency stop switch and key-operated light switch.

1.4 Single Automatic Operation (Cont'd)

.1 (Cont'd)

.2 Hall lanterns:

.1 Include up and down hall lanterns approved by Engineer with stainless steel faceplate with single stroke gongs at intermediate landings and single lanterns with single stroke gongs at terminal landings.

.2 When car has reached predetermined distance from floor, and is going to stop at that floor, illuminate corresponding lantern and sound gong in advance of stop. Maintain lantern illumination until car has left the landing.

.3 Use arrow-shaped lantern indicators coloured white with lens which project at least 19 mm from faceplate.

.3 Arrange operating device to give passenger in car uninterrupted use of elevator until car has reached desired destination and car door has been opened and again closed. Upon momentary pressure of landing button bring car to that landing.

.4 After car stops at landing in response to landing call render car inoperative from landing calls for predetermined interval not less than 3 seconds to allow boarding passengers time to register their call in car.

1.5 Car Stall Protective Circuit

.1 Automatically return car to bottom landing and open power operated doors if car should stall as result of relay failure, valve failure or low oil in system while ascending. Restore service by opening and reclosing main line switch.

1.6 Two-Way Levelling

.1 Include automatic two-way levelling device. Approach landing stops at reduced speed from either direction of travel.

.2 Level with accuracy of +/-12 mm under varying load conditions.

.3 Maintain car floor within +12mm level with landing floor with two-way automatic maintaining levelling device.

1.7 Elevator Type

.1 Holeless hydraulic elevator.

.2 Use direct acting plunger, pumping unit, storage tank and magnetic control valves.

.3 Locate pump unit and associated control equipment in machine room shown in drawings.

.4 Deliver operating fluid directly into cylinder at necessary pressure and in sufficient quantity to lift rated load at rated speed.

.5 Use oil as operating fluid with flash point at least 190 deg C.

.6 Use glycol or ester based fluids or similar fluids specially formulated for high fire resistance and low smoke production, as operating fluid. Ensure seals, packing and plastic materials used are unaffected by fluid use.

1.8 Performance

.1 Design and adjust equipment as follows:
.1 Provide smooth acceleration and deceleration of car without perceptible steps so adjusted as not to cause passenger discomfort.
.2 Permit doors to start opening in advance of stop at floor level such that doors are at least 3/4 open when car is stopped level with floor. The minimum time for doors to remain fully open shall be not less than 3 seconds upon car call.

1.9 Welding

.1 Where welding is used for cylinder and pressure piping, prepare joints and weld in approved manner using welders fully qualified for pressure vessel welding.

.2 Where directed, subject welds to radiographic or other non-destructive inspection.

.3 Identify field welds with welder's identification stamp.

1.10 Samples

.1 Submit duplicate 150 mm x 150 mm samples of elevator finishes in accordance with Section 01340:
.1 Floor material.
.2 Cab interior.
.3 Cab ceiling.
.4 Cab door.
.5 Hoistway entrance doors and frames.

1.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate on layout drawings:
.1 Pumping unit, controller, piping and other components in machine room.
.2 Car, guide rails, buffers and other components in hoistway.
.3 Rail bracket spacing and forces on guide rails.
.4 Outside diameter and wall thickness of cylinder, plunger and piping and working pressure.
.5 Length of plunger and cylinder.
.6 Top and bottom clearance and over travel of car.
.7 Location of circuit breaker, switchboard panel or disconnect switch, light switch and feeder extension points in machine room.
.8 Clearance between bottom of plunger and safety bulkhead of cylinder.
.9 Location in hoistway or machine room for connection of travelling cables for car light and telephone.
.10 Rating of drive motor.
.11 Heat dissipation of elevator equipment in machine room.

.3 Indicate on general arrangement drawings:
.1 Hoistway entrances and doors showing method of operation, details of construction and method of fastening to structural members of building.
.2 Car for design specified, showing details of construction, fastening to platform, lighting, ventilation and location of car equipment.

.4 Include catalogue illustrations of operating and signal fixtures.

1.12 Maintenance Data

.1 Provide maintenance data for elevator maintenance. Incorporate into maintenance manual specified in Section 01730.

.2 Include in maintenance data:
.1 Parts catalogue giving complete list of repair and replacement parts with cuts and identifying numbers.
.2 Legible schematic wiring diagrams covering electrical equipment as supplied and installed, including changes made in final work, with symbols listed corresponding to identity or markings on both machine room and hoistway apparatus. Cover one copy in plastic or glass frame and mount on wall in machine room.
.3 Lubrication chart, plastic or glass covered, framed and mounted on wall in machine room.

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1.13 Maintenance Service

.1 Include complete maintenance of elevator equipment for a period of 12 months from the date of the Final Certificate of Completion.

.2 Regularly, systematically, monthly examine, clean adjust and lubricate equipment.

.3 Repair or replace electrical and mechanical parts of elevator equipment as required due to defect and normal wear and tear.

.4 Engineer assumes responsibility for cleaning, repairs or replacements of car enclosure, hoistway enclosure, hoistway doors and door frames due to other than defect and normal wear and tear.

.5 Use only genuine standard parts produced by manufacturer of equipment.

.6 Perform work by competent personnel under supervision and in direct employ of elevator manufacturer or manufacturer's licensed agent.

.7 Perform work during regular trade working hours to approved schedule.

.8 Maintain locally adequate stock of parts for replacement or emergency purposes and provide qualified men to ensure fulfillment of this service without undue loss of time in reaching job site.

.9 Include call-back service due to elevator stoppage or malfunction at all times at no additional cost.

1.13 Maintenance Service (Cont'd)

.10 Dress maintenance men in uniforms. Register with designated building personnel at time of inspections.

1.14 Power Supply

.1 Power supply: 600 V, 3 phase, 3 wire, 60 Hz.

.2 Lighting supply: 120 V.

1.15 Use by Handicapped

.1 Comply with Building Standards for Handicapped, 1980, Section 3.5 and the following:
.1 Locate uppermost button in elevator cab control panel and centre-line of telephone instrument not more than 1520 mm above floor level. The center-line of the alarm button and emergency stop switch shall be at a nominal 900 mm from the floor.
.2 Furnish 40 mm diameter tubular stainless steel handrails on two sides of car with ends returned close to panels and removable from inside car. Have a minimum clearance between rail and wall of 40 mm at a nominal height of 813 mm from the floor.
.3 Provide Arabic numerals 16 mm in height raised 1 mm immediately to left of floor buttons.

1.16 Guarantee

.1 Provide written guarantee, signed and issued in the name of Her Majesty the Queen in Right of Canada, stating following workmanship is guaranteed for 3 years from the date of Interim Completion of entire contract.
.1 Blistering, spalling or peeling of paint due to improper surface preparation or material application.
.2 Opening of joints due to improper design or use of ineffective fastening devices.
.3 Separation, cracking or splitting of plastic laminate due to improper application to core material, or to method of fabrication which gives rise to areas of high stress concentration or which restricts normal expansion or contraction of plastic laminate.

1.17 Components

.1 Use major elevator components from standard product line of one manufacturer unless otherwise approved.

.2 Use components only which have performed satisfactorily together under conditions of normal use in not less than two other elevator installations of similar design and for a period of at least one year. Furnish names and addresses of owners or managers of buildings, in which proposed combination of major components has so performed.

1.17 Components (Cont'd)

.3 Major components means cylinder and plunger, motor, pumping unit, muffler, controller, selector, operation and control systems.

1.18 Basic Materials

.1 Steel sheet metal: to ASTM A366-72 cold-rolled sheet, commercial quality; to ASTM A525-73 with galvanized coating.

.2 Stainless steel sheet metal: type 304 with satin finish.

.3 Stainless steel bars, wire and shapes; type 304 with satin finish.

.4 Laminated plastic: to CAN 3-A172-M79, Grade general purpose type S standard, suede finish.

.5 Provide fastenings concealed from public view designed to withstand normal use.

1.19 Electrical Wiring, Conduit and Fittings

.1 Use steel compression type fittings where electrical metallic tubing is used. Fittings with set screws are not acceptable unless a separate identified grounding conductor is also installed inside raceway.

.2 Include at least 10% spare conductors and two pairs of shielded audio cables in travelling cables.

.3 Do not parallel conductors to increase current carrying capacity, unless individually fused.

.4 Do not use armoured flexible metal conduit as grounding conductor.

.5 Use type EO travelling cables.

1.20 Sound Isolation

.1 Provide sound isolation between plunger platen and car frame.

.2 Provide sound isolation between pumping unit and controller, motor and pump.

.3 Prevent lateral displacement of pumping unit.

1.21 Finish

.1 Paint machinery/equipment with oil resistant machinery enamel unless otherwise specified.

.2 Free structural parts of rust. Paint with rust resistant paint.

.3 Thoroughly clean and bonderize or equally prepare, frames, headers and other components specified to be in baked enamel.
.1 Apply sufficient number of mineral filler coats, each baked and sanded perfectly smooth, to provide flat even surface
.2 Apply heavy coat of baked enamel primer sanded and rubbed smooth.
.3 Finish in plain colour baked enamel consisting of two colour coats of high grade synthetic material baked on and brought to semi-gloss finish.
.4 Do not use manufacturing techniques such as spot welding which may cause visual imperfections or visual distortion of exposed stainless steel surfaces.

1.22 Lubrication

.1 Include means of lubricating bearings requiring periodic lubrication.

.2 When used, provide grease fittings which fit same gun.

.3 Where grease cups are provided, use automatic feed compression type.

.4 Provide visible and easily accessible lubrication points.

1.23 Roller Guides

.1 Equip car with roller guides mounted on top and bottom of car frame.

.2 Provide each guide with durable, oil resistant, resilient tired ball bearing rollers running on three finished rail surfaces.

.3 Do not lubricate guide rails. Maintain each roller on its respective guide in uniform contact with rail surface at all times by means of substantial springs or by resilient mountings.

.4 Provide guide operation which is inaudible to passengers in car or outside hoistway with car operating at rated speed and car fan turned off.

1.23 Roller Guides (Cont'd)

.5 Use tire material which will not develop flat spots after standing idle for 24 hours under average environmental conditions.

.6 Balance car.

1.24 Guide Shoes

.1 Use swivel type guide shoes for car. Assemble on metal base to permit self-alignment.

.2 Equip each shoe with renewable, non-metallic wearing gibs or inserts and spring takeup for side play between guide rails.

.3 Include renewable wearing gibs made of durable non-metallic material having low coefficient of friction and long wearing qualities when operated on guide rails receiving infrequent light applications of rail lubricant.

.4 Do not use gibs containing graphite or extreme pressure type lubricants which may adversely affect performance or safety.

.5 Use solid type guide shoes for car, of metal construction, fitted with renewable cast-iron wearing gibs or inserts.

1.25 Guide Rail Lubricators

.1 Include guide rail lubricators to distribute oil evenly.

.2 Include oil tight drip pan beneath each guide rail in pit.

1.26 Cylinder and Plunger

.1 Construct plunger or selected steel tubing machined true and finished to surface finish of 0.0008 mm roughness height rating or better.

.2 At top of cylinder include stuffing box and packing gland with seal or self-adjusting packing which does not require external adjustment.

.3 Include means to automatically return oil which leaks past packing, to storage tank. Filter oil if exposed to atmosphere.

.4 Include safety bulkhead on cylinder to rule 302.3 g of ANSI A17.1-1971.

1.26 Cylinder and Plunger (Cont'd)

.5 Design and install cylinder and plunger plumb, and to operate with minimum friction.

.6 Do not use a plunger follower guide.

1.27 Pumping Unit

.1 Design pumping unit as an integral unit combining motor, pump, valves and reservoir in one enclosure.

.2 Reduce airborne noise with sound deadening material on inside of enclosure or submerge pump and motor in oil reservoir.

.3 Provide swing panels or panels equipped with quick release fasteners for convenient access to parts of equipment requiring adjustment.

.4 Use positive displacement screw-type pump, with multiple V-belt connection to drive motor or with direct connection between drive motor and pump through flexible coupling, specially designed for quiet service.

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.5 Install oil tight drip pan beneath unit to retain leakage of hydraulic fluid.

.6 Install thermostatically controlled heaters or other means to maintain fluid viscosity within limits necessary to provide consistent, reliable operation at all times.

.7 Install thermostatic protection of oil temperature in reservoir where pump or motor is submerged in reservoir.

1.28 Motor

.1 Do not exceed EEMAC design B locked rotor current.

.2 Design for minimum locked rotor torque of 150% and minimum breakdown torque of 200% at normal voltage.

.3 Provide data plate on motor showing motor connections.

.4 Where reduced voltage starting is provided, switch to full voltage not more than 1.5 seconds after interlock circuit is established.

.5 Limit starting current of elevator motor to not more than 4 times full load running current.

1.28 Motor (Cont'd)	.6	Include class B motor insulation.
	.7	Include manually reset integral overheating protection to CSA C22.2 No. 77-1976.
1.29 Muffler	.1	Minimize transmission of fluid pulsations in pipeline between pumping unit and cylinder head with blow-out proof muffler.
1.30 Piping	.1	Use threaded couplings or mechanical couplings which mechanically prevent separation of adjoining members.
	.2	Welding is permitted providing interior of pipe is thoroughly cleaned after welding or where welding method prohibits introduction of foreign material into interior of pipe.
	.3	Provide sound isolation couplings in pipeline between pump and cylinder.
	.4	Locate piping where it can be serviced.
1.31 Oil Storage Tank	.1	Provide oil storage tank capacity equal to volume of oil required to lift elevator to top terminal plus reserve of not less than 45 litres.
	.2	Clearly indicate minimum permissible oil level.
	.3	Include gauge glasses to indicate oil level if top of tank is more than 1.2 m above floor level.
1.32 Low Oil Control	.1	Provide low oil control feature designed to automatically cause up-travelling car to descend to lower terminal landing if reservoir oil level is insufficient.
	.2	Arrange control so that oil reservoir is refilled before elevator can be returned to service.
	.3	Open car and hoistway doors automatically at lower terminal landing. Inactivate control buttons in car operating panel, except door-open button, and close hoistway doors.

1.33 Emergency Lighting

.1 Include emergency lighting in each car as follows:
.1 Use battery operated emergency lighting equipment, to CSA C22.2 No. 141-1972, to provide general illumination and 10 lx minimum illumination in car at operating panels and telephone cabinet for four hours minimum.
.2 Include means for convenient manual operation and testing of each unit from within car.
.3 Design battery unit of sufficient strength to support 90 kg person without causing malfunction or damage.
.4 Include means of containing any leakage or spillage of electrolyte.

1.34 Car Platform

.1 Include car platform as follows:
.1 Provide structural steel car platform frame filled with wood or steel sub-flooring.
.2 Provide threshold plate of aluminum to ASTM B221-74 alloy 6351-T6.
.3 Prepare sub-flooring in car to receive tile finish total thickness 9 mm including bedding.

1.35 Passenger Car Enclosure

.1 Fabricate car enclosure on 3 sides of 1.9 mm thick steel with spaces between and adjacent to removable panels finished in plain colour baked enamel.

.2 Install, removable panels retained securely with hidden fastenings. Design for removal of panels from inside car. Face panels with texture finish plastic laminate and balancing veneer with flame spread rating of 25 or less and trim edges with plastic laminate. Colour of plastic laminate as shown on Finish and Colour Schedule.

.3 Include overall fluorescent ceiling lighting using rapid start, high power factor ballasts, sound rated A, with metal eggcrate ceiling 12 x 12 x 19 mm thick, supported on baked enamel hung type ceiling frame. Design for light intensity measured 0.75 m above floor of 215 lx maximum. Totally enclose and conceal wiring and ballasts from view within the car and finish ceiling cavity white.

.4 Fabricate front return panels, 15 deg sloped soffit and entrance columns of integral stainless steel. Provide front return with integral car operating panel. Rear return panel in laminated plastic matching side walls.

1.35 Passenger Car Enclosure (Cont'd)

.5 Ventilate by an exhaust air handling unit through roof and through concealed perforations at base.

.6 Limit total fan noise to 55 dB on "A" scale of General Radio Sound Level meter type 1565lA from reading 0.9 m above floor with fan on high speed.

.7 Mount air handling unit on top of car and effectively sound isolate system from car to prevent transmission of vibration to car structure.

.8 Include single speed operation of ventilation system.

.9 Include telephone cabinet in car with telephone symbol 75 mm and wording "In case of emergency, lift receiver, wait for answer" engraved in letters at least 6 mm high on outside cover. Fill engraved wording with orange phosphorescent paint. Identify elevator and name of building on back of cabinet cover. Include telephone wiring within elevator hoistway.

.10 Use bolts fitted with washers and lockwashers and fabric separators, if necessary, to assemble and guarantee entire structure to operate entirely free from squeaks and metallic sounds.

.11 Finish both sides of car doors in texture finish plastic laminate to match sides of car. Door edges finish with satin finish stainless steel trim.

.12 Fabricate car enclosure of metal with minimum of ledges, projections and corners and finish in plain colour baked enamel with final coat brought to semi-gloss finish.

.13 Use sheet steel, smooth and free from defects, 1.9 mm minimum thick.

.14 Construct of one piece panels from floor to soffit, securely bolted together and to adjoining members with lightproof joints and reinforced to provide rigidity.

.15 Provide perforations in base on three sides and in ceiling on four sides to allow air to circulate as car travels through hoistway.

.16 Provide minimum 2285 mm clear height under fixed hung car ceiling.

1.35 Passenger Car Enclosure (Cont'd)

.17 Provide clear car entrance height of 2135 mm.

.18 Design floor to accept hard non-skid materials, flush with sill, with minimum fastenings and with securely held front edge.

1.36 Car Door Operator

.1 Include motor driven electric operator on car to automatically open and close car door.

.2 Open door when car has stopped at landing.

.3 Close door upon momentary pressure of either car or landing call buttons, provided hoistway doors are closed.

.4 Provide smooth opening and closing and cushioning at final limits of door travel.

1.37 Car and Hoistway Door Operator

.1 Operate car and hoistway doors at each hoistway entrance simultaneously, quietly and smoothly, without vibration, slam or shock, by electric operator located on car.

.2 Open doors automatically as car is levelling.

1.38 Car Top Clearance Guarding

.1 A guardrail or other suitable construction shall be provided to the top of the car to the approval of the enforcing authority.

1.39 Door Protective Device

.1 Include door protective device extending full height of clear opening and projecting beyond leading edge of each door panel.

.2 Should this device touch person or object while car door is closing, return car and hoistway doors to open position.

.3 Arrange to retract noiselessly at both limits of travel.

.4 Design and adjust device to cause doors to stop and re-open before doors contact object or person.

1.40 Light Ray Device

.1 Include additional door protection by means of two horizontal infra-red light rays projected across elevator car entrance approximately 125 mm and 740 mm respectively, above threshold.

.2 After stop is made, hold doors open for predetermined adjustable interval, unless closing is initiated sooner by registration of car call.

1.41 Car and Hoistway Door Hangers and Gibs

.1 Include two-point suspension door hangers for each door panel with resilient sound absorbing wearing surfaces and replaceable hanger tracks.

.2 Use ball or roller bearings sealed to retain grease lubrication and wipers to maintain rollers and track in clean condition.

.3 Absorb upthrust with adjustable eccentric rollers equipped with ball or roller bearings.

.4 Design for replacement of gibs without removing door from hanger tracks.

1.42 Metal Entrances

.1 Furnish at all floors, elevator entrances as shown on plan, having clear openings 915 mm wide x 2135 mm high and one-speed single slide door.

.2 Assume complete and undivided responsibility for entire installation including doors, frames, structural supporting angles, headers, fascias or toeguards, hangers, sills.

.3 Cushion opening doors with rubber bumpers and closing with rubber bumpers on strike jambs.

1.43 Flush Type Hoistway Doors

.1 Construct doors of flush type steel sheets for typical floors. Finish both sides with texture finish plastic laminate in colours shown on Finish and Colour Schedule. Door edges finished with stainless steel trim in satin finish.

.2 Reinforce doors to receive attachments and to withstand strains due to power operation.

.3 Include sight guards.

1.44 Unit Frame with Integral Trim

.1 Construct frame for typical floors of satin finish stainless steel as indicated, combining rough buck, jamb and casing in one piece welded bolted construction.

.2 Bolt frame to sill or sill extension and secure to header at top.

1.45 Fire Rated Entrances

.1 Provide fire protection rated elevator closures, produced under label service program of ULC or other agency acceptable to FCC and authorities having jurisdiction.

.2 Affix ULC or other acceptable agency label to elevator closures.

1.46 Sills

.1 Include extruded aluminum sills with anti-slip wearing surfaces to ASTM B221-74 alloy 6351-T6.

.2 Grout sills in position providing up to 50 mm in thickness as required.

.3 Include sill supports, where required and design for class of loading.

.4 Do not use exposed fastenings.

1.47 Fascias or Toeguards

.1 Include steel fascias or toeguards 1.5 mm thick minimum where necessary to reduce running clearance to 30 mm.

.2 Extend fascias and toeguards at least 75 mm beyond clear entrance.

1.48 Controllers and Cabinets

.1 Enclose controllers in enamelled ventilated sheet steel cabinets. Include hinged doors for easy access to CSA C22.2 No. 14-1973.

.2 Include direct current operating and control circuits.

.3 Provide similar switch and relay units of same manufacturer and cledarly identify controller components and terminal connections to agree with wiring diagrams.

.4 Use two main line contactors to avoid possibility of continued operation of pump if one switch should fail.

1.49 Position Indicator

.1 Include, over top of entrance, in car, electric position indicator with stainless steel faceplate and flush characters at least 25 mm high.

1.50 Button Illumination

.1 Include integral illumination of each button in each landing and car operating fixtures.

.2 Illuminate corresponding "up" and "down" button and car button whenever call is registered. Extinguish illumination when call has been answered.

1.51 Bilingual Markings

.1 Engrave identification and instructions at least 0.25 mm deep on operating panels and on all signal equipment in both English and French and recognized symbol. Submit markings and designs for approval.

1.52 Arrangement of Equipment

.1 Arrange equipment in machine room so that equipment can be removed for repairs or replacement without dismantling or removing other equipment components.

.2 Accommodate equipment in space indicated.

1.53 Guide Rails and Brackets

.1 Erect single rails plumb and parallel within maximum deviation of 3 mm.

.2 Use metal shims only and provide lockwashers under all nuts and tapped bolts.

.3 Compensate for expansion and contraction of guide rails.

.4 Use splice plates and guide rails with contact surfaces accurately machined to form smooth joints.

.5 In steel structures, bolt or weld brackets directly to steel hoistway framing.

.6 In concrete structures, provide inserts in concrete formwork or self-drilling expansion shell bolt anchors for support of brackets. Where Engineer considers any concrete fastener improperly installed, either replace fastener or demonstrate stability of fastener by performing on site test under which fastener is subjected to four times manufacturer's safe pullout or working load. Use self-drilling expansion shell bolt anchors only in solid concrete.

1.53 Guide Rails and Brackets (Cont'd)	.7	Anchor guide rails in pit so as not to reduce effectiveness of waterproofing.
	.8	Include steel reinforcement and backing for car guide rails where necessary.
1.54 Buffers	.1	Provide spring buffers to suit.
1.55 Erection	.1	Set entrances in perfect alignment with car openings and true with plumb hoistway lines.
	.2	Erect elevator closures in accordance with labelling requirements.
1.56 Protection	.1	Provide protective coverings for finished surfaces.
	.2	Provide guards to protect hoistways throughout duration of contract.
1.57 Touch-Up	.1	Upon completion, touch-up and restore to new condition, damaged or defaced factory finished surfaces.
	.2	Remove protective coverings and clean exposed surfaces after completion.
1.58 Field Quality Control	.1	Perform and meet tests required by CSA B44-1975.
	.2	Supply instruments and carry out additional specified tests.
	.3	Furnish test and approval certificates issued by jurisdictional authorities.
	.4	Test stop ring and hydraulic system by operating elevator with rated load in up direction against stop ring at rated speed.
	.5	Provide 2 weeks written notice of date and time of tests.
1.59 Co-ordination	.1	Co-ordinate delivery and installation with the designated General Contractor.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Load bearing members or points integral with building structure: Section 05120, 03300

.2 Field painting: Section 09900

.3 Electrical power supply: Section 16010

1.2 Reference Standards

.1 Do crane and hoist work in accordance with CSA B167-1964, CSA 22.2 No. 33-1959, and all applicable codes and regulations.

.2 Do welding in accordance with CSA W59-1982 unless otherwise indicated.

1.3 Description of Systems

.1 Provide and install a single girder, electrically powered, underrrunning crane serving Washdown Area 160, Machine Shop 158, and Carpentry Shop 156 with transfer monorail into Spray Paint 161. Two speed bridge, electric wire rope hoist, and trolley. Capacity: 5443 kg (12,000 lb).

.2 Provide and install in Helicopter Hangar 101 an overhead monorail with two-speed electrically driven trolley, and electricallypowered, two speed, wire rope hoist. Capacity: 1814 kg (4000 lb).

.3 Provide and install in Mechanics Shop 129 a fixed, two-speed electric chain lift with capacity of 5443 kg (4000 lb).

.4 Provide and install in Marine Emergency 131 an overhead monorail to accommodate Owner's existing Lodestar Model R electric chain hoist and manually operated trolley. Remove existing trolley hoist, and travelling electrical cable and reinstall in new location.

.5 Provide and install in Aids Technicians Mechanics' Shop 153 and Test Room 154 overhead monorail system with chain operated switching turntable in locations indicated. Capacity: 907 kg (2000 lb).

.6 Provide and install in Decommissioned Storage 152 an overhead monorail equipped with a manually chain-operated geared trolley. Capacity: 907 kg (2000 lbs)

1.4 Shop Drawings

.1 Provide shop drawings in accordance with Section 01340.

.2 For crane girders and monorails provide shop drawings showing layouts with dimensioned locations and details of supporting members, sway braces, fastening methods and connections, bridge construction, and giving details of bridge and runway conductors, bridge and trolley controls, and interlocking transfer mechanism between bridge girder and monorail into Spray Paint 161.

.3 Other information on bridge crane and hoists may be in the form of manufacturer's catalogue information and specifications giving dimensions, capacity, motor sizes and electrical characteristics.

1.5 Maintenance Data

.1 Provide operation and maintenance data for each system for incorporation into operation and maintenance manual specified in Section 01730, including information on motors and controls, and including wiring diagrams.

PART 2 - PRODUCTS

2.1 Single Girder Underrunning Crane

.1 General requirements:
Capacity: 5443 kg (12000 lb)
Span: as shown on drawings.
Bridge speed (2 speed): 24/6 mpm (80/20 fpm)
Lift (clear of floor): 5 m (16.5 ft)
Lift speed (2 speed): 3/0.79 mpm (10/2.6 fpm)
Trolley speed (2 speed): 24/6 mpm (80/20 fpm)

.2 Crane runway beams, bridge girder, and monorail: purpose manufactured I-beam type beams with ultimate tensile strength of 641 MPa, yield strength of 407 MPa, and Brinnell Hardness of 201, clean and grind top of bottom flange to provide smooth running surface for wheels of bridge end trucks and trolley. Dimensions as required by loading and clearance requirements.

.3 End trucks: bolt to girder with high tensile bolts. Of heavy double channel construction rigidly connected by heavy angles and end plates. Reinforced for wheel axles and equipped with heavy seat plates and safety lugs and heavy rubber end bumpers. Each end truck

2.1 Single Girder Underrunning Crane (Cont'd)

.3 (Cont'd) equipped with four hardened steel wheels with crowned treads. Each wheel equipped with two heavy duty, anti-friction, deep grooved ball bearings, permanently sealed and lubricated.

.4 Bridge drive: two separate drive units, one at each endtruck and mounted directly to reinforced pad of endtruck. Each unit consisting of amply sized, totally enclosed electric motor, fan cooled, with disc brake, and giving smooth acceleration, continuous rated and having class "B" insulation. Pinion gears of hardened alloy steel with machine cut teeth and securely geared to pinion shaft. Pinion movement prevented by spacers as required.

.5 Controls: push button station suspended from the hoist for control of all bridge, trolley, and hoist operations. All electrical control enclosures to be explosion proof. When bridge girder is in transfer position to monorail to Paint Spray 161, and interlocked, an electrical interlock shall prevent operation of bridge drive.

.6 Provide all components for runway suspension from load bearing points, including all hangers, sway braces, plates, clamps, fastening devices. Do all drilling of structural components required for complete installation.

.7 Provide combination motor-driven trolley and electric wire rope hoist with capacity and speeds specified in Paragraph 2.1.1 of this Section. Trolley drive and wheels of quality specified for bridge drive. Motors and electrical components of trolley and hoist to be explosion proof.

.8 Electric hoist:

.1 Motor driven with magnetically activated disc brake automatically applied in event of power failure and capable of holding the load safely. Brake rated at 150% of full motor torque, and shall be self adjusting. Provide red warning light indicate that brake linings require replacement.

.2 Rope drum with large diameter rope drum with deep machined grooves, with reserve drum capacity providing minimum of three additional wraps of rope on the drum at the hook's lowest point. Provide rope guide with nylon pressure ring to prevent overlapping of hoist cable.

2.1 Single Girder Underrunning Crane (Cont'd)

.8 (Cont'd)
.3 Gear train consisting of three reduction gear train with external spur drum gear. All helical gearing machine cut heat treated alloy steel, operating in an oil bath. Gear case of heavy, machined cast aluminum with gasketted coves. Factory tested before hoist assembly.
.4 Wire rope with safety factor of 5:1.
.5 Hook block of formed plates completely enclosing the sheaves. Large diameter sheaves and forged steel hooks rotating on enclosed, permanently lubricated steel bearings.
.6 Provide overload limiter on hoist.

.9 Transfer monorail into Paint Spray 161 to have transfer end supported off bridge runway beam by means of a "gooseneck" connection to ensure alignment of bridge beam and monorail. Provide manually chain operated interlock at transfer point, with operating control mounted on monorail beam.

.10 Electrical conductors:
.1 Downshop travel conductors: 3 phase, enclosed, insulated conductors.
.2 Cross bridge conductors shall be loop cord flat cable system to meet Class 1, Division 2, Group C or D with sufficient cable to allow hoist to transfer and travel the full length of the monorail into Paint Spray 161.
.3 Provide facility at hoist trolley drive to provide electrical interlock with Door 160C to prevent operation of hoist trolley when Door 160C is closed.

.11 Note that dimensions of hoist and hoist trolley must permit hook to travel to within 1000 mm of sidewall.

2.2 Monorail and Hoist, Helicopter Hangar

.1 General requirements:
Capacity: 1814 kg (4000 lb)
Trolley speed: 24/6 mpm (80/20 fpm)
Lift speed: 5.8/1.5 mpm (19/5 fpm)

.2 Monorail of quality specified in Paragraph 2.1.2 of this Section. Provide and install complete with all hangers, supports, sway braces, plates, clamps, fastening devices. Do all drilling of structure required for complete installation.

.3 Electric trolley and wire rope hoist of quality specified in Paragraphs 2.1.7 and 2.1.8 of this Section with exception that electrical components need not be explosion proof.

2.2 Monorail and Hoist, Helicopter Hangar (Cont'd)

.4 Controls: push button station suspended from hoist controlling trolley and hoist operations.

.5 Conductors: enclosed type cable looped and suspended from trolleys running in a steel box track full length of monorail.

2.3 Electric Chain Hoist: Mechanics Shop 129

.1 General requirements:
Capacity: 5443 kg (4000 lb)
Lift speed (2 speed): 3.9/1.2 mpm (13/4 fpm)

.2 Construction:
.1 Frame of double steel plate construction with housings and end covers of die cast aluminum. Frame balanced on either side with motor and gear case accessible for maintenance. Motor, brakes, gears and controls enclosed.
.2 Hoist motor equipped with pull rotor and conical disc brake. Brake spring set, electrically released, rated at 250% of full motor torque and capable of holding load firmly in position whenever power is not applied to hoist motor or in event of power failure. Limit switches to control lifting and lowering.
.3 Control: push button station suspended from hoist.
.4 Chain guide and guide rollers provided around load sheave, coupled with cross guide to form a continuous guide channel for the chain.
.5 Load sheave: mounted on precision ball bearings, with smooth machined, wear resistant surface.
.6 Load chain: high strength, case hardened steel chain, corrosion resistant.
.7 Hooks: drop forged from high strength alloy steel, heat treated for strength and toughness, with spring actuated safety latches. Upper hook fixed. Lower hook equipped with thrust bearing permitting 360 deg rotation of load hook.
.8 Provide and install suitable mounting at structure load point to accommodate load and to receive top hook of hoist.

2.4 Monorail, Marine Emergency 131

.1 General requirements:
.1 Capacity: 1814 kg (4000 lb)
.2 To accommodate existing Columbus McKinnon Lodestar Model R electric chain hoist together with existing manually operated trolley.

2.4 Monorail, Marine Emergency 131 (Cont'd)

.2 Provide and install new monorail of quality specified in Paragraph 2.1.2 of this Section. Provide and install all new hangers, supports, sway braces, clamps, fastening devices. Do all drilling of structure required for complete installation.

.3 Provide and install new conductors of enclosed type of suit collector on existing hoist.

2.5 Monorail and Trolley, Aids Technicians' Mechanics Shop 153 and Test Room 154

.1 General requirements:
Capacity: 907 kg (2000 lb)

.2 Monorail of quality specified in Paragraph 2.1.2 of this Section with capacity to support specified load.

.3 Provide chain-operated turntable switches in indicated locations with capacity to support and rotate loaded trolley. Trucks at various angles as shown. Operated by hand cahin through a series of spur and bevelled gears. Held positively in position by pin actuated locking pins released by extra pull on hand chain.

.4 Provide and install all hangers, supports, sway braces, clamps, fastening devices. Do all drilling of structure required for complete installation.

.5 Trolley: hand chain operated
.1 Trolley frame of heavy steel rolled sections forming sides. Sides connected by high strength steel suspension pin to distribute load equally to four wheels. Side plates including suspension pin supports to reduce bending stress on pin.
.2 Wheels: high quality gray iron wheels with hardened crowned treads, and large flanges axles of carbon steel, machined and hardened, rigidly suppported inside plates. Trolley to have two geared wheels. All trolley wheels equipped with sealed, permanently lubricated ball-bearings.
.3 Provide with hand chain operation driving a steel drive pinion engaging two geared wheels of trolley. Chain wheel equipped with chain guides.

.6 Install assembly to provide a maximum clearance from floor to centre line of steel suspension pin of 3.66 metres.

2.6 Monorail and Trolley, Decommissioned Storage

.1 General requirements:
Capacity: 907 kg (2000 lb)

.2 Monorail and trolley as specified in Paragraph 2.5 of this Section but less turntable switching.

.3 Mount as high as possible.

2.7 Finishes

.1 All factory produced components, cleaned, primed, and factory finished with anti-corrosive paint in colours selected by Engineer. Touch up in field after installation.

PART 3 - EXECUTION

3.1 Installation

.1 Instlal in accordance with manufacturer's directions and installation drawings.

.2 Adjust all operable components for smooth operation and alignment.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Temporary protection of pit opening: Section 01545

.2 Concrete pits: Section 03300

.3 Supply of compressed air to pit: Section 15443

1.2 Reference Standards

.1 Do vehicle lift work in accordance with CSA C22.1-1978, CSA B51-1975, local codes and regulations, except where specified otherwise.

.2 Do welding work in accordance with CSA W59-1982 unless specified otherwise.

1.3 Description of System

.1 In Mechanics Shop 129 provide two post lift of twin superstructure type and arranged with four swivel and telescoping arms with lifting pads, frame contact, free wheel, air-oil power system, 5000 kg minimum capacity, (2500 kg per jack) wheelrange: 2692 mm to 4216 mm.

.2 Travel: 1.8 m minimum rise.

.3 Superstructure:
.1 Front: 1320 mm length with arms extended and 710 mm length with arms retracted.
.2 Rear: 890 mm length with arms extended and 533 mm length with arms retracted.

.4 Lifting pads to rotate 360 deg, adjust in height, and have non-skid frame contact surfaces. Completely recess superstructure in floor when in lowered position.

.5 Design lift for light trucks and passenger automobiles and to provide maximum accessibility to vehicle underside for mechanics.

.6 Furnish adjustable axle supports, adapters, and accessories.

.7 Provide approved type non-rotating device to keep superstructure in alignment with wheel-locating devices and building walls. Design telescoping device to prevent jamming and damaging equipment.

1.3 Description of System (Cont'd)

.8 Provide adjustable wheel spotting indicator or other similar device for positioning vehicles above lift as approved by Engineer.
.1 Provide cable equalizer, or rack and pinion equalizer, or other means approved by Engineer to keep both superstructures level with respect to each other at all times in their travel, under all load conditions.
.2 Provide limit switch mechanism to prevent vehicle or lift from striking overhead obstruction.
.3 Mount horizontally adjustable post carriage on minimum of 4 roller bearing wheels rolling in 75 mm minimum steel channel tracks.
.4 Locate controls at least 600 mm from overhanging vehicles on lift.
.5 Provide all floor pit frames and covers, oil tank, oil, and all piping and controls, for fully operative system.

1.4 Welding

.1 Where welding is used for cylinder and pressure piping, prepare joints and weld in an approved manner using welders fully qualified for pressure vessel welding.

.2 Where deemed necessary by Engineer subject welds to radiographic or other non-destructive inspection.

1.5 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate general arrangement of equipment and pertinent details of each components.

1.6 Maintenance Data

.1 Provide maintenance data for automotive lift maintenance for incorporation into maintenance manual specified in Section 01730.

.2 Include:
.1 Operation instructions.
.2 Adjustment and care instructions.
.3 Photographs or cuts of repair parts with part numbers listed.
.4 List of recommended hydraulic fluids.
.5 Legible complete schematic and field diagrams showing electrical and hydraulic pneumatic circuits, with symbols listed corresponding to identity or markings on equipment.

PART 2 - PRODUCTS

2.1 Materials

.1 Hydraulic fluid: maximum 200 deg C fluid flash point, non corrosive, non gumming or clogging fluid which will not injure packings. Furnish sufficient quantity of hydraulic fluid to fill system.

.2 Use schedule 80 minimum steel piping and fittings sized for allowable pressure drops at required flows. Furnish piping complete with necessary isolation valves, pipe supports, and fittings, including fluid strainer in pump suction line.

2.2 Air-Oil Power System

.1 Furnish air-oil power system consisting of controls, air-oil pressure tank, drip pan, hydraulic cylinders and pistons, valves and connections. Minimize leakage from hydraulic system.

.2 Raise and lower lift in response to compressed air and hydraulic operating valves. Accomplish lowering by gravity. Design lift to stop and hold at any position.

.3 Furnish one manual lever air valve at air-oil tank to control air flow between compressor unit and air-oil tank, and one manual lever hydraulic valve for each lift post to control oil flow between air-oil tank and lift post. Provide 3-position air valve with position to allow compressed air to flow into air-oil tank, position to exhaust air from tank into atmosphere, and neutral position to shut off air flow. Provide muffler on air exhaust. Provide hydraulic valve as constant pressure manual lever valve directly controlling lift movement. Clearly and permanently mark each air and oil valve with its functions in French and English symbols.

.4 Provide one air-oil pressure tank. Fully protect tank against corrosion and provide for collection of air system water condensation by manual drain valve on lines from tank. Provide pressure-tight tank filling opening and cover. Provide safety device to render lift inoperative when fluid level in tank becomes too low.

.5 Provide connection to building compressed air system. Provide air system. Provide air connection and outlet for automotive tools.

2.3 Frames, Covers

.1 Provide the following to Section 03300 for incorporation into concrete work by that Section.
.1 Rear pit form and cover frame.
.2 Front pit form, track and frame, control box, and control box frame.
.3 Pipe chase between front and rear pits.

2.4 Piston and Cylinder

.1 Provide pistons and cylinders with self-adjusting oil seals, water seals, wipers, guide bearings, gaskets, oil connections and air elimination means.

.2 Add ballast to pistons, as necessary, to increase unloaded lowering speed to acceptable value.

2.5 Finish

.1 Ferrous metal:
.1 Clean metal surfaces, treat with phosphate.
.2 Apply one coat of primer.
.3 Apply one coat of paint finish in accordance with CGSB 1-GP-101M.

.2 Bolts, screws, nuts and washers:
.1 Zinc or cadmium finish.

PART 3 - EXECUTION

3.1 Excavation

.1 Excavate for cylinder regardless of soil, rock, water or other condition encountered.

.2 Arrange for access to site with truck mounted drilling rig where such is necessary.

.3 Where necessary due to soil conditions install casing and backfill with sand.

.4 Coordinate with pile installation if applicable.

.5 Coordinate cylinder installation with work of Section 02220.

3.2 Installation

.1 Place lift components accurately and plumb, and properly supported by building floor or structure.

.2 Arrange piping to be accessible for servicing purposes.

.3 Separate dissimilar metals, which may be subject to electrolysis upon contact, by electrolytically inactive material.

.4 Deliver pit forms, frames, boxes chases to Section 03300 for incorporation into concrete work. Do layout and establishments of lines and levels for associated concrete work. Supervise setting of forms, components, and concrete placement.

3.3 Completion and Testing

.1 Upon completion of installation install ballast in plungers to manufacturers instructions.

.2 Fill oil tank with specified oil. Carry out filling and bleeding operation to manufacturer's directions. Top up oil tank.

.3 Operate system, making adjustments required, ensuring all joints are free of leaks of either air or oil.

.4 Install all covers, housing doors, handles, and the like.

**********END**********

Project

Parry Sound, Ontario
Transport Canada
Canadian Coast Guard

Base Reconstruction

Project Number

095074/354604

Project Date

May 31, 1984

This document is the document referred to as "Plans and Specifications" and marked "A" in the Articles of Agreement entered into

on the .....day of .....19.....
Between Her Majesty the Queen

and .....

Signed .....
(Minister)

.....
(Contractor)

VOLUME ONE

VOLUME ONE (continued)

VOLUME ONE (continued)

VOLUME TWO

VOLUME TWO (continued)

VOLUME TWO (continued)

VOLUME THREE

VOLUME THREE (Continued)

VOLUME FOUR

VOLUME FOUR (CONTINUED)

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**********END**********

1 Acceptable Products

.1 Means that item named and specified by catalogue number meets specification in all respects regarding performance, quality of material and workmanship, and is acceptable to Engineer.

2 Equipment Requirements and Installation

.1 Permit equipment maintenance and disassembly by use of unions or flanges to minimize disturbance to connecting piping and duct systems and without interference from building structure or other equipment.

.2 Provide accessible means for lubricating equipment including permanent lubricated "lifetime" bearings.

.3 Base mounted equipment to be mounted on champered edge housekeeping pads a minimum of 100 mm high and 50 mm larger than equipment dimensions all around. Provided in Division 3, supervised by Division 15. Refer to drawings for location of items to be mounted on bases.

.4 Pipe drain lines to drains in an approved manner.

.5 Equipment, floor plates and ceiling plates shall line-up with building walls wherever possible.

3 Responsibility for Trial Usage

.1 Obtain written permission to start and test permanent equipment and systems prior to acceptance by Engineer.

.2 Owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing. Owner will submit list of equipment or systems which are to be tested to permit proper scheduling of work.

.3 Protect equipment and systems openings from dirt, dust and other foreign materials during trial usage.

4 Thermometers, Pressure Gauges

.1 General:

.1 Locate direct reading thermometers and gauges for reading from floor or platform.

.2 Provide remote reading thermometers and gauges where direct reading instruments cannot be satisfactorily located.

.3 Provide engraved lamacoid nameplate identifying medium adjacent to thermometers and gauges.

.4 Install thermometers in the following locations and also where indicated on the plans:

.1 on lines entering and leaving cooling coils

.2 on entering and leaving sides of domestic hot water heaters

.3 on branch hot water heating return lines

.4 on main hot water heating supply lines

.5 on leaving side of 3 way mixing valves

.5 Install gauges in the following locations and also where indicated on the plans:

.1 at main city water service entrance, 150 mm diameter.

.2 at suction and discharge of pumps, 115 mm diameter.

.3 on pipes entering and leaving cooling coils, 115 mm.

.4 at top of fire standpipe, 150 mm diameter.

.5 at both sides of pressure reducing valves, 150 mm diameter.

.6 Thermometers located over 3 m above the floor shall be remote bulb type with dial mounted on a steel or aluminum plate at eye level. Remote bulb thermometers shall be solid liquid filled with 150 mm dial and cast aluminum case.

.2 Thermometers:

.1 Provide heavy industrial, straight, angle or variable angle type, liquid filled, 175 mm scale length to CGSB 14-GP-2a.

.2 Provide bimetallic, self-indicating 100 mm dia dial type complying to CGSB 14-GP-5 with separable wells for piping.

4 Thermometers Pressure Gauges (Cont'd)

.3 Acceptable Products: Taylor-Weiss, Wexler-Ashcroft.
.4 Install thermometer wells as indicated.
.5 Scales shall be celsius type (0°C to 150°C) unless otherwise stated. Range of scale shall be approximately 20% below minimum to 20% above maximum temperature encountered.
.6 Thermometers shall have extension necks and extended stems where they are located in insulated pipes.
.7 Submit a schedule of thermometer temperature ranges for each application and receive approval thereof before the thermometers are ordered.

.3 Pressure Gauges:
.1 Provide 100 mm, dial type to CGSB 91-GP-1, having 1/2 of 1% accuracy unless otherwise stated.
.2 Acceptable Product: Peacock-Morrison, Ashcroft-Weiss, Winters, Lunkenheimer.
.3 Provide Canadian registration number.
.4 Scales shall be kilopascal type. Operating pressure or vacuum indication shall fall in the middle 1/3 of the scale range. Submit schedule of scale ranges for each application. Schedule shall be approved before gauges are ordered.
.5 Install an isolating globe valve in the gauge line.
.6 Use materials compatible with system requirements.

5 V-Belt Drives

.1 Fit reinforced belts in sheave matched to drive. Multiple belts on unit to be matched set.

.2 Use cast iron or steel sheaves secured to shafts with removable keys.

.3 For 0.25 kW to 7.5 kW motors use standard adjustable pitch drive sheaves, having ±10% range. Use mid-position of range for specified r/min.

.4 For over 7.5 kW motors, use sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size as approved to suit balancing.

5 V-Belt Drives (Cont'd)

.5 Use minimum drive rating of 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.6 Provide motor slide rail adjustment plates, allowing for centre line adjustment.

.7 Make allowance to provide additional pulleys and belts after start-up at no additional cost to the Owner to suit actual field operating conditions.

6 Guards

.1 Provide guards for exposed drives.

.2 Guards for drives shall have:
.1 Expanded metal screen welded to 25 mm steel angle frame.
.2 1.2 mm thick galvanized sheet metal tops and bottoms.
.3 Removable sides for servicing.
.4 38 mm dia hole on shaft centre for insertion of tachometer.
.5 Be self supporting.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to permit movement of motors for adjusting belt tension.

.5 For flexible couplings, provide removable, "U" shaped, 2.7 mm thick galvanized frame and 1.2 mm thick expanded mesh face.

.6 Provide 19 mm galvanized mesh wire or expanded metal screen on inlet or outlet of exposed fan blades.

.7 Guards are not required where fan and motor are contained in a cabinet all forming a part of a factory built unit.

7 Pipe Hangers and Supports

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1-1977, Part 5, and requirements of ULC C203.

.2 Set inserts in position in advance of concrete work. Use grid system in equipment rooms.

7 Pipe Hangers and Supports (Cont'd)

.3 Support from top of structural members. Where structural bearings do not exist or inserts are not in suitable locations, suspend hangers from steel channels or angles. Provide supplementary structural members. Obtain approval before using vertical expansion shields. Use minimum two shields for each hanger. Do not suspend from metal deck. Anchoring of piping and equipment shall be to manufacturers recommendations. Submit anchorage system for review.

.4 Hang or support horizontal cast iron drainage piping, installed above grade, at every hub. Hangers shall properly fit outside diameter of pipe. Hangers shall be Clevis type.

.1 Acceptable Products:
E. Myatt & Co. Ltd. - Fig. 126;
Grinnell Co. of Canada Ltd.
Fig. 260 for soil pipe
Fig. 590 for C.I. pressure pipe

.5 Horizontal piping and size of hanger rods for service other than plumbing shall have maximum support space as follows:

NOM. PIPE SIZE	MAX. SPAN M	ROD DIAM mm	NOM. PIPE SIZE	MAX SPAN M	ROD DIAM mm
NPS 1/2	1.5	10	NPS 4	4.2	16
NPS 3/4	1.8	10	NPS 5	4.8	16
NPS 1	2.0	10	NPS 6	5.1	22
NPS 1-1/2	2.8	10	NPS 8	5.7	22
NPS 2	3.0	10	NPS 10	6.6	
NPS 2-1/2	3.3	10	NPS 12	6.9	
NPS 3	3.6	10			
NPS 3-1/2	3.9	10			

.6 Spacing where pipes are grouped shall satisfy the smallest size pipe.

.7 All buried drainage installed south of grid line 10 in Shop Building and all buried drainage in Hangar Building shall be suspended from structural slab on both sides of each joint and every 1.5 m between joints using 12 mm diameter, Type 304 stainless steel threaded rods

7 Pipe Hangers and Supports (Cont'd)

and type 304 stainless steel hanger clamps equal to Grinnell Model #295H rod shall be secured to clamp using a Grinnell Model #290 eye nut and suspended from structural slab by wrapping rod over reinforcing steel.

.8 Hangers, for piping, other than cast iron drainage unless otherwise specified, shall be Clevis type.

.1 Acceptable Products:

.1 E. Myatt & Co. Ltd.

Fig. 124 for uninsulated piping,
Fig. 124L for insulated hot piping,
Fig. 125 for heavy duty uninsulated piping,
Fig. 125L for heavy duty insulated hot piping,
Fig. 124 or 125 for hangers sized to suit O.D. of insulation for cold piping.

.2 Grinnell Co. of Canada Ltd.
Fig. 260 for uninsulated piping,
Fig. 300 for insulated hot piping,
Fig. 260 for hanger sized to suit O.D. of insulation for cold piping.

.9 Hangers, for piping, other than cast iron drainage where horizontal axial motion is excessive and headroom is limited, shall be roller type.

.1 Acceptable Products:

.1 For pipe sizes up to and including NPS 5: E. Myatt & Co. Ltd. - Fig. 258, Grinnell Co. of Canada Ltd. - Fig. 174.

.2 For pipe size NPS 6 and over: E. Myatt & Co. Ltd. - Fig. 261,
Grinnell Co. of Canada Ltd. - Fig. 171.

.10 Hangers, for copper or brass piping not being used for domestic cold or chilled water service, shall be copper plated or plastic coated.

.1 Acceptable Products: E. Myatt & Co. Ltd. - Fig. 152CT, Grinnell Co. of Canada Ltd. - Fig. 97-C

7 Pipe Hangers and Supports (Cont'd)

.11 Support vertical cast iron drainage piping, including soil, waste, vent stacks, and rainwater leaders at hubs by a riser clamp located at every other floor slab. Bolt riser clamps around pipe and anchor to concrete slab.

.1 Acceptable Products:
E. Myatt & Co. Ltd. - Fig. 182, Grinnell Co. of Canada Ltd. - Fig. 261.

.12 Fit piping supported on roll type hangers, excepting chilled water or copper plumbing pipes, with pipe covering protection saddles. Properly size hanger rolls to fit protection saddles.

.1 Acceptable Products:
E. Myatt & co. Ltd. - Fig. 210-240, Grinnell Co. of Canada Ltd. - Fig. 160-165.

.13 Hangers, installed under domestic cold water and chilled water piping or covered cooling tower piping, shall be large enough to go completely around covering.

.14 Place a protection shield between hanger and covering. Protection shields shall be of carbon steel either galvanized or prime coated with corrosion resistant paint.

.1 Acceptable Products:
E. Myatt & Co. Ltd. - Fig. 251, Grinnell Co. of Canada Ltd. - Fig. 167.

.15 Size clevis and roller type hangers supporting any other piping systems to suit bare pipe.

.16 A fabricated hanger may be used where groups of pipes, having the same slope, are run together. Provide a separate roll for each pipe and mount rolls on a suitable trapeze.

.1 Acceptable Products:
E. Myatt & Co. Ltd. - Fig. 262 and 264, Grinnell Co. of Canada Ltd. - Fig. 175 and 177.

7 Pipe Hangers and Supports (Cont'd)

.17 Use adjustable roll hangers for piping supported from below.

.1 Acceptable Products:
E. Myatt & Co. Ltd. - Fig. 262 and 266, Grinnell Co. of Canada Ltd. - Fig. 177 and 274.

.18 Supporting bolts shall be one of maximum size that can be used with required hangers and shall be complete with locking stop nuts.

.19 Vertical pipes, other than cast iron drainage, shall be suitably supported by means of riser clamps.

.1 Acceptable Products:
E. Myatt & Co. Ltd. - Fig. 182 for standard applications, Grinnell Co. of Canada Ltd. - Fig. 261 for standard applications. Hanger standard 40 for critical applications.

.20 Fit a pipe hanger on horizontal pipes not more than 300 mm from one side of the elbow, wherever pipes change direction either horizontally or vertically. Support main pipe run as close as possible to tee, at points where pipes drop from tee branches.

.21 A horizontal traveller, attached perfectly horizontal to ceiling on steelwork, may be used, where headroom limits swing of hanger rods, and lateral motion is expected at 90 degrees to run.

.1 Acceptable Products:
Grinnell Co. of Canada Ltd. - Fig. 170.

.22 Use pipe roll with horizontal travellers to accommodate axial motion.

.1 Acceptable Products:
E. Myatt & Co. Ltd. - Fig. 258 or 261, Grinnell Co. of Canada Ltd. - Fig. 171 or 174.

.23 Arrange upper support and pipe attachment to allow hanger rods to pivot where headroom is sufficient to allow ample rod swing.

7 Pipe Hangers and Supports (Cont'd)

.1 Acceptable Products:
.1 Welded beam attachment:
E. Myatt & Co. Ltd. - Fig. 530
Grinnell Co. of Canada Ltd. - Fig. 66.
.2 Beam Clamp:
E. Myatt & Co. Ltd. - Fig. 500, 510, 511, Grinnell Co. of Canada Ltd. - Fig. 218, 228 and 292.
.3 Ceiling Flanges:
Grinnell Co. of Canada Ltd. - Fig. 154 and 155.
.4 Pipe Clamps:
E. Myatt & Co. Ltd. - Fig. 133, 134, 136, Grinnell Co. of Canada Ltd. - Fig. 212, 216 and 295.
.5 Welded eye nuts:
E. Myatt & Co. Ltd. - Fig. 480
Grinnell Co. of Canada Ltd. - Fig. 290.

.24 Provide spring hangers where indicated or where called for under Section 15030.
.1 Provide spring hangers to compensate for thermal expansion of vertical piping. Submit for approval an isometric sketch showing load, travel conditions, and spring selection data for each hanger location.

.25 Conduit hangers shall be galvanized after fabrication.
.1 Acceptable Products:
Burndy Canada Ltd., Canadian Struct Products, Ltd., Electrovert Ltd., E. Myatt & Co., Ltd., Steel City Electric Co.

.26 Do not use perforated strapping (grabbler bars) to hang conduit.

.27 Install hanger rods vertically without bends or offsets so that finished piping is true with respect to both line and grade. Refer to table for sizes. Adjust hanger rods to equalize loads.

.28 Submit arrangement and type of hangers and wall hooks for review.
.1 Place support within 300 mm of each horizontal elbow.
.2 Hangers shall be 3 piece minimum standard ie. attachment, rod, pipe attachment.

7 Pipe Hangers and Supports (Cont'd)

.3 Mild steel wall hooks may be used to support non-expanding piping. Allow 25 mm minimum clearance for insulated pipe.

.4 Provide riser clamps as indicated.

.29 Provide channel and clamps for piping supported vertically on corridor walls in Shop Building and exterior walls in pipe tunnel and Hangar Building as detailed on Drawing #M-12, Detail 8.

.1 Acceptable Product:
Unistrut of Canada Ltd.

8 Sleeves

.1 Provide pipe sleeves at points where pipes pass through masonry or concrete.

.2 Provide sleeves of minimum 0.8 mm thick galvanized sheet steel with lock seam joints for sleeves installed in walls above grade.

.3 Use cast iron or steel pipe sleeves with annular fin continuously welded at midpoint:

.1 Where sleeve extends above finished floor.

.2 For sleeves installed in outside foundation walls below grade.

.4 Sizes:

.1 Provide 6 mm clearance all around, between sleeve and pipes or between sleeve and insulation.

.2 Where piping passes below footings, provide minimum clearance of 50 mm between sleeve and pipe. Backfill up to underside of footing with concrete of same strength as footing.

.5 Terminate sleeves flush with surface of concrete and masonry and 50 mm above floors. Not applicable to concrete floors on grade.

.6 For pipes passing through roofs, use cast iron sleeves with caulking recess and flashing clamp device. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make water-tight durable joint.

8 Sleeves (Cont'd)

.7 Fill voids around pipes. Remove plastic sleeves:

.1 Caulk between sleeve and pipe in below grade floors with oakum and lead between sleeve and pipe.

.2 Where sleeves pass through walls or floors, caulk space between insulation and sleeve or between pipe and sleeve with fibreglass or waterproof fire retardent nonhardening mastic. Seal space at each end of sleeve with waterproof, fire retardant, nonhardening mastic.

.3 Ensure no contact between copper tube or pipe and ferrous sleeve.

.4 Fill future-use sleeves with lime plaster or easily removable filler.

.5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint.

.8 Where pipes pass through fire rated walls, floors and partitions, pack space between with asbestos rope and seal with caulking in accordance with CGSB 19-GP-9Ma.

.9 Temporarily plug all openings during construction.

.10 Seal annular space between sleeve and pipe, where bare pipe passes through a sleeve in outside foundation walls, with a modular mechanical type seal, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and the sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely watertight seal between the pipe and the sleeve.

.1 Acceptable Product:
Thunderline Linkseal as distributed by Corrosion Services Ltd.

8 Sleeves (Cont'd)

.11 Where openings for duct pass through floor or ceiling slabs in mechanical rooms and in other locations as shown, seal the void between duct and formed opening by installing a sleeve around each duct and packing between sleeve and formed opening with 75 mm of lightweight concrete trowelled to a smooth finish using 2 layers of 15 mm drywall plaster board for forming.

.12 Submit sleeving drawings for all sleeves and openings required in concrete work in ample time so that drawings can be reviewed and the sleeves can be set in the forms before the concrete is poured.

9 Escutcheons and Plates

.1 Provide on pipes passing through finished walls, partitions, floors and ceilings.

.2 Use chrome or nickel plated brass, solid type or split type ss no. 302 with set screws for ceiling or wall mounting. Finish to be approved by Engineer.

.3 Inside diameter shall fit around finished pipe. Outside diameter shall cover opening or sleeve.

.4 Where sleeve extends above finished floor, escutcheons or plates shall clear sleeve extension.

.5 Secure to pipe or finished surface but not insulation.

10 Tests

.1 Provide the following supplementary requirements to tests specified:

.1 Give written 24 hour notice of date when tests will be made.

.2 Do not insulate or conceal work until tested and approved. Follow construction schedule and arrange for tests.

.3 Conduct tests in presence of Engineer.

.4 Bear costs including retesting and making good.

.5 General:

.1 Conduct performance, leakage and grade tests as specified and as

10 Tests (Cont'd)

requested by inspection authorities having jurisdiction both during progress of Work and at its completion, to prove that equipment and systems meet quality of installation, workmanship and operating characteristics called for.

.2 Method and details of tests shall be submitted in writing. Approval of same shall be obtained before commencing any tests.

.3 Supply test equipment, apparatus, gauges, meters and the like, together with skilled personnel as required to perform tests and record results.

.4 Give notification in writing to those concerned in advance, of tests. Either the Owner's representative or the inspection authority having jurisdiction shall witness tests.

.5 Do not subject expansion joints, flexible pipe connections, meters, control valves, converters and fixtures, to test pressures, greater than stated working pressure of equipment. Isolate or remove equipment or device during tests when prescribed test pressure is greater than working pressure of any piece of equipment or device.

.6 Should a section of pipe or duct fail under test, repair and retest the pipe or duct. Repeat this process until person witnessing test is satisfied with test results.

.7 Replace faulty fittings, pipe or duct with new fittings, pipe or duct.

.8 Do not repair screwed joints by caulking nor welded joints by peening.

.9 Where it is necessary to test portions of duct and piping systems before the system is complete, overlap successive tests so that no joint or section of duct or pipe is missed in the testing.

10 Tests (Cont'd)

.10 Thoroughly clean piping and ducts after completion of tests, in accordance with instructions in the appropriate Articles of these Specifications. Clean strainers and filters after the cleanout period.

.11 Test and calibrate controls, PRV's, instrumentation and relief valves after the cleanout period. Adjust valves and dampers and balance systems in an approved manner so that job is left ready for continuous and efficient operation.

.12 Test components and control systems during full operation of systems to allow proper functioning and sequencing of systems under every condition of operation.

.13 Supply lubricating oils and packing as required for proper operation of equipment and systems until the Work has been accepted.

.14 Demonstrate upon completion of the Work and testing of same, that all tests and calibrations have been carried out satisfactorily. Repeat any tests if so requested.

.6 Testing Plumbing:

.1 Test drains for tightness and grade as required by the Ontario Water Resources Commission Act, Regulation No. 647.

.2 Hydrostatically test domestic water piping to a pressure of at least 1034 kPa.

.3 Make special tests for service piping, including automatic sprinkler as described under the appropriate Sections of Specification for these services.

.4 Tests shall last at least twenty-four (24) hours and if leaks develop, these shall be corrected and test repeated in an approved manner and to satisfaction of inspection Authorities.

.7 Testing, Heating and Cooling:

.1 Hydrostatic test hot water heating, chilled water and condenser water piping, to prove tight

10 Tests (Cont'd)

at not less than 1-1/2 times the working pressure of final system pressures, but not less than 52.5 kPa which shall hold without pressure drop for a period of not less than twelve (12) hours without pumping. Make correction for variations in ambient temperature between start and finish of this test. Give welded joints a hammer test during the hydrostatic test.

.2 Test compressed air risers for Automatic Controls, in accordance with requirements of local and provincial authorities.

.8 Testing Ventilation:

.1 Test medium pressure ductwork with air pressure of 1.5 kPa. Examine construction joints for damage or weakening. Reduce pressure to the maximum working pressure or 1.0 kPa whichever is larger, and check joints for audible leaks. Mark each leak and repair after pressure is released.

.2 Test air leakage in the entire system for a period of one hour, taking readings every two minutes, using a suitable approved flow measuring device. Leakage of the total system shall not exceed 5% of the rated capacity of the system in m^3/s. The permissible leakage where part of a system is tested shall be proportioned to the amount of the system tested.

11 Painting

.1 Apply at least one coat of corrosion resistant primer paint to supports, and equipment fabricated from ferrous metals.

12 Special Tools and Spare Parts

.1 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass installed.

.4 One set of v-belts for each piece of machinery.

.5 One set of filters for each filter bank installed.

12 Special Tools and Spare Parts (Cont'd)

.2 Identify spare parts containers as to contents and replacement parts number.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers.

.4 Furnish one grease gun and adaptors to suit different types of grease and grease fittings.

.5 Upon completion of project and immediately before hand-over, replace all filters.

13 Access Doors

.1 Supply access doors for furred ceilings or spaces for servicing equipment and accessories or for inspection of safety, operating or fire devices for installation under section erecting the walls or ceilings.

.2 Access doors shall be flush mounted 600 x 600 mm for body entry and 300 x 300 mm for hand entry unless otherwise noted. Doors shall open 180° have rounded safety corners, concealed hinges, screwdriver latches and anchor straps. Steel shall be prime coated. Doors shall be of approved manufacturer with published literature.

.3 Provide stainless steel access doors for tiled, marble or terrazzo surfaces.

.4 Acceptable Product: Zurn, Wade-Le Hage-Buensod.

.5 Submit list of proposed access door locations and obtain approval before commencing access door installation.

.6 In removable panel type ceilings provide approved colour marking devices at 4 corners below point requiring access.

14 Dielectric Couplings

.1 Provide wherever pipes of dissimilar metals are joined.

.2 Provide insulating unions for pipe sizes NPS 2 and under and flanges for pipe sizes over NPS 2.

14 Dielectric Couplings (Cont'd)

.3 Cast brass adapters may be used where approved by the Engineer.

.4 Provide felt or rubber gaskets to prevent dissimilar metals contact.

15 Instruction of Operating Staff

.1 Provide certified personnel to assist and instruct operating staff on operation of mechanical equipment. Provide maintenance specialist personnel to instruct operating staff on maintenance and adjustment of mechanical equipment and any changes or modification in equipment made under terms of guarantee.

.2 Provide instruction during regular work hours prior to acceptance and turn-over to operating staff for regular operation.

.3 Use operation and maintenance data manual for instruction purposes. On completion of instruction, turn one manual over to chief operating engineer, the balance to Owner.

.4 Instruction period shall be not less than 3 working days for summer operation and 3 working days for winter operation of the system (total 6 working days).

.5 The duration of the session and those present shall be recorded.

16 Supports and Bases

.1 Supply and erect special structural work required for the installation of mechanical equipment. Provide anchor bolts and other fastenings unless noted otherwise. Mount equipment required to be suspended above floor level, where details are not shown, on a frame or platform bracketted from the wall or suspended from the ceiling. Carry supports to either the ceiling or the floor, or both as required, at locations where, because wall thickness is inadequate, it is not permitted to use such brackets.

16 Supports and Bases (Cont'd)

.2 Concrete bases for mechanical equipment, which do not require vibration isolation mountings, shall conform to the following table unless otherwise specified or shown:

Equipment kW	Thickness of Base
Up to 7.5	150 mm (maximum for fans)
11.1 to 18.6	250 mm
22.3 and over	300 mm

.3 Dowel concrete bases in direct contact with floor slab into concrete floor slab with not less than four 12 mm diameter steel rods. Fasten rods to floor slab reinforcing steel before pouring.

.4 Provide concrete bases for equipment, which are not in direct contact with the floor slab, i.e. "Floating", complete under the Section supplying the equipment.

.5 Foundations above floor shall be 75 mm larger all around than base of apparatus. Chamfer corners 25 mm and finish to make a smooth, neat surface using plywood formwork and 1350 Kg. concrete.

.6 Set equipment baseplates on a minimum 12 mm grout and fill hollow portion of base with concrete.

.7 Vibration mountings required between equipment and base, or inertia pad and base shall have all requirements of the vibration mountings manufacturer incorporated therein.

.8 Support coils in air supply units by means of a structural steel frame at least 600 mm above finished floor unless otherwise shown or stated.

.9 Support hangers, in general, from inserts in concrete construction or from building structural steel beams, using beam clamps. Provide additional angle or channel steel members, required between beams for supporting pipes and conduits.

16 Supports and Bases (Cont'd)

.10 Provide any additional supports required from existing concrete construction for any piping or equipment, by drilling same and installing expansion bolt cinch anchors.

.1 Accepable Manufacturer: Canadian Cinch Anchor Systems Ltd.

.11 Do not use explosive drive pins in any section of Work without obtaining prior approval.

17 Grounding

.1 Ground electrical equipment and wiring in accordance with Canadian Electrical Code and Local Inspection Authority's rules and regulations.

.2 Install grounding conductors, outside electrical Rooms and Electrical closets, in conduit and conceal where possible. Make connections to water mains, neutral and equipment with brass, copper or bronze bolts and connectors or weld using Cadweld or Thermoweld processes.

.3 Provide grounding conductors, sized as per code, and connect to grounding bus or water main wherever non-metallic raceways are installed.

.4 Clean exposed copper to a bright surface and finish with two coats of clear insulating varnish.

.5 Ground motors 14.9 kW and larger with a separate ground wire back to ground terminal in starter and provide a ground lug bolted directly to the motor frame.

.6 Ground motors smaller than 15 kW through supply conduit system and conforming with Code.

18 Wiring for Mechanical

.1 A starter, and/or disconnect switch as required, together with required pilot lights and remote switches shall be provided by trade Section of Mechanical Division 15 for each motor or electrical item requiring control provided by that trade.

.2 Where individual starters and controls are grouped together, a panel for mounting this equipment shall be provided by Contractor under Mechanical Division 15.

18 Wiring for Mechanical (Cont'd)

.3 Where a separate disconnect switch is provided wiring between disconnect and starter shall be by trade providing the starter.

.4 Wiring from splitter to disconnect switch or combination starter will be under Electrical, Division 16.

.5 Conduit and wiring to line side of remotely located starters or to line terminals of Motor Control Centres will be provided under the Electrical Division 16. Wiring, conduit and fittings, from these points to motor or item being controlled shall be provided under trade Section of Mechanical Division 15 supplying the motor or item being controlled.

.6 Wiring to water unit heaters and cabinet unit heaters will be under Electrical Division 16 and will terminate in a junction box installed adjacent to the motor or device being controlled. Provide wiring and conduit from this box to the starter and thermostat or other device including connections thereto.

.7 Wire final 300 mm to 450 mm of motor connections with flexible conduit.

.8 Wiring, motors, control devices and electrical equipment provided under Mechanical Division 15 shall conform to the Canadian Electrical code as amended to date.

.9 Wiring methods and standards shall conform with those specified in Electrical Division 16 for the area of the building in which the installation is to be made.

.10 Install wiring in conduit unless otherwise noted.

.11 Use thin wall conduit up to and including NPS 1-1/4 size for wiring in ceilings, furred spaces, in hollow walls and partitions and where not exposed to

18 Wiring for Mechanical (Cont'd)

mechanical injury. Use rigid galvanized steel conduit for wiring in poured concrete, where exposed and for conduit NPS 1-1/2 size and larger.

.12 Run conduit and cables in finished areas concealed above ceilings and in partitions. Run conduit and cable exposed in any unfinished areas such as mechanical rooms, rooms with no suspended ceilings, service tunnels and penthouses and install at right angles or parallel to building lines. Boxes shall be cast type.

.13 Wiring shall be RW-90 X-Link type sized to carry 125% of the full load running current in accordance with the Electrical Code. Wiring shall be minimum No. 12 gauge, except for control wiring which shall be colour coded No. 14 gauge.

.14 Wiring to any Marine Lights, will be terminated in an outlet box on an adjacent wall, column or ceiling under Electrical Division 16. Provide wiring, conduit, switches and marine lights to complete installation.

.15 Marine lights shall be complete with Pyrex globe, wire guard and 100 watt I.F. lamp.

.1 Acceptable Products:
Crouse Hinds - Type ARB-31,
Killark - Type VOBG-100.

.2 Switches shall be 20 amp., single pole, with neon pilot light, installed in a cast metal condulet box.

.1 Acceptable Products: Smith & Stone - No. 4-4901.

.3 Mount switches in an easily accessible location on outside of plenum, or as otherwise directed on site. Provide one switch for each fan system, except that in no case shall more than 12 lights be controlled by one switch. Provide a minimum of one marine light per 3 m width of plenum. Mounting height of light shall be as directed on site.

19 Excavation and Backfill

.1 Excavation and backfilling for mechanical work is specified in Section 02220.

.2 Ensure that excavation for underground mechanical services is in location and at depth indicated. Provide protective materials around and over services and be present at all times during excavation and backfilling to supervise work.

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20 Cutting and Remedial Work

.1 Set sleeves and mark openings in concrete forms and in masonry before placing of concrete and erection of masonry. Assume full responsibility for laying out mechanical work and for any damage caused by incorrectly located equipment and mechanical services.

21 Staging of Construction

.1 Refer to Section 10005 for Staging of Construction. Provide temporary and permanent mechanical services as shown to accommodate staging.

Pg. 19 Addendum #1

.2 Stage 1 - Helicopter Hanger
.1 Complete mechanical services for hanger building including temporary connections as shown for fire protection, domestic water, storm, sanitary, compressed air and propane.
.2 New helicopter fuel tanks and connections to existing fuel dispensers.

.3 Stage 2 - Shop Wing of Main Building and Flammable Liquid Storage Building
.1 Complete mechanical services as shown for both buildings.
.2 Replace temporary connections with permanent connections in hangar building.

.4 Stage 3 - Completion of Contract including:
.1 Permanent mechanical connections to shop wing of main building.
.2 Mechanical services to guard house.
.3 Installation of fuel storage tanks and dispensers in workboat area.

**********END**********

1 Identification of Equipment

.1 Manufacturer's Nameplates:

.1 Provide on each piece of equipment a metal nameplate, mechanically fastened with raised or recessed letters.

.2 Include registration plates e.g. pressure vessel, Underwriters' Laboratories Canada and CSA approval, as required by respective agency and as specified. Indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors, all factory supplied.

.3 Locate nameplates so that they are easily read. Do not insulate or paint over plates.

.2 System Nameplates:

.1 Provide laminated plastic plates with black face and white centre of minimum size 90 x 40 x 2.5 mm nominal thickness, engraved with 6 mm high lettering. Use 25 mm lettering for major equipment.

.2 Fasten nameplates securely in conspicuous place. Where nameplates can not be mounted on cool surface, provide standoffs.

.3 Identify equipment type and number e.g. pump No. 2 and service or areas or zone of building served e.g. south zone chilled water primary.

.4 Submit list of equipment nameplates for review prior to engraving.

2 Identification of Piping

.1 Comply with standard detail drawing plate "Identification of Piping Systems" number 15010.101.

.1 Identify medium in piping with markers showing name and service and directional flow arrows where relevant.

.2 Apply primary colours in exposed areas only, on finished piping surfaces include secondary colour bands to indicate type and degree of hazard.

.3 Conform to CGSB 1-GP-12c Colour Coding System Schedule as follows:

Primary Classification	Secondary Classification	Legend Type and Direction Arrows
Yellow 505-101	Orange 508-102	Black 512-101
Green 503-107	Purple 511-101	White 513-101
Blue 202-101	Black 512-101	
Red 509-102	Yellow 505-101	
	White 513-101	

2 Identification of Piping (Cont'd)

.2 Manufactured Pipe Markers and Colour Bands:

.1 Provide plastic coated cloth material with protective overcoating and waterproof contact adhesive undercoating, suitable for continuous operating temperature of 150°C and intermittent temperature of 200°C. Apply to prepared surfaces.

.2 Apply 50 mm wide tape single wrap around pipe or pipe covering with ends overlapping one pipe diameter but not less than 25 mm for colour bands.

.3 Use block capital letters 50 mm high for pipes of 75 mm nominal and larger od including insulation and not less than 20 mm high for smaller diameters.

.4 Use direction arrows 150 mm long by 50 mm wide for piping of 75 mm nominal or larger od including insulation and 100 mm long by 20 mm wide for smaller diameters.

.5 Use waterproof and heat resistant plastic marker tags for pipes and tubing of 20 mm nominal and smaller od.

.6 Use black pipe marker letters and direction arrows. Use white on red background for fire protection pipe markers.

.3 Acceptable Products: WH Brady identification tapes, bands, markers; Seton Name Plate Corporation Setmark pipe markers.

.4 Location of identification:

.1 Locate markers and classifying colours on piping systems so they can be seen from floor or platform.

.2 Identify piping runs at least once in each room.

.3 Do not exceed 15 m between identifications in open areas.

.4 Identify both sides where piping passes through walls, partitions and floors.

.5 Where piping is concealed in pipe chase or other confined space, identify at point of entry and leaving, and at each access opening.

.6 Identify piping at starting and ending points of runs and at each piece of equipment.

2 Identification of Piping (Cont'd)

.7 Identify piping at major manual and automatic valves immediately upstream of valves. Where this is not possible, place identification as close to valve as possible.

.5 Submit table legends with colour classifications to Engineer for approval review before ordering material where colours differ from following table.

.6 Table: Pipe and valve identification to be completed.

3 Identification of Ductwork

.1 Use 50 mm high black stencilled letters, e.g. "Cold", "Hot", "Return", "Sanitary Exhaust", "Kitchen Exhaust" with directional flow arrow. Nomenclature to be submitted for approval.

.2 Maintain 15 m maximum distance between markings.

.3 Identify ducts each side of dividing walls or partitions and beside each access door.

.4 Stencil over final finish only.

4 Identification Valves and Controllers

.1 Provide brass tags with 12 mm stamped of code lettering and numbers filled with black paint. Secure with non-ferrous chains or "S" hooks. Use for all valves and operating controllers.

.2 Provide Engineer with six identification flow diagrams of approved size for each system. Include tag schedule, designating number, service, function, and location of each tagged item and normal operating position of valves.

.3 Mount where directed one copy of flow diagram and schedule mounted in glazed frame. Provide one copy in each maintenance instruction manual.

.4 Consecutively number valves in system.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

.2 Provide shop drawings to the General Contractor for setting anchor bolts and other appurtenances necessary for the proper installation of this equipment.

.3 Submit drawings for approval showing complete details of foundations including necessary concrete and steel work, vibration isolation devices and reinforcing steel.

.4 Vibration Isolation Manufacturer shall supply the above mentioned shop drawings and steel forms for inertia bases.

.5 Supply necessary information to the Vibration Isolation Manufacturer regarding equipment to be isolated.

1.2 Maintenance Data

.1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.3 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

1.4 Manufactured Items

.1 Sound attenuators and vibration isolators shall be product of one manufacturer for generic type.

.2 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

1.5 Test Reports

.1 Manufacturer's representative shall visit site 4 times, at specified intervals, during installation and shall submit inspection reports in writing for each visit.

.2 After start-up, final corrections and balancing of systems, independent testing agency shall take octave band sound measurements over full audio frequency range in areas adjacent to mechanical equipment rooms, duct and

1.5 Test Reports (Cont'd)

pipe shafts, and in other locations as directed by the Engineer.

.3 Include cost in tendered price of this work including travel time.

.4 Submit complete report of test results including sound curves.

PART 2 - PRODUCTS

2.1 General

.1 Mount equipment, apparatus and piping on approved foundations or suspend from approved supports, as specified herein, shown, or as required. Refer to Clause "Supports and Bases"; in this Specification which assigns responsibility for the provision of concrete foundations (floating floor slabs, inertia base, housekeeping pads and curbs) in accordance with design and supervision as specified hereinafter.

.2 Maximum transmissibility shall not exceed 2%.

.3 Refer to drawings for details of the various materials and application group designations specified below and on Drawings.

.4 Sound and Vibration Control Manufacturer shall make four field visits during construction to ensure that equipment isolated by his devices has been installed strictly in accordance with his recommendations. Submit a report after each visit on the status and condition of vibration and sound control installation.

.5 Make sound measurements in accordance with the American Standard Method for the Physical Measurements of Sound S1.2-1962. Obtain silencer acoustic ratings using the insertion loss duct-to-reverberant room method as currently applied at Riverbank Acoustic Laboratories. Obtain silencer pressure drop ratings using the method currently applied at Texas Engineering Station. Sound control devices being used on project shall have been tested by an approved acoustic laboratory. Submit published ratings for approval.

2.1 General (Cont'd)

.6 Equipment shall be adequately isolated or acoustically treated to maintain an acceptable noise level in occupied areas of the building. Drawings and Specifications shall be referred to for areas in which a lower or higher noise level is acceptable. Approved, qualified personnel shall take noise measurements over complete audible frequency range in occupied zones adjacent to mechanical equipment rooms and main duct shafts, and in other locations as requested.

.7 Submit a report, complete with resultant sound curves confirming that equipment has been adequately isolated and that acceptable noise levels exist in occupied zones (reference ASHRAE Guide 1965-66 Average "NC" levels). Acceptable levels shall be as follows:

.1	General office (open)	NC38
.2	Private office	NC36
.3	Cafeteria (unoccupied)	NC40
.4	Lobby	NC40

.8 The Equipment Manufacturer shall provide additional steel rails as required for rigidity or load distribution. Limit stops shall be provided for satisfactory operation of fan equipment. Submit construction and performance drawings and data for approval of devices to be used before commencing construction.

2.2 Springs

.1 Springs shall be stable, colour coded and selected to operate at no greater than 2/3 solid deflection.

.2 Springs for outdoor or high humidity applications shall have two coats of neoprene.

.3 Outside spring diameter shall be a minimum of 0.8 times rated vertical operating height and the ratio of horizontal stiffness to vertical stiffness (kx/ky) shall be greater than 1.2 times ratio of static deflection to operating height.

2.3 Spring Mounts

.1 Spring mounts shall be complete with levelling devices, 0.6 mm thick ribbed rubber sound pad bonded to load plate. Fasteners shall be zinc chromate plated and mounts for outdoor or high humidity

2.3 Spring Mounts (Cont'd)

applications shall have two coats of neoprene.

.2 Mounts bolted to floor shall be complete with rubber isolation washers.

.3 Type I mounts shall be closed spring type mounts with top and bottom housings separated with neoprene rubber stabilizers.

.4 Type II mounts shall be open spring type mounts with extra stiff springs having a minimum kx/ky of 1.0.

.5 Type III mounts shall be controlled type mounts with heavy rigid steel base frames, built-in vertical limit stops and removable spacers. Springs shall be extra stiff having a minimum kx/ky of 1.0. Clearances between metal parts shall be 12 mm minimum.

2.4 Spring Hangers

.1 Type SH shall be welded steel housing with one coat anti-rust paint, complete with colour coded stable spring, retaining cups and acoustic washer. Provide rubber grommet in bottom hole of spring hangers for isolating ceilings.

.2 Type SHR shall be as Type SH but shall have 25 mm elastomeric element in place of acoustic washer.

2.5 Pad Type Isolators

.1 Type AA rubber waffle or ribbed pads shall be of high quality 30 durometer natural rubber, minimum of 12 mm thick and selected for a maximum loading of 340 kPa.

.2 Type BB rubber-steel-rubber pads shall consist of two layers of Type AA pad, 12 mm thick, as specified above, bonded to 6 mm plates. Holes shall be sleeved and complete with isolation washers.

.3 Type RLS mounts shall be elastomer rubber with threaded insert and hold down bolt holes.

.4 Type R mounts shall be neoprene, 50 mm free height, with natural frequency not to exceed 15 CPS at full load. Isolator shall be capable of sustaining a load of 114 kg with maximum deflection of 6 mm.

2.6 Bases

.1 Type "A" integral steel fan and motor bases, complete with motor slide rails welded in place, shall have minimum vertical sections as follows:

MOTOR KW	VERT. SECT. (mm)
up to 2.2	75
5.6	100
14.9	150
37.3	200
over 37.3	250

.2 Submit sizes of reinforced bases having smaller vertical sections for approval.

.3 Type "B" channel slings shall be of structural members with gusset plates welded to the ends.

.4 Type "C" concrete inertia bases shall be complete with reinforcing rods. For pump bases refer to Drawings. Thickness of inertia slabs shall be as listed.

.5 Steel bases and inertia bases shall clear sub-bases by at least 50 mm. Block and shim bases level, so that duct and pipe connections can be made to a rigid system at operating level before isolator adjustment.

2.7 Silencers

.1 Silencers shall be completely fabricated with incombustible materials and shall be suitable for the system pressure. Acoustic media shall be a minimum of 40 kg/m³ density, packed under a 10 percent compression and protected from air erosion by minimum 1.6 mm perforated metal, unless otherwise specified. Silencers with internal air velocities above 22.8 m/s shall also have fibre-glass cloth air erosion protection. Silencers shall have 50 mm slip connections, unless otherwise specified. Silencers shall be galvanized or painted with anti-rust primer coat. Units 600 mm diameter and larger shall be complete with lifting lugs. See Drawings for quantities and sizes.

.2 Rectangular construction silencers for low and medium velocity applications shall have 1.6 mm minimum outer shell unless otherwise specified or indicated, with airtight mastic filled seams.

2.7 Silencers (Cont'd)

.3 Circular construction silencer outer casings shall be all welded with continuous welded seams, 1.6 mm minimum for 915 mm diameter and larger, and .85 mm galvanized steel with lock form seams for smaller diameters.

.4 Intake and exhaust silencers shall consist of individual acoustical splitters supported from and between masonry walls. Construction of the splitters shall be as previously specified except that all metal parts shall be 304 stainless steel. Splitters shall be 20 mm wide. Length, depth, number and shape shall be as shown.

2.8 Acoustic Plenums and Panels

.1 Acoustic plenums and panels shall be prefabricated 100 mm thick unless otherwise specified.

.2 Acoustic plenums shall include acoustic panels, steel supports, joiner sections, floor channels, sealing materials, fasteners and opening frames. Panels shall consist of 1.2 mm backing 0.8 mm perforated metal facing, 1.2 mm inner channel stiffeners on minimum 50 mm centres, and shall be of galvanized construction. Acoustic media fill shall be inorganic, inert, rot-proof, and minimum 72 kg/m^3 density packed under at least 10% compression. Panels shall have an absorption co-efficient of 0.99 at 250 c.p.s.

PART 3 - EXECUTION

3.1 Installation

.1 Install silencers according to manufacturer's recommendations.

.2 Refer to schedule for size, quantity and sound data of silencers.

.3 Refer to Drawings for details of isolation.

.4 Equipment not specifically named in the application of isolation shall be isolated with deflection shown in Table as a minimum requirement to meet noise criteria. Isolate equipment other than fans at a "Fan Wheel Dia." of 760 to 1370 mm.

3.1 Installation (Cont'd)

.5 Isolate motor driven mechanical equipment (except propeller fans, in-line mounted pumps and sump and sewage pumps).

.6 Isolate equipment containing water, such as refrigeration machines and cooling towers, where draining or flooding results in unloading and loading spring forces, with Type III mounts having built-in limit bolts.

.7 Mount air compressors on concrete inertia bases as detailed. Mount bases on vibration isolators as described herein. Provide air compressors with braided metallic flexible pipe connectors. Include flexible pipe hose connector on rupture disc refrigerant relief vent line. Hose and its liner shall be suitable for refrigerant used. Minimum hose working pressure shall be 1034 kPa.

.8 Equip pipe supports at vertical in-line pumps with rubber-steel-rubber pads, Type "BB".

.9 Support equipment such as water heaters, Dom. H.W. tanks when located in mechanical rooms or rooms where floor slab is directly in contact with ground, on rubber-steel-rubber pads Type "BB". Isolate equipment, mounted in rooms or areas on upper floors with spring vibration isolators.

.10 Locate isolation for equipment other than pumps as necessary to provide a stable support under saddles, frames and projections of equipment.

.11 Resiliently support piping 75 mm size or larger located within equipment or fan rooms, and also first two hangers on such piping leaving these rooms or areas, and not less than 1200 mm of horizontal piping connected to resiliently mounted equipment with combination spring hangers or spring mounts. This shall include piping in any areas which are open to outside, and piping in other locations where spring isolators are specifically indicated. Nearest point of support to any piece of equip-

3.1 Installation (Cont'd)

ment shall have an operating static deflection of twice equipment isolator deflection but not more than 50 mm. Next two supports shall have a static deflection, equal to isolator deflection but not more than 50 mm. Other spring hangers and spring mounts shall have a minimum static deflection of 25 mm.

.12 Erect floor mounted equipment, complete with steel or concrete inertia base and/or vibration devices as required, on 100 mm high concrete housekeeping pads unless otherwise specified.

.13 Provide colour coded mounts and all securing hardware such as bolts, sleeves, washers, nuts, hanger rods.

.14 Install acoustic plenums and panels where shown according to manufacturers recommendations.

**********END**********

PART 1 - GENERAL

1.1 Scope

.1 Balance, adjust and test air system and equipment and submit reports as specified.

.2 Balance, adjust and test water system and equipment and submit reports as specified.

.3 Work to be done shall include furnishing of labour, materials and equipment required for installation, testing and putting into proper operation complete air and water distribution systems. Complete systems shall be left ready for continuous and efficient satisfactory operation.

1.2 Quality Assurance

.1 Perform testing and balancing by an agency that specializes in this type of work.

.2 Procedures, in general, shall be in accordance with the latest edition of AABC's National Standards for Field Measurement and Instrumentation - Total System Balance; a reference copy shall be available at the site. Variable volume system shall be tested in accordance with "Minimum Standards for Testing and Balancing a Variable Volume System" as published by the AABC.

.3 Carry out site visits during latter stages of construction to ensure that the balancing work can be properly performed, confirm proper placement of dampers, pitot tube openings, therometer wells, balancing valves and access provided.

.4 Begin testing and balancing after systems have been completed and work fully operational.

1.3 Balancing Agenda

.1 Descriptive Data: General description of each system including associated equipment and different operation cycles, listing of flow and terminal measurements to be performed and selection points for proposed sound measurements.

1.4 Balance Report

.1 Submit copies of reports described prior to final acceptance of project.

.2 Provide reports in bound manuals complete with index page and cover identification. After completion of satisfactory spot checks, submit four (4) copies of final balancing reports.

.3 Stamp reports by a Registered Professional Engineer.

.4 Include types, serial number and dates of calibration of instruments.

1.5 System Data

.1 Reports shall include balance and equipment data listed.

.2 Air Handling Equipment Installation Data:
Manufacturer and Model:
Size:
Arrangement, Discharge and Class:
Motor type, HP, RPM, voltage, phase cycles and full load amp, location and local identification.

.3 Air Handling Equipment Design Data:
Total air flow rate:
Static Pressure:
Motor HP, RPM, and amps:
Outside air flow rate:
Fan RPM:
Fan bhp:
Inlet and outlet dry and wet bulb temperature:

.4 Air Handling Equipment Recorded Data:
Air flow rate:
Static pressure:
Fan RPM:
Motor operating amps:
Inlet and outlet dry and wet bulb temperature:

1.5 System Data (Cont'd)

.5 Duct Air Quantities - Mains, Outside Air and Exhausts (Maximum and Minimum):
Duct sizes:
Number of pressure readings:
Sum of velocity measurements:
Average velocity:
Duct Recorded air flow rate:
Duct design air flow rate:

.6 Exhaust Air Systems:
Outlet identification:
Location and designation:
Manufacturer's catalogue identification and type:
Application factors:
Design and recorded velocities:
Design and recorded air flow rates:
Deflector vane or diffuser cone settings:

.7 Pump Installation Data:
Manufacturer and Model:
Size:
Drive type:
Motor type, HP, RPM, voltage, phase, cycles and full load amps.

.8 Pump Design Data:
Water flow rate:
Head:
RPM:
bhp:

.9 Pump Recorded Data:
Discharge and suction pressures (flow and no flow):
Operating Head:
Operating water flow rate (from pump curves if metering not provided).

.10 Expansion Tank Installation Data:
Manufacturer, size, capacity:
Pressure reducing valve setting:
Pressure relief valve setting:

.11 Air Heating and Cooling Equipment Design Data:
Heat transfer rate:
Water flow rate:
Entering and leaving water temperatures:
Entering and leaving air temperatures:
Air flow rate:
Water pressure drop:

1.5 System Data (Cont'd)

.12 Air Heating and Cooling Equipment Recorded Data:
Element type and identification (location and designation):
Entering and leaving air and water temperatures:
Air and water flow rates:
Adjusted temperature rise or drop:

.13 Chilled Water Unit Installation Data:
Manufacturer and model:
Motor type, HP, RPM, voltage, cycles, phase and full load amps:
Water flow rates:
Water pressure drops:
Entering and leaving water temperatures:

.14 Chilled Water Unit Recorded Data:
Water flow rates:
Water pressure drops:
Entering and leaving water temperatures:

PART 2 - PRODUCTS

2.1 Instruments

.1 Use accurate instruments for measurements.

.2 Provide calibration histories for each instrument when accuracy of readings is questionable. Instrumentation shall be in good condition, recently calibrated and where requested instruments shall be recalibrated by an independent testing agency before proceeding with work.

PART 3 - EXECUTION

3.1 General Procedure

.1 Balance to maximum measured flow deviation of 5% of design values and take 4 traverse readings of each variable volume riser system. One at top, 1/3, 2/3 and at farthest point.

.2 Permanently mark settings on valves, splitters, dampers and other adjustment devices by directional arrows.

.3 Subsequent to correctional work, take measurements to verify balance has not been disrupted or that any such disruption has been rectified.

3.1 General Procedure (Cont'd)

.4 At final inspection, re-check random selections of data recorded in report. Re-check points of areas as selected and witnessed by the Engineer.

.5 Measurements of static pressure loss across cooling coils, and filter banks shall be taken and tabulated with manufacturer's published pressure loss ratings at the established fan air volume.

.6 Check and adjust the complete systems prior to end of warranty after final acceptance and submit report.

.7 Air System Procedure:
.1 Adjust air handling and distribution systems to provide required or design supply, return and exhaust air quantities.
.2 Make air quantity measurements in ducts by pitot tube traverse of entire cross-sectional area of duct.
.3 Measure air quantities at each air inlet and outlet.
.4 Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion levels. Effect volume control only by duct internal devices such as dampers and splitters.
.5 Vary total system air quantities by adjustment of fan speeds. Vary branch air quantities by damper regulation.
.6 Where modulating dampers are provided, take measurements and balance at extreme conditions. For variable air volume systems obtain the balancing procedure outlines from the Engineer.
.7 On the variable volume riser systems, air quantities shall be determined using pitot tube traverse at top, 1/3, 2/3 and farthest point.

.8 Water System Procedure:
.1 Adjust water systems to provide required or design quantities for each part.
.2 Use calibrated venturi tubes, orifices or other metered fittings and pressure gauges in conjunction with permanent and portable type flow meters to determine flow rates for system balance. Where flow metering devices

3.1 General Procedure (Cont'd)

are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

.3 Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

.4 Effect system balance with automatic control valves fully open to heat transfer elements.

.5 Effect adjustment of water distribution systems by means of balancing cocks, valves and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

.6 Where pump capacity available is less than total flow requirements of individual system parts, full flow in any part may be simulated by temporary restriction of flow to other parts.

.9 Co-operation:

.1 The mechanical trades shall co-operate with the Balancing and Testing Agency in the following manner:

.1 Provide sufficient time before final completion date so that tests and balancing can be accomplished.

.2 Provide immediate labour and tools to make corrections when required without undue delay. Install additional balancing dampers as required by test and balance agency.

.3 Put all heating, ventilating and air conditioning systems and equipment into full operation and shall continue the operation of same during each working day of testing and balancing.

.4 Balance and Testing Agency shall be kept informed of any major changes made to the system during construction and shall be provided with a complete set of as-built drawings.

.10 Site Investigation:

.1 During the completion of the construction of the shafts and ceiling spaces to be used for the return air systems and before these areas are completely enclosed, a representative of

3.1 General Procedure (Cont'd)

.10 (Cont'd) the Balancing and Testing Agency shall inspect and make necessary tests to ensure that proper tightness is obtained. The Balancing Agency shall make all necessary repairs to all such spaces for the purpose of making these adequately air tight; a report is to be submitted to the Architect and Engineer. Upon completion of any repairs, a re-inspection by the Balancing and Testing Agency shall be made and final report submitted.

**********END**********

PART 1 - GENERAL

1.1 Motors .1 Supply electrically driven equipment specified under Division 15 complete with motors.

1.2 Related Work .1 Installation of anchor devices, setting templates: Section 03300

1.3 Source Quality Control .1 Engineer reserves the right to witness standard factory testing of motors 37.3 kW and above.

1.4 Shop Drawings .1 Submit shop drawings in accordance with Section 01340.

.2 Indicate:
.1 Overall dimensions of motor.
.2 Shaft centreline to base dimension.
.3 Shaft extension diameter and keyway, coupling dimensions and details.
.4 Fixing support dimensions.
.5 Dimensioned position of ventilation openings. Details of ventilation duct attachments.
.6 Terminal box location and size of terminals.
.7 Arrangement and dimensions of accessories.
.8 Diagram of connections.
.9 Starting current and relative data necessary for use in design of motor starting equipment.
.10 Speed/torque characteristic.
.11 Weight.
.12 Installation data.

1.5 Maintenance Data .1 Provide data for incorporation into maintenance manual specified in Sections 01730 and 15010.

.2 Data necessary for maintenance of motors.

.3 Manufacturer's recommended list of spare parts.

1.6 Maintenance Material .1 Provide maintenance materials in accordance with Section 01730.

.2 Spare bearings, slipring brushgear, accessories.

1.7 Delivery and Storage

.1 Handle motors with suitable lifting equipment.

.2 Store motors in heated, dry, weather-protected enclosure.

.3 If delivery of a specified motor will delay delivery or installation of any equipment install a motor for temporary use. Final acceptance of equipment will not occur until the specified motor is installed.

PART 2 - PRODUCTS

2.1 Rating

.1 Nameplate rating of motor shall be not less than the input brake kW rating of the driven equipment at the specified operating condition and not less than the minimum kW specified or shown. Motors shall be sized to come up to rated r.p.m. under load within 10 seconds unless indicated otherwise.

2.2 Motors

.1 Motors up to and including 0.25 kW shall be 115 volt, 60 Hz, single phase. Motors 0.37 kW and larger shall be 575 volts, 60 Hz, three phase unless otherwise indicated in motor schedules.

.2 Motors unless otherwise specified shall be 1750 r.p.m., drip proof with ball bearings and three phase motors shall be CEMA design 'B' with Class 'B' insulation.

.3 Motors 37.3 kW and larger shall have a temperature sensing device in each winding to disconnect motor when winding overheats. Operation of sensing device shall cause a pilot light to be illuminated on the starter and a reset button on the starter must be manually operated before motor can be restarted.

.4 Motors in air ducts, plenum chambers or inside unit type air conditioning equipment shall have motor winding protection to disconnect motor when winding overheats. Single phase motors and three phase motors up to 20 HP may be protected with Klixon type motor temperature winding overheating protection.

2.3 Sensing Devices

.1 Motors equipped with these temperature sensing devices shall be guaranteed for one year against burnouts due to overheating resulting from overload, locked rotor, blocked ventilation, bearing seizure, single phasing, unusual duty cycle, high ambient and voltage unbalance.

.2 The motor manufacturer shall provide the sensing device in the motor and shall supply the compatible control unit for installation in the starter enclosure.

.3 Three phase motor temperature sensing devices and associated control units shall be as manufactured by:
.1 Canadian General Electric Co. Ltd. - Thermo-Tector with CR-125-L lock-out relay.
.2 Westinghouse (Canada) Ltd. - Thermistor with Type 3-UN-7 tripping unit.
.3 Siemens Canada Ltd. - PTC Thermistor with 3-UN tripping unit.
.4 Texas Instruments Inc. - 3-BA sensor with 3-AA switching device.

2.4 Materials

.1 Motors: to, CSA C22.2 No. 100-1974.

.2 Lead markings: to EEMAC M2-1-1966.

2.5 Motor Type

.1 Squirrel cage.

.2 In high hazard areas, motors shall be explosion proof, as indicated on Drawings.

2.6 Enclosure

.1 Open dripproof guarded.

.2 Totally enclosed nonventilated.

.3 Totally enclosed pipe ventilated for use in nonhazardous location.

.4 Refer to Drawings for type.

2.7 Insulation

.1 Class B.

.2 Ambient temperature: 40°C.

2.8 Bearings

.1 Antifriction type bearings, fitted with readily accessible facilities for lubrication.

2.9 Shaft

.1 Standard shaft extension.

2.10 Acceleration Torque/Speed Characteristic

.1 Fan manufacturer to provide for motor manufacturer, an acceleration load torque versus speed characteristic and obtain inertia of driven equipment referred to motor shaft speed and pass to motor manufacturer for use in acceleration and deceleration calculations.

2.11 Starting Method

.1 Winding connection necessary for appropriate starting method to be terminated and identified in motor terminal box.

2.12 Manufacturers

.1 Acceptable Manufacturers: Canadian General Electric Co. Ltd., Westinghouse (Canada) Ltd., Etatech Ind. Inc., Brook Electric Motors of Canada Ltd., The Prestolite Co. - Leland, Brown Boveri Canada Ltd.

PART 3 - EXECUTION

3.1 Installation

.1 Dry out motor if dampness present in accordance with manufacturer's recommendations.

.2 Install motor on driven machinery, baseplate, structure, slide rails or concrete base, ensuring it has fully cured before installation rigid plumb and square, using only lifting facilities provided.

.3 Make connections as indicated. Use liquid tight pvc jacketted flexible conduit between rigid conduit and motor.

.4 Make flexible conduit long enough to permit movement of motor over entire length of slide rails.

.5 Check for correct direction of rotation, with motor uncoupled from driven equipment.

.6 Align and couple motor to driven machinery to manufacturers instructions, using only correct parts such as couplings, belts, sheaves, as provided by manufacturer.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01340.

.2 Indicate:
.1 Mounting method and dimensions.
.2 Starter size and type.
.3 Layout of identified internal and front panel components.
.4 Enclosure types.
.5 Wiring diagram for each type of starter.
.6 Interconnection diagrams.

1.2 Operation and Maintenance Data

.1 Provide data for incorporation into maintenance manual specified in Sections 01730 and 15010.

.2 Include operation and maintenance data for each type and style of starter.

1.3 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

.2 Provide listed spare parts for each different size and type of starter:
.1 2 contacts, stationary.
.2 2 contacts, movable.
.3 1 contact, auxiliary
.4 1 control transformer
.5 1 operating coil
.6 2 fuses
.7 4 indicating lamps

1.4 Manufacturers

.1 Starter for 3 phase motors shall be supplied by the same manufacturer.

PART 2 - PRODUCTS

2.1 Materials

.1 Starters: to CSA C22.2 No. 14-1973, EEMAC E14-1.
.1 Half size starters not acceptable.
.2 CEMA 2 enclosures dripproof indoor.
.3 Fuses shall be selected in accordance with Section 15180.

2.2 Manual Motor Starters

.1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
.1 Switching mechanism, quick make and break.
.2 One overload heater manual reset.

2.2 Manual Motor Starters (Cont'd)

.2 Accessories: as stated on Drawing.

.3 Locate motor starters as shown on Drawings.

2.3 Full Voltage Magnetic Starters

.1 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
.1 Contactor solenoid operated, rapid action type.
.2 Motor overload protective device in each phase, manually reset from outside enclosure.
.3 Power and control terminals.
.4 Wiring and schematic diagram inside starter enclosure in visible location.
.5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include HRC fused disconnect switch with operating lever on outside of enclosure to control disconnect and provision for:
.1 Locking in "OFF" position with up to 3 padlocks.
.2 Locking "ON" position.

.3 Accessories:
.1 Pushbuttons, Selector switches: standard labelled as indicated.
.2 Indicating lights: standard type and colour as indicated.
.3 1-N/O and 1-N/O spare auxiliary contacts or as required to suit control sequences specified.

2.4 Control Transformer

.1 Single phase, dry type, control transformer with primary voltage as indicated and 120 V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 Finishes

.1 Apply finishes to enclosure in accordance with Section 15010.

2.6 Equipment Identification

.1 Provide equipment identification in accordance with Section 15010.

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 Magnetic starter designation label, white plate, black letters, size 2 engraved as indicated.

2.7 Manufacturers

.1 Acceptable Manufacturers are: Westinghouse Canada Inc., Canadian General Electric Company Ltd., Square D Company Limited, Allen Bradley Canada Company, Siemens Canada Ltd., Cutler Hammer Canada Limited, GTE Sylvania Canada Ltd., Klockner-Moeller.

2.8 Sensing Devices

.1 Starters, for motors equipped with temperature sensing devices in the winding, shall have installed in the starter enclosure the compatible control unit supplied by the motor manufacturer. A 110 volt control transformer, a pilot light to indicate when the sensing device has operated, and a separately identified reset button to reset the control device shall be provided in the starter.

PART 3 - EXECUTION

3.1 Installation

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

3.2 Tests

.1 Perform tests in accordance with Section 16010 and manufacturer's instructions.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check the sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Installation of anchor devices, channel base sills, setting templates: Section 03300

1.2 Source Quality Control

.1 Conduct equipment inspection at manufacturer's plant.

.2 Provide manufacturer's type test certificates.

.3 Engineer to witness standard factory testing of complete motor control centre including operation of switches, circuit breakers, starters and controls.

.4 Submit written test results.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate:
.1 Outline dimensions.
.2 Configuration of identified compartments.
.3 Floor anchoring method and dimensioned foundation template.
.4 Cable and bus duct entry and exit locations.
.5 Dimensioned position and size of busbars and details of provision for future extension.
.6 Schematic and wiring diagrams.

1.4 Operation and Maintenance Data

.1 Provide data for incorporation into maintenance manual specified in Sections 01730 and 15010.

.2 Include data for each type and style of starter.

1.5 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

PART 2 - PRODUCTS

2.1 Materials

.1 Control equipment and enclosures CSA sprinklerproof gasketted Type 1: to CSA C22.2 No. 14-1973.

.2 Control transformers: to CSA C22.2-No. 66-1956(R1969).

2.1 Materials (Cont'd)

.3 Auto transformers: to CSA C22.2 No. 47-1977.

.4 Circuit breakers: to CSA C22.2 No. 5-1963.

.5 Disconnect switches: to CSA C22.2 No.4-1974.

2.2 Supply Characteristics

.1 600 V, 60 Hz, wye connected, 3 phase, grounded neutral.

2.3 Motor Control Centre

.1 Compartmentalized vertical sections with common power busbars.

.2 Floor mounting, free standing, enclosed dead front.

.3 Indoor gasketted enclosure.

.4 Accommodating incoming circuit breaker, combination starters and disconnect switches as indicated.

.5 Front mounting.

.6 Class II, Type B.

2.4 Vertical Section Construction

.1 Independent vertical sections fabricated from rolled flat steel sheets bolted together to form rigid, completely enclosed assembly. (Motor Control Centre PH-1 shall be comprised of 2 completely separate sections, power fed independently with equalized loading in each section).

.2 Each vertical section divided into compartment units, minimum 305 mm high, as indicated.

.3 Each unit to have complete top and bottom steel plate for isolation between units.

.4 Horizontal wireways, equipped with cable supports, across top and bottom, extending full width of motor control centre, isolated from busbars by steel barriers.

.5 Vertical wireways for load and control conductors extending full height of vertical sections, and equipped with cable tie supports. Installation wiring to units accessible with doors open and units in place.

2.4 Vertical Section Construction (Cont'd)

.6 Openings, with removable coverplates, in side of vertical sections for horizontal wiring between sections.

.7 Incoming cables or bus duct to enter at top with terminals as indicated.

.8 Provision for outgoing cables to exit via top or bottom with terminals.

.9 Removable lifting means.

.10 Provision for future extension of both ends of motor control centre including busbars without need for further drilling, cutting or preparation in field.

.11 Divide assembly for shipment to site, complete with hardware and instructions for re-assembly.

2.5 Sills

.1 Continuous channel iron floor sills for mounting bases with 19 mm diameter holes for bolts.

2.6 Busbars

.1 Main horizontal and branch vertical, three phase high conductivity copper busbars in separate compartment, bare selfcooled, extending entire width and height of motor control centre, supported on insulators and rated:
.1 Main horizontal busbars as indicated.
.2 Branch vertical busbars as indicated.

.2 Branch vertical busbars for distribution of power to units in vertical sections.

.3 No other cables, wires, equipment in main and branch busbar compartments.

.4 Brace buswork to withstand effects of short circuit current of 42 kA rms symmetrical. (Short circuit capacity of each section (2) of Motor Control Centre PH-1 shall be 65000A symmetrical).

.5 Bus supports: high dielectric strength, low moisture absorption, high impact material, with long creepage surface designed to discourage collection of dust.

2.7 Ground Bus

.1 Copper ground bus size 50 x 3 mm extending entire width of motor control centre, located at bottom.

2.8 Starter Unit Compartments

.1 Units EEMAC size 4 and smaller, plug-in type with self-disconnect. Guide rail supports for units to ensure that stabs make positive contact with vertical bus. Provision for units to be installed or removed, off load, while buses energized.

.2 Unit mounting:
.1 Engaged position - unit stabbed into vertical bus.
.2 Withdrawn position - unit isolated from vertical bus but supported by structure. Terminal block accessible for electrical testing of starter.
.3 Provision for positive latching in either engaged or withdrawn position and padlocking in withdrawn position.
.4 Stab-on connectors free floating silver plated clips, self-aligning, backed up with steel springs.

.3 External operating handle of circuit switch interlocked with door to prevent door opening with switch in "on" position. Provision for 3 padlocks to lock operating handle in "off" position and lock door closed.

.4 Hinge unit doors on same side.

.5 Overload relays manually reset from front with door closed.

.6 Pushbuttons and indicating lights mounted on door front.

.7 Devices and components by one manufacturer to facilitate maintenance.

2.9 Wiring Identification

.1 Provide wiring identification in accordance with Section 15010.

2.10 Equipment Identification

.1 Provide equipment identification in accordance with Section 15010.
.1 Motor control centre main nameplate size No. 7 engraved.
.2 Individual compartment nameplate size No. 5 engraved.

2.11 Terminals .1 Cable lugs or bus duct terminals shall be provided as required. The main bus shall be adequately sized to match the feeder provided to cable lugs or bus duct terminals under Electrical Division 16.

2.12 Continuity .1 Motor Control Centres and starters installed therein, shall be of the same manufacture throughout the job and shall be of the same manufacture as starters installed remote from the Motor Control Centres.

2.13 Power and Control Wiring .1 Power and control wiring between the terminal blocks in the Motor Control Centre and the motor or component being controlled, shall be provided by the Mechanical Trade Section whose equipment is involved.

.2 Starters or disconnects shown or required on load side of Motor Control Centres shall be provided under the Trade Section supplying the equipment being controlled.

2.14 Fused Disconnects .1 Starter units for 3 phase motors shall be of the combination H.R.C. fused disconnect plug-in type complete with stop-start push-buttons, hand-off automatic selectors or on/off maintained contact selector switch in cover as shown. Refer to Sections 15010, 15160, 15170 and 15180.

2.15 Transformers .1 Provide transformers in each Motor Control Centre to feed single phase motors.

2.16 Finishes .1 Apply finishes in accordance with Section 15010.

.2 Paint motor control centre exterior light gray and interiors white.

2.17 Wiring .1 Wiring between Motor Control Centre and starter or disconnect, where starters or disconnects are to be installed adjacent to equipment being controlled and are shown being fed through fused disconnects or panels mounted in Motor Control Centres, shall be provided under the Mechanical Trade Section whose equipment is being controlled.

2.18 Manufacturers .1 Acceptable Manufacturers: Allen Bradley Canada Ltd., Canadian General Electric Co., Cutler Hammer Canada Ltd., Square D Co. Canada Ltd., Westinghouse Canada Ltd., Klockner-Moeller, Siemens.

PART 3 - EXECUTION

3.1 Installation .1 Set and secure motor control centre in place on channel bases, rigid, plumb and square to building floor and wall.

.2 Make field power and control connections as indicated.

.3 Ensure correct overload heater elements are installed.

3.2 Tests .1 Perform tests in accordance with Section 15010.

.2 Ensure moving and working parts are lubricated where required.

.3 Operate starters in sequence to prove satisfactory performance of motor control centre during 8 hour period.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings .1 Submit shop drawings in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 General .1 Fuses for the project shall be of one manufacture and shall be C.S.A. certified Form 1, current and energy limiting type 200,000 ampere interrupting capacity with NEMA CLass "J" rejection type mountings.

.2 Supply a list of motors, with their starting and operating characteristics, and the type of equipment associated with the motors, to the Fuse Manufacturer for verification of fuse sizes.

.3 Size fuses in accordance with Fuse Manufacturer's recommendations. Note that fan motors are to be sized for 10 second maximum start-up time as specified in Section 15160.

.4 Provide one spare set of three fuses for each rating and type of fuse used in this Contract, and hand over to Owner at completion of Work.

.5 Size fuses installed in combination magnetic starters, Motor Control Centres or in disconnect switches used in conjunction with magnetic starters, for a branch circuit and motor protection for over-current protection in accordance with Fuse Manufacturer's recommendations.

2.2 Manufacturers .1 Acceptable manufacturers: Chase Shawmutt - AMP TRAP, English Electric Co. of Canada, Appleton Electric Co.

PART 3 - EXECUTION

3.1 Installation .1 Install in accordance with the manufacturer's recommendations.

**********END**********

PART 1 - GENERAL

1.1 Reference Standards

.1 Do thermal insulation in accordance with ACNBC, NBC-1980, ASTM E96-66 (1972) and ASTM C411-61 (1975).

.2 Fire hazard rating:
.1 Meet NFPA 90A-1978, NFPA 255-1979 and CAN4-S102-79.
.2 Materials specified which have been approved by FCC for special applications are acceptable.

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves and jointing recommendations.

1.3 Samples Submittals

.1 Submit samples in accordance with Section 01340.

.2 Submit for review: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board, Affix typewritten label beneath sample indicating service.

1.4 Definitions

.1 "CONCEALED" - insulated mechanical services in trenches, chases, furred spaces, pipe shafts or hung ceilings. Services in tunnels will not be considered to be concealed.

.2 "EXPOSED" - will mean "not concealed" as defined herein.

PART 2 - PRODUCTS

2.1 P-1 Formed Fibrous Glass to 200°C

.1 Application: Insulation system P-1 for piping, valves, and fittings maximum temperature 200°C.
.1 Constant temperature and scheduled hot water heating systems and steam.
.2 Domestic hot and recirculation system.

2.1 P-1 Formed Fibrous Glass to 200°C. (Cont'd)

.2 Materials:

.1 CGSB 51-GP-9M, rigid mineral fiber sleeving for piping.

.2 Acceptable Product: Fibreglass Canada Ltd; Johns Mannville: Standard glass fibre moulded sectional pipe covering with factory applied all service jacket.

.3 Thickness:

.1 For all systems.

Line Size Nominal	Thickness Nominal
All Sizes	25 mm

2.2 P-2 Formed Fibrous Glass with V-B -14° to 200°C.

.1 Application: insulation system P2 for piping, valves and fittings for temperature -14° to 200°C.

.1 Domestic cold water system.

.2 Chilled water system.

.3 Rain water leader.

.4 Storm piping (for 5 m from drain).

.2 Material:

.1 CGSB 51-GP-9M, rigid mineral fiber sleeving for piping and CGSB 51-GP-52 vapour barrier jacket.

.2 Acceptable Product: Fibreglass Canada Ltd; Johns Mannville: Standard glass fibre moulded sectional pipe insulation with factory applied all service vapour barrier jacket.

.3 Thickness:

.1 For domestic cold water, fire standpipe, sanitary and storm building drains.

Line Size Nominal	Thickness Nominal
All Sizes	50 mm

.2 For all other systems:

Line Size Nominal	Thickness Nominal
Up to NPS 3	25 mm
NPS 4 to 6	38 mm
NPS 8 and over	50 mm

2.3 Fastenings

.1 For insulation systems P-1 and P-2:

.1 Self adhesive tape and 100% coverage lagging adhesives.

.1 Self adhesive tape rated under 25 for flame spread and under 50 for smoke development.

2.3 Fastenings (Cont'd)

.2 For Vapour Barriers:
.1 Quick-setting adhesive for joints and lap sealing of vapour barriers. Flame spread 10 smoke development 0.
.2 Acceptable Product: Foster 85-75 Drion.

2.4 Jackets

.1 Canvas:
.1 Apply in exposed areas: compact, firm ULC listed heavy plain weave, cotton fabric at 220 g/m².
.2 On concealed valves and fittings use ULC listed plain weave cotton fabric at 120 g/m².
.3 Acceptable Product: S. Fattal Thermocanvas.

PART 3 - EXECUTION

3.1 Application

.1 Apply insulation after required tests have been completed and approved by Engineer. Insulation and surfaces shall be clean and dry when installed and during application of any finish.

.2 Work shall be performed by insulation journeymen.

.3 Insulation and coverings on hot piping to be applied while surface is between 50 to 60°C.

.4 Insulation roof drain body with 25 mm flexible insulation held in place with 100% coverage of insulating cement.

.5 Vapour barriers and insulation to be complete over the full length of pipe or surface, without penetration for hangers, and without interruption at sleeves, pipe and fittings.

.6 Install insulation with smooth and even surfaces.

.7 Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations.

3.2 Pipe Insulation

.1 Preformed insulation: sectional insulation up to NPS 12, sectional or curved segmented above NPS 12.

3.2 Pipe Insulation (Cont'd)

.2 Multi-layered, insulation: use staggered butt joint construction.

.3 Vertical pipe over NPS 3: use insulation supports welded or bolted to pipe directly above lowest pipe fitting. Thereafter locate on 4.5 m centres and at each valve and flange.

.4 For valves, fittings and process equipment requiring periodic maintenance of parts and sub-assemblies, listed or indicated use factory fabricated easily disassembled insulation. Submit samples for approval of Engineer.

.5 Terminate insulation at each end of unions and flanges on hot lines, and at other points where indicated, with insulation cement, to CGSB 51-GP-6M, trowelled on bevel.

.6 Gouge out insulation for proper fit where there is interference between weld bead and insulation. Insulation shall be bevelled away from studs and nuts to permit their removal without damage to insulation, and shall be closely and neatly trimmed around extending parts of pipe saddles, supports, hangers and clamp guides and sealed with insulating cement.

.7 Insulation is not required for:
.1 Exposed radiation and connector piping located above floor.
.2 Valves, unions and flanges on low temperature systems 120°C. and under.
.3 Chrome plated piping, valves, unions, flanges and valve bonnets on domestic hot and cold water services including drinking fountains.
.4 Rainwater and sanitary drainage pipe unless otherwise specified.

3.3 Mechanical Fasteners

.1 Secure pipe insulation by straps. Space straps at not more than 900 mm on centres and use at least 3 rows per length of insulation section.

3.4 Sizing

.1 Provide fire retardant coating on canvas jackets.

3.4 Sizing (Cont'd)

.2 Fire retardant coating shall be approved by FCC prior to application. FCC reserves right to remove sample of covering for testing.

.3 Coat canvas covering exposed in finished spaces with diluted coat of lagging adhesive as recommended by insulation manufacturer for priming.

**********END**********

PART 1 - GENERAL

1.1 Reference Standards	.1	Do thermal insulation in accordance with ACNBC, NBC-1980, ASTM E96-66 (1972) and ASTM C411-61 (1975).
	.2	Fire hazard rating. .1 Meet NFPA 90A-1978, NFPA 255-1979, and CAN4-S102-79. .2 Materials specified which have been approved by FCC for special applications are acceptable.
1.2 Shop Drawings	.1	Submit shop drawings in accordance with Section 01340.
	.2	Submit for review manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves and jointing recommendations.
1.3 Samples Submittals	.1	Submit samples in accordance with Section 01340.
	.2	Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.
1.4 Definitions	.1	"CONCEALED" - insulated mechanical services in trenches, chases, furred spaces, pipe shafts or hung ceilings. Services in tunnels will not be considered to be concealed.
	.2	"EXPOSED" - will mean "not concealed" as defined herein.
	.3	Refer to thermal insulation schedule on drawings for extent of duct insulation.

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PART 2 - PRODUCTS

2.1 D-1 Glass Blanket -40 to 50°C Duct	.1	Application: insulation system D1 for ducting temperature 10 to 50°C on round or oval ducting.

2.1 D-1 Glass Blanket -40 to 50°C Duct (Cont'd)

.2 Material:
.1 CGSB 51-GP-11M mineral glass fiber blanket for ducting.
.2 Acceptable Product: Fibreglass Canada Ltd. Type PF 336 with RFFRK foil facing.

.3 Thickness:

Insulation thickness Nominal	Operating Temperature
25 mm	Up to 50°C

2.2 Fastenings

.1 Self adhesive tape 100 mm wide rated under 25 for flame spread and under 50 for smoke development.

.2 Quick-setting, nonflammable fire resistive adhesive to adhere fibrous glass to ducts. Flame spread 15 smoke development 0.

.3 If duct is over 635 mm wide use weld pins on bottom of duct.
.1 Acceptable Product: Foster 85-20 Spark-Fas.

.4 For Vapour Barriers:
.1 Quick-setting adhesive for joints and lap sealing of vapour barriers. Flame spread 10 smoke development 0.
.2 Acceptable Product: Foster 85-20 or 85-15.

.5 For Canvas:
.1 Washable adhesive for cementing canvas lagging cloth to duct insulation.
.2 Acceptable Product: Foster 30-36 Sealfas.

.6 Pins:
.1 Weld pins 4 mm diameter, with 35 mm diameter head for installation through the insulation. Length to suit thickness of insulation.
.2 Acceptable Product: Duro Dyne, Clip-Pin.
.3 Weld pins 2.0 mm for installation prior to applying insulation. Length to suit thickness of insulation. Nylon retain clips 32 mm square.
.4 Acceptable Product: Duro Dyne spotter pins with spotter clips or stop clips as required.

2.3 Jackets

.1 Canvas:
.1 Apply in exposed areas: compact, firm ULC listed heavy plain weave, cotton fabric at 220 g/m².
.2 Acceptable Product: S. Fattal Thermocanvas.

PART 3 - EXECUTION

3.1 Application

.1 Apply insulation after required tests have been completed and approved by Engineer. Insulation and surfaces shall be clean and dry when installed and during application of any finish.

.2 Work shall be performed by insulation journeymen.

.3 Insulation and coverings on hot equipment to be applied while surface is between 50 to 60°C.

.4 Vapour barriers and insulation to be complete over the full length of duct or surface, without penetration for hangers, standing duct seams and without interruption at sleeves.

.5 Install insulation with smooth and even surfaces.

.6 Apply insulation materials, accessories and finishes to manufacturer's recommendations.

3.2 Duct Insulation

.1 General:
.1 Joints to be on top of ducts.
.2 Adhere and seal vapour barrier using vapour seal adhesives.
.3 Stagger longitudinal and horizontal joints, on multilayered insulation.

.2 Mechanical fasteners:
.1 On rectangular ducts, use 50% coverage of insulating cement and weld pins at not more than 200 mm centres, but not less than 2 rows per side.
.2 Round ducts use 100% coverage of insulating cement and self adhesive tape on joints.

3.3 Sizing

.1 Provide fire retardant coating on canvas jackets.

.2 Fire retardant coating shall be approved by DFC prior to application. DFC reserves right to remove sample of covering for testing.

.3 Coat canvas covering exposed in finished spaces with diluted coat of lagging adhesive as recommended by insulation manufacturer for priming.

**********END**********

PART 1 - GENERAL

1.1 Reference Standards

.1 Do thermal insulation in accordance with ACNBC, NBC-1980, ASTM E96-66 (1972) and ASTM C411-61 (1975).

.2 Fire hazard rating:
.1 Meet NFPA 90A-1981, NFPA 255-1979, and CAN4-S102-79.
.2 Materials specified which have been approved by FCC for special applications are acceptable.

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Submit for review manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves and jointing recommendations.

1.3 Samples Submittals

.1 Submit samples in accordance with Section 01340.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

1.4 Definitions

.1 "CONCEALED" - insulated mechanical services in trenches, chases, furred spaces, pipe shafts or hung ceilings. Services in tunnels will not be considered to be concealed.

.2 "EXPOSED" - will mean "not concealed" as defined herein.

PART 2 - PRODUCTS

2.1 E-1 Fibrous Glass Blanket Hot Curved Surfaces 20 to 400°C

.1 Application: insulation system E-1 for hot curved surfaces on domestic hot water storage tank.

.2 Materials:
.1 CGSB 51-GP-11M mineral glass fiber blanket for machinery and boilers.

2.1 E-1 Fibrous Glass Blanket Hot Curved Surfaces 20 to 400°C (Cont'd)

.3 Thickness:

Insulation Thickness Nominal	Operating Temperature
50 mm	up to 120°C.

2.2 E-5 Flexible Elastomeric Sheet -40°C to 95°C

.1 Application: insulation system E-5 for cold surfaces on expansion tanks, evaporators and condensers, refrigeration machine.

.2 Materials:

.1 CGSB 51-GP-40M flexible elastomeric unicellular sheet covering.

.2 Acceptable Product: Johns-Manville Canada Inc., Aerotube

.3 Thickness:

Insulation Thickness Nominal	Operating Temperature
12 mm	-40° to 0°C
9 mm	0° to 95°C

2.3 E-6 Calcium Silicate Formed VB -40°C to 400°C

.1 Application: insulation system E-6 for cold surfaces on chilled water pumps. On pumps, insulation shall be site made to required shape, demountable with hinged or dowelled construction with 0.6 mm thick aluminum alloy outer liner.

.2 Materials:

.1 CGSB 51-GP-2M calcium silicate for machinery and boilers.

.2 Acceptable Product: Fibreglass Canada Ltd., Kaylo 10.

.3 Thickness:

Insulation Thickness Nominal	Operating Temperature
50 mm	-40 to 400°C

2.4 E-7 Calcium Silicate and Cement 450°C

.1 Application: insulation system E-7 for hot surfaces on boilers and diesel to exhaust system.

Addendum #1

.2 Materials:

.1 CGSB 51-GP-2M calcium silicate for boiler and machinery and CGSB 51-GP-7MP finishing cement.

.2 Acceptable Product: Fibreglass Canada Ltd., Kaylo 10.

.3 Thickness:

Insulation Thickness Nominal	Operating Temperature
50 mm; 2-25 mm layers	to 450°C

2.5 Fastenings

.1 Self adhesive tape 100 mm wide rated under 25 for flame spread and under 50 for smoke development.

.2 Quick-setting, nonflammable fire resistive adhesive to adhere fibrous glass to equipment. Flame spread 15 smoke development 0.
.1 Acceptable Product: Foster 85-20, Spark-Fas.

.3 For Vapour Barriers:
.1 Quick-setting adhesive for joints and lap sealing of vapour barriers. Flame spread 10 smoke development 0.
.2 Acceptable Product: Foster 30-36 Sealfas.

.4 For Canvas:
.1 Washable adhesive for cementing canvas lagging cloth to equipment insulation.
.2 Acceptable Product: Foster 30-36 Sealfas.

2.6 Jackets

.1 Canvas:
.1 Apply in exposed areas: compact, firm ULC listed heavy plain weave, cotton fabric at 220 g/m².
.2 Acceptable Product: S. Fattal Thermo canvas.

PART 3 - EXECUTION

3.1 Application

.1 Apply insulation after required tests have been completed and approved by Engineer. Insulation and surfaces shall be clean and dry when installed and during application of any finish.

.2 Work shall be performed by insulation journeyman.

.3 Insulation and coverings on hot equipment to be applied while surface is between 50 to 60°C.

.4 Vapour barriers and insulation to be complete over the full surface, without penetration.

3.1 Application (Cont'd)

.5 Install insulation with smooth and even surfaces.

.6 Apply insulation materials, accessories and finishes to manufacturer's recommendations.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Excavation and backfilling: Section 02220

.2 Concrete bases, equipment pads and grouting: Section 03300

.3 Building-in into
.1 Concrete: Section 03300
.2 Gypsum board: Section 09250

.4 Protected Membrane Roofing and Flashing: Section 07550

.5 Painting: Section 09900

1.2 Description of Systems

.1 Waste, vent, hot and cold water piping systems, and storm water piping system including fixtures, and equipment.

.2 Providing new waste, vent, hot and cold water piping systems complete with new fixtures and equipment indicated.

.3 Work commences 1.5 m outside of exterior face of building wall in concrete collar for storm and sanitary building mains; cold water and fire protection system.
.1 Connection to plumbing fixtures supplied as part of factory built equipment and specified under other Sections.
.2 Drains for air handling systems, air handling unit components, air cooled condensers.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Shop drawings are required for plumbing fixtures, floor drains, roof hoppers, pumps, valves, fire extinguishers, oil interceptors, wall hydrants, hot water heaters, air compressors, compressed air outlets, lubrication rack and pump, back flow preventors, acid neutralizer, vehicle exhaust pick-up equipment and fuel dispenser and tanks.

1.4 Maintenance Data

.1 Provide maintenance data in English and French where available for all pumps, valves, hot water heaters, air compressors, fire pumps, acid neutralizer, oil interceptors, lubrication rack and pump, compressed air outlets, gas and diesel fuel dispensers with associated pumps, and pressure reducing valves for incorporation into maintenance manual specified in Section 01730.

1.5 Fixtures and Fittings

.1 In case of discrepancy between architectural and mechanical drawings as to number and location of fixtures, the architectural drawings shall govern.

**********END**********

PART 2 - PRODUCTS

2.1 General .1 This section to be read in conjunction with Sections 15401 and 15499.

2.2 Soil, Storm, Waste and Vent Pipe and Fittings .1 Piping:

.1 Soil, waste, rain water and vent lines inside building above ground shall be Class 4000 cast iron with factory applied asphaltum coating, or D.W.V. hard drawn copper with drainage cast brass solder type fittings.

.2 Soil, waste, vent and storm piping inside building above ground shall be in accordance with ANSI A40.5 and CSA B70 for cast iron and CSA HC7.5 and CSA HC7.6 for D.W.V. copper.

.3 Soil and waste piping buried inside building shall be Class 4000 cast iron factory coated with asphaltum coating in accordance with ANSI A40.5 and CSA B70.

.4 Storm piping buried inside building shall be rubber gasket and integral bell type polyvinylchloride (PVC) PMS SDR 35 manufactured in accordance with ASDM D-3034-80, or CSA B-137.3-M-1981.

.2 Fittings:

.1 Fittings for above ground cast iron pipe: cast iron, to CSA B70-M1978, and with factory applied coat of asphaltum.

.2 Fittings for copper drainage tube: recessed solder joints, drainage pattern fittings of wrought copper or cast brass, with 50-50 solder (lead-tin alloy).

.3 Joints:

.1 Cast iron hub and spigot pipe and joints: packed with oakum and tightly caulked with cast lead to CSA B67-1972 lead wool.

.2 Cast iron MJ pipe joints: neoprene with stainless steel clamp type joint to CGSB 77-GP-2M. Acceptable Product: Bibby.

.3 DWV copper pipe joints: solder joint.

2.2 Soil, Storm, Waste and Vent Pipe and Fittings (Cont'd)

.4 Threaded pipe joints: make with teflon tape. Apply to male threads only.

.5 Copper to cast iron joints: male brass adaptors to tapped fitting or caulk ferrale to hub fitting.

.6 Galvanized steel to cast iron joints: caulk pipe with coupling into hub.

2.3 Water Pipe and Fittings

.1 Above ground domestic cold water piping NPS 4 and smaller and domestic hot water piping on all sizes shall be Type "L" hard drawn copper tubing with cast bronze or wrought copper solder type fittings. Do not connect copper piping directly to ferrous material including tanks or piping. When making such connections use unions or flange connections, similar to Epco Di-Electric pipe fittings. Extruded brass fittings will not be accepted.

.2 Above ground domestic cold water piping, NPS 6 and larger Schedule 40 galvanized steel with 862 kPa screwed galvanized fittings. Regardless of pipe size, use galvanized steel pipe and flanged fittings on cold water service for water meter assembly and around fire main back flow preventor.

.3 Water piping in mechanical equipment rooms shall be copper or galvanized steel as previously specified. Install disconnecting flanges of same material at tanks and pumps. Use wrought copper streamlined fittings, with silver brazing alloy solder for fittings and valves, on hot water lines within 7.5 m of hot water tanks.

.4 Buried water piping, NPS 3 and smaller Type "K" hard drawn copper tubing.

.5 Buried water piping NPS 4 and larger shall be cast iron mechanical joint Class ASA 24 cement lined ductile iron Tyton joint Class ASA-A21-51-1965 Class 2 and in accordance with AWWA Specification C-151. Cement lining shall conform

2.3 Water Pipe and Fittings (Cont'd)

to AWWA Specification C-104. Fittings shall conform to AWWA Specification C-110 and are not required to be cement lined. Include glands, lead tipped rubber gaskets and Domalloy nuts and bolts. Clamp pipe at bends and tees, with 19 mm rods and anchor it to building where possible. Concrete anchor blocks of 0.4 m^3 size, using 20 MPa concrete, shall be provided when pipe cannot be anchored to building.

.6 Connections:
.1 Solder: 95:5 antimonial tin solder.
.2 5% silver solder: above NPS 1 1/2 type Silfos 5.

.7 Unions, threaded NPS 2 and under: all bronze unions Class 150, 1 MPa rating, ground seat.

2.4 Valves

.1 Provide all valves of same type by one manufacturer, ie. cast iron valves by one manufacturer; bronze valves by one manufacturer.

.2 Unless otherwise specified or noted, valves to be ANSI Class 200, 1.4 MPa, screwed or soldered ends, malleable iron handle. In equipment rooms and boiler rooms, provide OS&Y and globe valves NPS 2½ and over, above 2.4 m, with chain operators.

.3 Acceptable Product: Valves for NPS 2 and under:
Gate: Crane 428 or 1320C, Jenkins 810 or 313.
Globe straight: Crane 7, 5, 1312, Jenkins 106A or 106AP.
Globe angle: Crane 17 or 1311, Jenkins 108A or 108AP.
Swing Check: Crane 37 or 1342, Jenkins 92 or 92P.
Ball Valves: Crane 915 or Jenkins 34

.4 Acceptable Product: Valves for NPS 2 1/2 and over:
Gate wedge: Crane 465 1/2, Jenkins 454.
Gate double disc: Jenkins 404.
Globe: Crane 351, Jenkins 142.
Check: Crane 373, Jenkins 587.
Butterfly: malleable or ductile iron body, ductile iron disc EPDM Grade 'E' liner, long neck design.

2.4 Valves (Cont'd)

.5 For domestic hot water service all valves shall be suitable for hot water to a maximum temperature of 66°C.

.6 Provide ball valves at each piece of plumbing equipment and at each branch line take-off, and globe valves where balancing is required.

2.5 Table Compressed Air

.1 Use for compressed and instrument air up to 860 kPa.

ITEM	SIZE NOMINAL	DESCRIPTION	MATERIAL SPEC
Pipe	Main NPS ½ to NPS 2	Schedule 40 continuous weld Screwed end	ASTM A53-78
	NPS 2½ to NPS 4	Schedule 40 continuous weld with bevelled end	
	Branch	Copper Type 'L' hard drawn	ASTM B88-78
Fittings Including Couplings	Main NPS ½ to NPS 2	Class 150,1 MPA MI Threaded	ANSI B16.3-1971
Couplings	NPS 2½ to NPS 4	Schedule 40 forged steel	
	Branch	Compression flared joints	ASTM A234-78
Nipples	Main	Schedule 40 Screwed	ASTM A53-78
Unions	Main	Class 150, 1 MPa MI brass to iron ground seat	ANSI B16.3-1971

2.5 Table Compressed Air (Cont'd)

ITEM	SIZE NOMINAL	DESCRIPTION	MATERIAL SPEC
Flanges	NPS ½ to NPS 2	Class 150, 1 MPA FF Screwed	
	NPS 2½ to NPS 4	Class 150,1 MPA FF slip-on or weld neck	ASTM A181-77 ASTM A105-77
Gate Valves	NPS ½ to NPS 2	Class 125, 860 kPa threaded end rising stem screw in bonnet	
Acceptable	Product: Jenkins 810; Crane 428; For NRS use Jenkins 310; Crane 438		
	NPS 2½ to NPS 4	Class 125, 860 kPa iron body, bronze mounted OS&Y rising stem type with flanged ends	
Acceptable	Product: Jenkins 404 - Crane 465½		

2.5 Table Compressed Air (Cont'd)

ITEM	SIZE NOMINAL	DESCRIPTION	MATERIAL SPEC
Globe Valves	NPS ½ to NPS 2	Class 150, 1 MPA bronze threaded ends, with renewable general purpose composition disc NRS	
Acceptable	Product: Jenkins 106A; Crane 7		
	NPS 2½ to NPS 4	Class 200, 1.4 MPa WOG iron body bronze mounted, OS&Y flanged ends, with renewable general purpose composition disc	
Acceptable	Product: Jenkins 142; Crane 359		
Check Valves	NPS ½ to NPS 2	Class 300, 2 MPa WOG bronze lift check composite disc type	
Acceptable	Product: Jenkins 117 A; Victaulic		
	NPS 2½ to NPS 4	Class 200, 1.4 MPa WOG iron body bronze mounted flanged ends with rubber faced disc	
Acceptable	Product: Jenkins 477 RD; Victaulic; Nibco F908W		
Air Compressor Check Valves	NPS ½ to NPS 2	Class 600, 4 MPa WOG bronze, cushioned check nickel alloy seat ring teflon disc threaded ends	

2.5 Table Compressed Air (Cont'd)

Item - Type 'A' outlet (where indicated on Drawings). Provide a compressed air filter/regulator with 35 to 860 kPa adjustable relieving type diaphragm, transparent bowl, 50 micron filter element, pressure gauges, non-rising adjustment, automatic drain, metal bowl protectors.

Acceptable Product: C.A. Norgren Co. Model #B12-421-A3LA complete with model #5514-06 mounting bracket.

Item (A) outlet (where indicated on drawings) provide one compressed air filter/regulator as per Type 'A' and one compressed air filter/regulator/lubricator similar to Type 'A' with the addition of a micro fog lubricator as per Drawing #M-10, Detail 14.

Acceptable Product: C. A. Norgren Co. Model #P4A-420-A3NA complete with model #5514-06 mounting bracket.

Item - At each compressed air outlet, provide a brass quick disconnect plug and socket designed for positive single action connection with instant automatic shut-off of socket and of line.

Acceptable Product: Hanson Couplings Series 3000.

2.6 High Pressure Lubrication Piping

.1 Piping to overhead delivery mechanism and grease cabinet steel seamless tubings: J.I.C. approved, working pressures 35,000 kPa, burst pressure 138,000 kPa, 16 mm O.D., 12 nominal I.D., wall thickness .2. Use 16 mm compression fittings, min. working pressure 28,000 kPa, burst pressure 111,500 kPa.

.2 Acceptable Product: Alemite Industrial Fluid Handling Lubricating and Automotive Service Equipment Ltd.

.3 Product model numbers of Alemite have been used on Drawing #M-11, Detail 10.

**********END**********

PART 2 - PRODUCTS

X Pg. 10 Addendum #1.

2.1 General

.1 This section to be read in conjunction with Section 15401 and 15499.

2.2 Water Specialties

.1 Wall hydrants and hose bibbs
.1 Size, types and models shall be as indicated on the schedule.
.2 Hydrant and hose bibb box shall be made of nickel bronze.
.3 Provide non-freeze hydrants where shown.
.4 Provide two (2) extra keys.

.2 Water hammer arrestors (shock absorbers)
.1 Provide arrestors to Plumbing and Drainage Institute Standard PDI-WH 201 on branch supplies to each fixture or group of fixtures.
.2 Size of arrestors to PDI-WH 201, using a maximum of 1034 kPa water pressure.
.3 Air chamber: 50 mm x 450 mm long pipe complete with isolating valve and pet cock.
.4 Acceptable Product: Enpoco, Zurn Z1700 size No. 100.

.3 Back flow preventors (Domestic Water)
.1 Protect entire water distribution system against contamination due to backflow from non-potable sources. Provide each connection to equipment, for which approved air gap or vacuum breaker is not shown or specified elsewhere in connection with fixture or equipment itself, with backflow preventor and dump valve.
.2 Acceptable Product: Watts No. 900, NPS 2 and larger, Watts 9D NPS 3/4 or NPS½.

.4 Back flow preventor (Fire Protection Main)
.1 Protect entire water distribution system against contamination due to back flow from non-potable sources.
.2 Acceptable Product: Viking double check NPS 8 back flow preventor.

.5 Backwater valves
.1 Provide where indicated complete with gas tight and water tight flapper.
.2 Acceptable Product: Enpoco. See Drawing #M-11, Detail 13.

2.2 Water Specialties (Cont'd)

.6 Water meter

.1 Provide water meter and valved bypass of size to comply with local water authority. Install water meter furnished by municipal utility where shown.

.2 Provide meter inside building, with main shut-off butterfly valve on either side of meter and drain with globe valve and hose nipple for NPS 3/4 hose on house side of valve downstream from meter.

.3 Provide 150 mm diameter pressure gauge 0-1100 kPa scale to CGSB 91-GP-1, Type A, Grade A, on downstream side of meter.

.7 Trap seal primers

.1 Traps in toilet rooms and other areas require priming according to plumbing code.

.2 Provide priming device piped to nearest water closet so that device will introduce regulated amount of water into trap whenever fixture is used.

.3 Acceptable Product: Enpoco.

.4 Traps for floor drains in mechanical rooms to be primed by 22 L flush tank set to flush once every 8 h.

.8 Strainers

.1 Minimum service rating of 860 kPa gauge pressure or system pressure whichever is greater.

.2 Strainers: non-ferrous on non-ferrous lines, and on domestic water service; otherwise iron bodied.

.3 Type: cleanable Y pattern.

.4 Screens: removable and made from 20 mesh ss, 0.55 mm thick material 1 mm at 1.35 mm centres.

.5 NPS 2 and under, screwed with brass cap.

.6 Acceptable Product: Sarco BT, Armstrong F4SC, Crane 988½, Braukmann FY32.

.7 NPS 2½ and over flanged with bolted cap or clamped cap, NPS 1 minimum size blowdown valve, to NPS 6, NPS 8 and above with NPS 2 blowdown valve.

.8 Acceptable Product: Sarco BF-150, Crane 989½, Armstrong F4FL, Braukmann FH33, Leitch 528 pipeline basket type.

2.3 Oily Water Interceptor	.1	Oil interceptor complete with oven cured epoxy coated steel body, with stainless steel orifice flotrol device, visible deep seal trap and cleanout, adjustable draw off and double vent connections on each side, removable baffles, skid proof aluminum cover and frame complete with inspection cover, stainless steel captive fasteners and polyurethane bonded lifetime gasket.
	.2	Interceptor shall be installed where shown in Hangar Building.
	.3	Acceptable Product: Enpoco E-6400 E (925 L/m)
2.4 Shop Building Oil Interceptors With Receiving Chamber	.1	Oil Interceptor complete with oven cured epoxy coated steel body, with stainless steel orifice flotrol device, visible deep seal trap and cleanout, adjustable drawoff and double vent connections on each side, removable baffles, skid proof aluminum cover and frame complete with inspection cover, stainless steel captive fasteners and polyurethane bonded lifetime gasket. Receiving chamber shall be equal to interceptor less interior components.
	.2	Acceptable Product: Enpoco E-6300 E (See drawing #M-4 for size of each unit and Drawing #M-11, Detail 4).
2.5 Deep Seal Traps	.1	Cast iron body deep seal traps, threaded, hub, or spigot on inlet and/or outlet, with minimum seal equal to 127 mm.
2.6 Waterproof Safes	.1	DTS type 30 mil non-plasticized laminated two ply sheet of chlorinated polyethylene water proofing membrane below any waterproofed area required for plumbing fixtures, such as showers or janitor's mop receptors, turn up 150 mm into walls and curbs, fold at corners and flash into floor drain.
	.2	Acceptable Product: Gardewick Industries

2.7 Acid Neutralizer Tank	.1	Stainless steel neutralizer tank with oven cured ultra coated interior and cover, stainless steel, perforated retaining baffles with solid director baffle. Interior basket shall be filled with 20 mm lime chips.
	.2	Acceptable Product: Enpoco E5.5 (74 L/s). See Drawing #M-11, Detail 11.
	.3	Provide 100 kg bag of lime chips and turn over to Owner.
2.8 Ground Hydrant	.1	Ground hydrant shall be NPS 3/4 non-freeze type for frost-free bury, with polished nickel bronze and removable key, top flush with grade.
	.2	Acceptable Product: Enpoco HY-7.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 This section to be read in conjunction with Sections 15401 and 15499.

2.2 Domestic Water Circulators

.1 Bronze body, brass impeller, in-line domestic hot water circulator, suitable for maximum gauge pressure of 850 kPa WP and 105°C maximum temperature and continuous service. Shaft shall be fitted with thrust collar and be oil lubricated from visible oil supply. Pump shall be direct connected to 1750 r/min motor. Pump shall be connected to rigidly anchored piping for circulator supports.

.2 Accessories:
.1 Stainless steel shaft
.2 Stainless steel shaft sleeve
.3 High temperature construction up to 135°C.

.3 Acceptable Product: Armstrong 25 mm S-25 nominal Standard.

2.3 Submersible Sump Pumps

.1 Simplex pumping units shall be controlled by internal diaphragm pressure switch and shall be complete with a high water alarm with separate mercury float switch. High water alarm shall consist of two normally open contacts rated at 115 Volts AC, and a bell, pilot light and silencing switch, mounted in a suitable enclosure, located adjacent to pump unless noted otherwise. Division 16 will wire to junction box at bell; provide all wiring beyond box.

.2 Provide starter as indicated on Drawing #M-13. Division 16 will wire to starters, provide all wiring beyond starter.

.3 Acceptable Product: Hydro-O-Matic Pump Co., as supplied by Scarborough Pump Co.; Kenco, as supplied by Darling Bros.

.4 Product nubmers of Scarborough Pump Co. have been used on Drawings.

**********END**********

PART 2 - PRODUCTS

2.1 General	.1	This section to be read in conjunction with Sections 15401 and 15499.
2.2 Roof Hoppers	.1	Roof hoppers, as listed in Schedule, shall have flashing clamp, bearing pan, gravel stop and deck clamp.
2.3 Floor Drains	.1	Floor drains, as listed in Schedule, shall have an integral double drainage flange with an adjustable strainer with finish as indicated. Floor drains for any waterproofed areas, protected with metal or lead safe or other waterproofing material, shall have flashing ring, clamping device and any required extension pieces. Floor drains in monolithic floor finish areas shall have integral flange to receive the floor finish.
2.4 Scupper Drains	.1	Scupper drains as listed in Schedule shall have a brass strainer.
2.5 Combination Drains	.1	Combination drains as listed in Schedule shall have nickel bronze top.

**********END**********

PART 2 - PRODUCTS

2.1 General .1 This section to be read in conjunction with Sections 15401 and 15499.

2.2 Cleanouts .1 Finished Areas

Nickel bronze frame and round scoriated full opening nickel bronze access cover. Acceptable Product: Enpoco E-3000 SQ.

.2 Tiled Areas

Nickel bronze frame and round recessed full opening nickel bronze access cover. Acceptable Product: Enpoco E-3000 YSQ.

.3 Terrazzo Areas

Nickel bronze frame and round cover with deep terrazzo recess. Acceptable Product: Enpoco E-3000 ZSQ.

.4 Monolithic Floor Areas

Tops of cleanouts in monolithic floor areas shall have an extended flange to suit application of monolithic floor finish.

.5 Unfinished Areas

Duco cast iron frame, heavy duty scoriated cast iron round tractor cover and internal plug. Acceptable Product: Enpoco E-3000 R

.6 Exposed Areas and Accessible Pipe Chase

Cast iron caulking ferrule with neoprene gasket and plug secured to body with cap screws. Acceptable Product: Enpoco E-3070, on copper lines use Enpoco E-3070 CC.

.7 Behind Finished Tile and Block Walls

Cleanout with "RAC" stainless steel round access cover. Ferrule shall be installed so that bolted cover is within 25 mm of finished wall. Acceptable Product: Enpoco E-3050.

2.2 Cleanouts (Cont'd)

.8 At Base of Exposed Stacks and Rain Water Leaders

Acceptable Product: Enpoco E-3800 on copper stacks use Enpoco E-3800 CC.

.9 Concealed Stack Cleanout

Complete with "RAC" stainless steel access cover. Acceptable Product: Enpoco E-3000.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 This section to be read in conjunction with Sections 15401 and 15499.

2.2 Domestic Hot Water Heaters

.1 Storage type, electric heated, factory assembled and tested and of size and capacity, and located as shown.

.2 Constructed of glasslined steel with magnesium anode protection to Provincial Code Standards to operate at a working pressure of 860 kPa.

.3 Each tank shall be prime painted and encased with fiberglass insulation, foil faced, and enamelled steel jacket.

.4 Provide each tank with a thermostat, an ASME code rated temperature-pressure relief valve at top, a boiler type hand hole cleanout and a 12 mm valved drain at bottom.

.5 Copper sheathed immersion elements arranged for flip-flop operation controlled by close tolerance positive snap action thermostats and protected by a manual reset high temperature limit switch. Controls, including contactors, shall be built-in and shall be completely factory prewired. Provide a suitably sized fused disconnect switch at each tank and wire from switch to heater. Connections to line side of switch will be provided by Electrical Division 16.

.6 Acceptable Product: Ruud Limited; Anthes Eastern Ltd. - John Wood; Raypak Thermonics Ltd.; Teledyne Laars Ltd; John Inglis Co. Ltd; A. O. Smith Corp.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 This section to be read in conjunction with Sections 15401, 15499 and 15606.

2.2 Propane Gas System

.1 Connect gas outlets and fixture tail pieces. Provide union system and shut-off valves at isolation points as indicated and in connections to gas burning equipment.

.2 Necessary arrangements will be made by Owners with local propane gas supplier for provision of 7580 L storage tank and bulk supply. Division 15 Contractor shall include for installation of storage tank complete with vapourizers, regulator and weatherproof hood, sized to suit maximum demand at -40°C.

.3 Provide reinforced concrete pad, 1 m longer than tank length, 1 m wider than tank width and 150 mm thick. Anchored tank with supports. Install accessories and hardware to CGA B149.2-M80.

.4 Provide gas piping between tank, vaporizers, regulator, accessories and between location of gas storage tank and gas supply outlets where shown. Provide an approved spring loaded gas plug valve on line immediately inside building, including a safety valve vented to atmosphere.

.5 Piping shall be Schedule 40 black steel with malleable iron screwed fittings using "Tite-Seal" compound at each joint. Valves shall be approved type lever operated gas cocks. Install and test piping in accordance with Propane Storage, Handling and Utilization Code 255, Ontario Regulation 313/73 as revised to date, together with any applicable local rules and regulations. Buried gas piping shall have a polyethylene coating as manufactured by Shaw Pipe Protection Ltd. Provide heat shrinkable sleeve at each joint.

.6 Provide complete distribution system within building as indicated. Weld joints over 65 mm nominal.

2.2 Propane Gas System (Cont'd)

.8 Caulk where main enters building.

.9 Provide pressure reducing valves, suitable for table propane gas service. Pressure reducing valve shall be spring loaded. Relief valve shall be set 35 kPa above delivery pressure of valve. Pressure reducing valves shall have capacity as indicated on drawings.
.1 Acceptable Product:
Product model numbers of Fisher Controls have been used on drawings.

.10 Tests with air pressure for 1 h, without loss of pressure.
.1 Tank piping and ancillaries to a gauge pressure of 860 kPa.
.2 Piping in building to a gauge pressure of 7 kPa.

.11 Submit certificate of approval from the Ontario Department of Energy Resources Management stating final acceptance of the system, on completion of construction.

2.3 Table Propane Gas

ITEM	SIZE NOMINAL	DESCRIPTION	MATERIAL SPEC
Fittings Including Couplings	NPS ½ to NPS 1½	Class 150, 1 MPa MI threaded (banded)	ANSI B16.3-1971
	NPS 2 to NPS 10	Schedule 40 forged steel bevel end	ASTM A234-78
Nipples	NPS ½ to NPS 2	Schedule 40 screwed	ASTM A53-78
Unions	NPS ½ to NPS 2	MI brass to iron ground seat	ANSI B16.3-1971

2.3 Table Propane Gas (Cont'd)

ITEM	SIZE NOMINAL	DESCRIPTION	MATERIAL SPEC
Flanges	NPS ½ to NPS 1½	FF screwed	ASTM A181-77 ASTM A105-77
	NPS 2 to NPS 10	FF slip-on or weld neck	
Bolts and Nuts		Carbon steel stud bolts and semi-finished hex head nuts	ASTM A307-78
Valves		Code approved lubricated plug valves	
Acceptable Product:		NPS ½ to NPS 1½ Nordstrom Fig. 114 Screwed. NPS 2 to NPS 10 Nordstrom Fig. 143 Flanged.	
Joints		Threaded with Rectoseal A5 pipe dope. Welded	
Gaskets		Full Face type	

2.4 Fuel Dispensing Systems

.1 Provide complete dispensing systems for fuels as indicated on Drawings. Equipment and piping shall be U.L.C. approved and satisfactory for the intended use.

.2 Buried fuel piping, fill lines and vent lines shall be fibreglass reinforced epoxy resin pipe. The fuel piping above grade and from point of change from fibreglass to steel shall be Schedule 40 galvanized pipe with galvanized iron fittings. Fuel piping shall slope down

2.4 Fuel Dispensing Systems (Cont'd)

toward the storage tanks where possible with a minimum grade of 64 mm per 30 m. Piping arrangement must be checked with the pumping equipment supplier before assembly work is started.

.3 Fuel pump for helicopter fuel system only will be supplied by the Owners and installed under this Section and the complete installation shall be made in accordance with all fuel handling acts and all appropriate municipal and provincial regulations. Electric power and control wiring for the installation will be done under Division 16.

.4 Existing helicopter fuel dispenser shall remain in existing location. New services shall be reconnected. Maximum downtime of fuel system shall be 30 hours.

.5 Provide minimum 152 mm pea gravel under all fuel piping. Supports shall not exceed 1524 mm intervals.

.6 Pipe shall be installed in a manner and at a depth to ensure that the underground lines are protected against expansion, contractions, vibration and settling.

2.5 Gasoline and Diesel Fuel Dispensing Systems: (Two Systems)

.1 Provide for each system the following equipment:

.1 Lockable adapter and fill caps - Model 97
.2 300 dia. fill box model 6410
.3 50 mm T-vent - model 631-20
.4 760 x 760 manholes - model 60363
.5 Red jacket submersible pump .56 kW motor 2.84 L/s at 148.6 kPa head, 208 V, 1 Ø, 60 Hz. Model P75S1
.6 Resistoflex 50 mm x 610 mm underground flexible connectors. Model 292-32-24
.7 Red jacket leak detector - Model 116-017
.8 40 mm shear valve - Model 264T
.9 50 mm solenoid valve - Model 115-2.
.10 32 mm x 32 mm nozzle complete with swivel check and tube - model 7-4-12-12.

2.5 Gasoline and Diesel Fuel Dispensing Systems: (Two Systems) (Cont'd)

.11 32 mm x 30.5 m long fuel oil delivery hose complete with male and male scovill fittings - model 4204

.12 Hose reel complete with geared hand crank rewind, and electric rewind model 3524-24-26

Above equipment is based on selection from RNG Equipment Inc.

.2 Acceptable products: RNG Equipment Inc., Tokheim of Canada Ltd.

2.6 Fuel Dispensers

.1 Provide fuel dispensers for the gasoline and diesel fuel systems.

.2 Fuel dispenser shall have internal explosion proof incandescent light source. Unit shall be Black Liquid Crystal Digital with four digit pricing capacity, five digit money display, six digit volume display in litres, maximum delivery setting, non-resettable mechanical litre totalizer, key entry to manager's functions and battery back-up power supply to retain memory for a maximum of thirty days. Self testing features, battery test, memory test, pulser test and display test.

.3 Acceptable products: Tokheim of Canada Ltd.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 This section to be read in conjunction with Section 15401, 15499 and 15403.

2.2 Compressors

.1 Two package type air compressors each complete with motor, starter and pressure-stat and mounted on a single storage tank.

.2 Each compressor and motor assembly shall be complete with replaceable inlet filter, discharge check valve, valved bypass, silencer, motor, slide rails, "V-Belt" drive and belt guard.

.3 Each compressor shall be complete with an approved unloading device to prevent motor starting with compressor fully loaded.

.4 Receiver shall have a valved pressure gauge, automatic bleed piped to drain, a relief valve and inspection port. Receiver shall be built in accordance with CSA Code for pressure vessels, and shall be sized so that number of compressor operating cycles does not exceed five per hour at any time. Provide pressure switches to maintain receiver pressure.

.5 Size of each compressor motor and capacity of receiver shall be submitted for approval and shall not be less than ratings and capacity shown on Drawings.

.6 Provide an auxiliary panel with automatic 'lag-lead' and 'hand-off-auto' switches for lead-lag operation of individual compressors.

.7 Piping and wiring required between each compressor, aftercooler and air receiver shall be completely connected up so that complete factory assembled unit is ready for immediate and continuous duty.

.8 Compressors shall be suitably isolated to eliminate vibration transfer to piping system or building structure.

2.2 Compressors (Cont'd)

.9 Acceptable Products: DeVilbiss (Canada) Ltd.; Canadian Ingersoll Rand Co. Ltd.; Dunham-Bush Canada Ltd. - Brunner; Canadian Broomwade Limited; Atlas Copco Canada Ltd.

2.3 Filter, Reducing Valve Assembly and Aftercooler

.1 Aftercooler, filter drier and reducing valve assembly on discharge line from air receiver, capable of holding an accurate control air pressure under every load condition.

.2 Aftercooler shall consist of a hermetically sealed compressor, air to refrigerant evaporator, air cooled condenser and necessary controls with automatic moisture drain trap. Aftercooler shall have a pressure dewpoint between 0.5°C and 3.5°C at 700 kPa.

.3 Filter drier shall be amply sized, with felt type filtering pad and screens. Filter shall have a large drip leg with automatic bleed piped to drain and shall be constructed so that filtering media can be easily removed for inspection and replacement.

.4 Acceptable Products: C.A. Norgren Co.; Hankinson Corporation.

.5 Provide a pressure reducing valve assembly at or near air receiver to provide designated line pressure to service piping extending through building. Pressure reducing valve shall be pilot operated and shall be complete with three valve bypass, relief valve set at 35 kPa above delivery pressure of the PRV and pressure gauge, both on the low pressure side of the valve. Reducing valve shall have capacity and pressure setting as designated. Pressure reducing valves with less than 105 kPa differential shall be spring operated type.

.6 Acceptable Product: A. W. Cash Valve Mfg. Corp - Acme; Singer Valve Company Ltd.; Leslie Company; Fisher Controls.

2.4 Drip Connections

.1 Extend compressed air piping from air receiver with sectionalizing valves, automatic drip connections and process "take off" connections as indicated. Connections shall be taken off top of pipe.

.2 Drip connections, where indicated, shall consist of 250 mm long pipe leg full size of air main and a NPS ½ ball float water discharge trap with 3 valve by-pass and test connection. Traps shall discharge into a hub drain as indicated. Install air piping so that any condensate drains into trapped drip legs.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 This section to be read in conjunction with Sections 15401 and 15499.

2.2 Plumbing Fixtures and Trim

.1 Plumbing fixtures shall be product of one manufacturer, and of same colour in any one washroom or location.

.2 Plumbing fittings shall be product of one manufacturer.

.3 Materials
.1 Vitreous china to CSA B45.1-1973.
.2 Stainless steel fixtures to CSA B45.4-1975 Class II, type 302 in accordance with CSA G110.6-1968.
.3 Plumbing fittings to CSA B125-1975.
.4 Exposed plumbing brass and metal work shall be heavy triple chromium plated.

2.3 Water Closets

.1 Type 'A-1'
.1 Bowl: Vitreous china, elongated wall hung bowl, syphon jet action, NPS 1½ top spud.
.2 Acceptable Products: American Standard "Afwall" AF-2477, Crane "Neu-Placidus" 3-459.
.3 Flush Valve: Exposed with vacuum breaker, chrome plated flush valve with seat bumper.
.4 Acceptable Product: Cambridge Brass 81T201 or Crane 402VB "Presto".
.5 Seat: Elongated open front seat, self sustaining hinges, black in colour.
.6 Acceptable Product: Moldex 105 SS
.7 Carrier: Acceptable Product: Enpoco EC710 and EC770 where applicable.

.2 Type 'A-2'
.1 Bowl: Same as 'A-1' accept that it shall be mounted 425 mm to the rim.
.2 Flush Valve: Exposed with vacuum breaker, chrome plated flush valve with seat bumper and center bumper for seat with cover.
.3 Acceptable Products: Cambridge Brass 81T201-5 or Crane 625VB "Presto".
.4 Seat: Elongated with open front and cover, white in colour.
.5 Acceptable Product: Moldex 46-0.
.6 Carrier: Acceptable Product: Enpoco EC790-32E WCH.

2.3 Water Closets (Cont'd)

.3 Type 'A-3'

.1 Bowl: Vitreous china, elongated floor mounted bowl, syphon jet action, NPS 1½ top spud.

.2 Acceptable Products: American Standard AF-2222, Crane 3-297 "Neu-Saneto".

.3 Flush Valve: Exposed with vacuum breaker, chrome plated flush valve.

.4 Acceptable Product: Cambridge Brass 81T201 or Crane 402VB "Presto".

.5 Seat: Elongated open front seat, self-sustaining hinges, black in colour.

.6 Acceptable Product: Moldex 105SS.

.7 Provide floor flange, gasket and bolt caps.

.4 Type 'A-4'

.1 Bowl: Vitreous china, elongated floor mounted bowl, syphon jet action, close-coupled closet combination with elongated rim bowl.

.2 Acceptable Products: American Standard AF-2010-L "Carlyle" or Crane 3-77 "Monterey".

.3 Supply: Cambridge Brass 47T216 or Crane C-3016.

.4 Seat: Elongated open front seat, self sustaining hinges, black in colour.

.5 Acceptable Product: American Standard AF-9213 or Crane equal.

.6 Provide floor flange, gasket and bolt caps.

2.4 Lavatories

.1 Type 'B-1'

.1 Basin: Vitreous china, oval basin with front overflow, for under counter installation.

.2 Acceptable Products: American Standard AF-0473 "Ovalyn" or Crane 1-981 "Tiara".

.3 Supply Fitting: 200 mm centreset, deck mounted NPS 3/8 copper tubing inlet, and aerator.

.4 Acceptable Product: American Standard 2238.533 or Crane C-1126.

.5 Tailpiece: NPS 1¼ P.O. plug with open grid strainer, chrome plated.

.6 Acceptable Product: Cambridge Brass 33T265.

.7 Trap: NPS 1¼ adjustable "P" trap less cleanout, chrome plated.

.8 Acceptable Product: Cambridge Brass 33T301.

2.4 Lavatories (Cont'd)

.9 Supplies: Rigid flexible supply with lockshield stops.
.10 Acceptable Product: Cambridge Brass 47T312.

.2 Type 'B-2'
.1 Basin: Vitreous china, oval basin with front overflow, self-rimming with stainless steel frame.
.2 Acceptable Products: American Standard AF-0470 "Ovalyn" or Crane 1-983 "Tiara".
.3 Supply fitting: 100 mm centreset, single lever handle, aerator.
.4 Acceptable Product: American Standard 2379.071 "Aquarian II" or Symmons S-90.
.5 Tailpiece: NPS 1¼ P.O. plug with open grid strainer, chrome plated.
.6 Acceptable Product: Cambridge Brass 33T265.
.7 Trap: NPS 1¼ adjustable 'P' trap less cleanout, chrome plated.
.8 Acceptable Product: Cambridge Brass 33T301.
.9 Supplies: Rigid flexible supply with lockshield stops.
.10 Acceptable Product: Cambridge Brass 47T312.

.3 Type 'B-3'
.1 Basin: Vitreous china basin with front overflow, anti-splash rim, soap dish and concealed arm punchings, 100 mm centres, white in colour.
.2 Acceptable Products: American Standard AF-0375 "Scotian" or Crane 1-208 "Norwich".
.3 Supply Fitting: 100 mm centreset deck mounted faucet with single lever handle, vandal proof aerator.
.4 Acceptable Product: American Standard 2379.071 "Aquarian II" or Symmons S-90.
.5 Tailpiece, trap and supplies shall be the same as for 'B-2'.
.6 Carrier: Acceptable Product: Enpoco EC440ES.

.4 Type 'B-4'
.1 Washfountain: 914 mm diameter, semi-circular pre-cast terrazzo.
.2 Acceptable Product: Bradley Model CHC-536, colour "Granite" complete with standard equipment.

2.5 Urinals

.1 Type 'C'

.1 Urinal: Vitreous china, syphon jet action urinal, extended shields, NPS 3/4 integral flush spreader and open trap, white in colour

.2 Acceptable Products: American Standard "Trimbrook" AF-6560, Crane "Embassy" 7-150FV

.3 Flush Valve: Exposed with vacuum breaker, chrome plated flush valve NPS 3/4 top spud.

.4 Acceptable Product: Cambridge Brass 81T231.

.5 Chair Carrier: Enpoco EC-510

2.6 Service Sinks

.1 Type 'D' Janitor's Mop Receptor

.1 Basin: Shall be of pre-cast Terrazzo manufactured of grey Portland cement 900 mm x 900 mm x 150 mm deep, stainless steel top covers and drain cast integral with NPS 3 outlet.

.2 Acceptable Product: Fiat SB-900X900X150

.3 Supply Fitting: 200 mm wall mounted service sink faucet with bottom brace, body mounted vacuum breaker and 1.5 meter vinyl hose and hanger and lever handles.

.4 Acceptable Product: Cambridge Brass 28T2493.

.2 Type 'E' Service Sink

.1 Sink: Acid resisting enamelled cast iron service sink with drilled back for 200 mm centres fitting, cast iron wall hanger, white in colour complete with "U" type rim guard.

.2 Acceptable Products: American Standard "Lakewell" AB-7692-0490, Crane 7-563.

.3 Trap: Shall be 75 mm cast iron "P" trap standard, adjustable with strainer.

.4 Supply Fitting: 200 mm wall mounted service sink faucet with hose end spout with vacuum breaker and indexed lever handles.

.5 Acceptable Product: Cambridge Brass 28W1063.

2.7 Showers

.1 Type 'F' Male Staff Shower
.1 Shower trim shall be pressure balancing type mixing valve, shower head with adjustable spray and 0.19 L/s flow restrictor, integral volume control and integral stops. Head located 1830 mm above finished floor.
.2 Acceptable Product: Symmons #S-86-1x complete with Model #N4-151 head.
.3 Floor drain: Enpoco 1.10R125DF

.2 Type 'F-1' Female Staff Shower
.1 Same as Type 'F' but with shower head located 1676 mm above finished floor.

2.8 Drinking Fountain

.1 Type 'G'
.1 Wheelchair model refrigerated drinking fountain having a capacity at 32°C. ambient of 0.01 L/s with 27°C. inlet water.
.2 Acceptable Product: Sunroc - Model #SWC-8.

2.9 Eye and Face Wash

.1 Type 'H' Emergency Eye and Face Wash
.1 Wall mounted, stainless steel, complete with NPS 1½ satin chrome plated 'P' trap.
.2 Acceptable Product: Haws model #7760BT or Western Safety Equipment Model #760BT.

.2 Type 'H-1' Emergency Eye and Face Wash
.1 Counter mounted stainless steel bowl. Run drain to sink tailpiece.
.2 Acceptable Product: Haws Model #7701 DM or Western Safety Equipment Model #701 DM.

.3 Type 'I' Emergency Shower and Eye Wash
.1 Combination shower and eye wash unit.
.2 Acceptable Product: Haws Model #8300 or Western Safety Equipment Model #9305.

2.10 Sinks

.1 Type 'J-1' Stainless Steel Sink (First Aid Room)

.1 Sink: 406 mm x 356 mm x 250 mm deep stainless steel sink with three hole drilling, crumb cup strainer and NPS 1½ stainless steel tailpiece

.2 Acceptable Product: Kindred Industries Ltd. Model #QL202 or Architectural Metal Industries Model #1011

.3 Trap: NPS 1½ chrome plated brass 'P' trap with cleanout.

.4 Faucet: Acceptable Product: Cambridge Brass 27T2934 deck mount gooseneck faucet with blade handles, ('A' dimension = 225 mm)

.5 Supplies: Acceptable Product: Cambridge Brass 49T311 supplies.

.2 Type 'J-2' Stainless Steel Sink (Servery and Lunch Room)

.1 Sink: 406 mm x 457 mm x 178 mm deep stainless steel sink with three hole drilling, crumb cup strainer and NPS 1½ stainless steel tailpiece.

.2 Acceptable Product: Kindred Industries Ltd. Model #QL202 or Architectural Metal Industries Model #1017,

.3 Trap: NPS 1½ brass 'P' trap with cleanout.

.4 Faucet: Acceptable Product: Cambridge Brass 27T2133 deck mount faucet.

.5 Supplies: Acceptable Product: Cambridge Brass 49T311 supplies.

.3 Type 'K' Concrete Sink

.1 Sink: Single compartment concrete sink, 1168 mm x 584 mm x 318 mm deep, complete with angle iron support stand, NPS 1½ open grid strainer, NPS 1½ P.O. plug and tailpiece.

.2 Acceptable Product: Royal Manufacturing and Precast Industries Ltd., Toronto, Ontario (416) 636-2581.

.3 Trap: NPS 1½ cast brass with cleanout.

2.10 Sinks (Cont'd)

.4 Supply Fitting: Wall mounted 200 mm faucet with hose end spout and vacuum breaker.
.5 Acceptable Product: Cambridge Brass 28T2464.

.4 Type 'L' Stainless Steel Sink
.1 Sink: 610 mm x 610 mm x 460 mm deep, 1.6 gauge stainless steel sink complete with adjustable feet, two hole drilling, crumb cup strainer, NPS 1½ tailpiece, NPS 1½ "P" trap with clean-out.
.2 Acceptable Product: Architectural Metal Industries Series 7501 (modified bowl depth).
.3 Supply Fitting: Wall mounted 200 mm faucet with hose end spout and vacuum breaker.
.4 Acceptable Product: Cambridge Brass 28T2066.

**********END**********

PART 3 - EXECUTION

3.1 General

.1 This section to be read in conjunction with Section 15401 and the following Part 2 - Product sections 15403, 15404, 15420, 15421, 15423, 15424 and 15450.

3.2 Fixture Installation

.1 Connect fixtures complete with supplies and drains, separately trapped, supported level and square. Each fixture must have valves and air chambers on supplies. Hot water faucets shall be on left. Mixing faucets; opposite action and thermostatic controlled mixing valves to have check valves on supplies.

.2 Provide chrome plated rigid supplies to fixtures with screwdriver stops, reducers and escutcheons.

.3 Provide carriers for all wall hung fixtures as specified.

.4 Fixtures mounted on glazed tile surfaces shall have ground faces to finished surface.

.5 Fixtures shall be serviced as follows:

Fixture	Waste	Vent	Cold Water	Hot Water
1 Lavatory	NPS 1¼	NPS 1¼	NPS ½	NPS ½
2 Sinks (countertop)	NPS 1½	NPS 1¼	NPS ½	NPS ½
3 Drinking Fountain	NPS 1¼	NPS 1¼	NPS ½	-
4 Water Closet (Flush)	NPS 4	NPS 1½	NPS 1	-
5 Water Closet (Tank)	NPS 4	NPS 1½	NPS ½	-
6 Slop or Mop Sink	NPS 3	NPS 1½	NPS 3/4	NPS 3/4
7 Urinal (Flush)	NPS 2	NPS 1½	NPS 3/4	-
8 Individual Shower	NPS 3	NPS 1½	NPS ½	NPS ½
9 Floor Drain	NPS 3	NPS 1½	-	-

.6 Connect and mount or connect only those already mounted on equipment supplied by kitchen equipment in other sections previously specified.

3.2 Fixture Installation (Cont'd)

.7 Provide air chambers for each fixture or group of fixtures.

.8 Where future fixtures are shown to be "roughed in" on drawings, plug or cap outlet branches for same, gas tight and water tight. Cap openings in walls with ss cover plates, secured with knock-off head screws.

3.3 Piping Installation

.1 General:
.1 Install straight, parallel and close to walls and ceilings, with specified pitch. Use standard fittings for direction changes.
.2 Install groups of piping parallel to each other; spaced to permit application of insulation, identification, and service access, on trapeze hangers.
.3 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets.
.4 Where pipe sizes differ from connections sizes of equipment install reducing fittings close to equipment. Reducing bushings are not permitted.
.5 Brass and copper pipe and tubing shall be free from surface damage. Replace damaged pipe or tubing.
.6 Ream ends of pipes and tubes before installation.
.7 Lay copper tubing so that it is not in contact with dissimilar metal and will not be kinked or collapsed.
.8 Use non-corrosive lubricant or teflon tape applied to male thread.
.9 Grooved pipe ends: cut square, seating surface clean and free from indent and score marks.
.10 Install swing or swivel joints to connect risers to mains. Use coupling in risers from one floor outlet to next.
.11 Install flanges or unions to permit removal of equipment without disturbing piping systems.
.12 Clean ends of pipes or tubing and recesses of fittings to be brazed or soldered. Assemble joints without binding.

3.3 Piping Installation (Cont'd)

.2 Equipment drainage:
.1 Install drain valves at low points.
.2 Extend equipment drain piping to discharge into floor or hub drain.
.3 Install drain piping from drain pan of air handling units, full size of outlet connection and equipment with trap seal equal to fan total pressure, unless otherwise instructed by Engineer.

.3 Expansion and contraction:
.1 Install flexible connections, pipe loops and offsets as indicated.
.2 Support piping to prevent any stress or strain.
.3 Provide steel anchors welded to steel piping, clamped to non-ferrous fastened to building structure or embedded in concrete pier. Coordinate with Engineer where fastenings are to be made.
.4 Design axial traverse shall be 4/3 times expansion on temperature difference between 18°C. ambient and corresponding fluid temperature.
.5 Anchor horizontal runs of brass and copper pipe to wall or floor construction. Coordinate locations with Engineer. Obtain approval for all anchor types.

.4 Sanitary and storm drainage:
.1 Run piping to main sewers with uniform grade. Trap and vent fixtures as required.
.2 Where inverts are not given, pipes shall have uniform grade complying with Reg. 736.
.3 Plug or cap pipe and fittings to keep out debris during construction.
.4 Jointing of pipe: compatible with type of pipe used.
.5 Acceptable Product: Garlock, John Crane Compound, Chesterton, Albion, Master Metallic Compound, Loctite.

.5 Interior buried piping:
.1 Lay pipe on compacted bedding of clean, coarse sand free from clay, snow or ice, organic matter or stones.
.2 Grade bottoms of excavations for pipes. Shape to fit the lower 1/3 segment of pipes and sockets, taking care to ensure even bearing along barrels.

3.3 Piping Installation (Cont'd)

.3 Do not lay pipe in water or when in opinion of Engineer conditions are unsuitable.

.4 Run buried drains minimum 200 mm clear below bottom of concrete slab.

.6 Water Piping:

.1 Run water piping from service connection to fixtures, equipment and outlets.

.2 Connect pressure gauge graduated from 0 to a gauge pressure of 1100 kPa on water service main on building side of water meter. Install gauge cock between service main and gauge. Stem mount gauge shall have 114 mm dial to CGSB 91-GP-1 Type A, grade A.

.3 Provide washroom groups and branch take-offs from mains with isolating ball valves. Install stop valve in each fixture supply.

.4 Where two or more branch recirculating hot water lines are connected to main recirculating line, provide lockshield globe valve and check valve in each branch line for balancing water flow and for prevention of back flow in one branch. Adjust balancing valves to provide recirculation through system. Turn over lockshield valve key to Engineer after balancing at interim takeover.

.5 Provide hose bibb or sediment faucet for complete system drainage.

.6 Pipe water treatment system as indicated and connect to building cold water system and to raw water delivered by site services.

.7 Flushing and cleaning procedure for piping system.

.1 Flush and clean out after pressure tests.

.2 Fill with solution of water and non-foaming, phosphate-free detergent.

.3 Flush and drain. Clean strainers.

.4 Refill water system with clean water.

3.4 Specialties Installation

.1 Cleanouts:
.1 Install accessible cleanouts at traps, and where required.
.2 Unless serviceable from below floor in basement, bring cleanouts up to finished floor or wall.
.3 Building drain cleanout and stack base cleanouts: NPS 4.

.2 Install backwater valves in pits or with access to top for servicing.

.3 Floor drains: provide with trap primers connected to nearest cold water flush valve, or as shown to manual primer.

.4 Water meter: installation to comply with local water authority requirements. Provide stanchions at piping to inlet and outlet within 150 mm of meter.

.5 Testing: ensure that insulated piping and equipment installed in concealed spaces is tested and inspected prior to permanent concealment. Give 48 hour notice to Engineer in writing.

.6 Outside hydrants: install 1.0 m above grade or recess in floor as shown.

.7 Inside hydrants and hose bibbs: install 1200 mm above finished floor.

.8 Disinfection: disinfect potable water system to requirements of authority having jurisdiction. Provide necessary chemicals and flushing required.

3.5 Equipment Installation

.1 Electric appliances: connect to hot and cold water systems and pipe drain from relief valve to floor drain. Electrical work is described under Division 16.

.2 Hot water heaters: install as per manufacturer's instructions to hot and cold water.

.3 Control valve: install water control valves in supply pipe to tank, equipment, heaters according to manufacturer's instructions.

3.5 Equipment Installation (Cont'd)

.4 Pumps:

.1 Secure base mounted pump assembly bedplate to concrete base provided. Grout after assembly to piping.

.2 Secure frame and cover plates of sump pumps of various types onto pit frames provided.

.3 Keep discharge piping and valves clear of sump pumps to allow for vertical withdrawal of pumps. Locate check valves in horizontal position only.

.4 Connect sump pump discharge to main drain line as indicated and place gate and nonslam counterweighted check valve close to pump, in line from each pump. Set counterweight arm in horizontal position. Keep discharge piping clear of pumps to facilitate removal from sump.

.5 Anchor piping securely, immediately after flexible connection and also just before sump pump discharge line connects to main cast iron drain piping.

.6 Align pump and motor assembly after grouting base mounted units, and after mounting of cover plate of sump type vertical pumps.

3.6 Testing

.1 Test piping in accordance with procedures outlined in Section 15010, and as specified.

3.7 Commissioning

.1 Equipment: make tests to demonstrate capabilities and general operating characteristics of equipment, as instructed by Engineer.

3.8 Clean up

.1 Leave systems operating with work areas clean to satisfaction of Engineer.

3.9 Mounting Heights

.1 Fixture mounting heights measured from floor shall be in accordance with following paragraphs:

.1 Water Closet:

.1 Standard: 375 mm to top of bowl rim

.2 For physically handicapped: 450 mm to top of seat

.2 Urinal:

.1 Standard: 550 mm to top of bowl rim

3.9 Mounting Heights (Cont'd)

.3 Lavatory:
.1 Standard: 850 mm to top of basin rim
.2 For physically handicapped: 850 mm to top of basin rim
.4 Drinking Fountain:
.1 For physically handicapped: 900 mm to top of basin rim

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Painting: Section 09900

.2 Fire detection and alarm system: Section 16601

1.2 Reference Standards

.1 Do work to the following except where specified otherwise:
.1 Federal building and fire regulations as approved by Fire Commissioner of Canada.
.2 FCC 401M-1976 Fire Extinguishers, FCC 402-1977 Standpipe and Hose Systems, FCC 403-1976 Sprinkler Systems, FCC 410-1979 Fire Alarm Systems.
.3 National Fire Protection Association Standards:
NFPA 10-1978 Portable fire extinguishers
NFPA 13-1983 Installation of sprinkler systems
NFPA 14-1983 Standpipe and hose systems
NFPA 17-1980 Dry chemical extinguishing

1.3 Description of Systems

.1 Provide the following fire protection systems:
.1 Automatic sprinkler systems
.2 Fire hose and standpipe system (Part of Sprinkler Systems)

1.4 Dominion Fire Commissioner Approval

.1 Fire Commissioner of Canada shall approve design, entire installation, equipment, materials as well as perform inspection and supervise all tests.

1.5 Certificates

.1 Provide written certificate that components are compatible, and where applicable, certified for intended use by nationally recognized testing agency.

PART 2 - PRODUCTS

2.1 Pipe and Fittings

.1 Steel pipe: Schedule 40, for sizes under NPS 8, Schedule 30 for sizes NPS 8 and over to CSA B63-1966(R1971).

.2 Fittings: 1210 kPa working pressure of following: cast iron screwed to ANSI B16.4-1977, 1210 kPa malleable iron, screwed to ANSI B16.3-1977, 1210 kPa cast iron flanged to ANSI B16.1-1975, 1210 kPa. Mechanical groove coupling 1210 kPa to ANSI B31.3-1980.

2.1 Pipe and Fittings (Cont'd)

.3 Flange bolts: square or hex head bolts with heavy hex nuts to ASTM A307-76b.

.4 Flange gaskets: 1.6 mm thick plain or cloth inserted red rubber to ANSI B16.20-1973 and ANSI B16.21-1962.

2.2 Valves

.1 Valves: of one manufacturer for fire protection; ULC listed; bearing manufacturer's name trademark and FM identification figure number and pressure rating. Unless otherwise specified or indicated design for 1.2 MPa working water pressure.

.2 Valves over NPS 2 shall have rising stems and be repackable under pressure. Provide malleable iron handwheels and under NPS 2 use rising or non-rising stems.

.3 Valves on fire lines and standpipes: equip with contacts and devices necessary for operation of supervisory system specified under "Fire Detection and Alarm System" Section 16601.

2.3 Pipe Hangers

.1 Conform to NFPA 13-1980 and Section 15010 for sprinkler systems.

.2 Conform to NFPA 14-1983 and Section 15010 for standpipe and hose systems.

2.4 Signs

.1 Signs: fabricated from metal with chain suspension; white letters on red background.

2.5 Gate Valves

.1 Valves NPS 2 and under: bronze to ASTM B61-76 double disc and screwed ends.

.2 Valves NPS 2½ and over: Underwriters' Laboratories pattern, iron body, bronze mounted, with OS&Y double disc or wedge, flanged ends.

2.6 Globe Valves

.1 Valves NPS 2 and under: bronze to ASTM B61-76 screwed ends, composition disc replaceable without removing valve from line.

.2 Valves NPS 2½ and over: iron body, bronze mounted, OS&Y, flanged ends bolted bonnet and yoke, bronze seat, solid bronze disc, seat and disc replaceable without removing valve from line.

2.7 Check Valves

.1 Valves NPS 2 and under: bronze to ASTM B61-76 for both horizontal and vertical mounting with replaceable composition disc, screwed cap and ends.

.2 Valves NPS 2½ and over: Underwriters' Laboratories pattern, iron body, bronze mounted, regrind-renew bronze disc and seat ring, bolted cap flanged ends. Design for either horizontal or vertical mounting.

2.8 Valve Supervisory Switches

.1 Switches shall be ULC listed with two sets of Form 'C' contacts. Switches shall be suitable for OS & Y gate valve or butterfly valves. Switches shall further be suitable for dry or wet conditions.

2.9 Pressure Switches

.1 Pressure switches shall be ULC listed and suitable for wet and/or dry pipe systems as shown on Drawings.

2.10 Vane Type Water Flow Switch

.1 Water flow switches shall be ULC listed and with two sets of Form 'C' contacts (S.P.D.T.). Initial time setting shall be approximately 45 seconds.

PART 3 - EXECUTION

3.1 Inspection

.1 Do not recess, paint or conceal piping, accessories or work prior to inspection and approval by FCC and authorities having jurisdiction or authorized representative.

3.2 Installation

.1 Install systems in accordance with manufacturer's recommendations.

.2 Allow for expansion and contraction when installing pipe hangers.

.3 Discharge drains to safe location in interior of building to visible point of free discharge at open drain.

.4 Install signs required by FCC or local Fire Protection Department.

.5 Secure outdoor signs with stainless steel bolts.

3.3 Field Quality Control

.1 Subject systems and equipment to operational test.

3.3 Field Quality Control (Cont'd)

.2 Hydrostatically test fire hose and standpipe systems, including water supply connections and fire department connections at 350 kPa in excess of normal working pressure but not less than 1.4 MPa for two (2) hours without loss under supervision of FCC.

.3 Upon complete installation of piping and apparatus for sprinkler systems, test joints for tightness and good condition of piping. Inspect in presence of FCC. When testing with water, install pressure gauge at highest point of installation. If impossible to test whole installation in single operation, subdivide into several zones and test each zone in manner described.

.4 During tests, stop any leaks and remove and repair any defective part. Perform test over again until satisfactory results are obtained.

.5 Provide hydraulic pump, temporary connections and labour required for tests.

.6 Hydrostatically, test dry pipe system in same manner as wet pipe system, except when low temperature will not permit testing with water. Conduct interim test with air. Conduct standard hydrostatic test when weather permits. Test at 275 kPa air pressure for twenty-four hours with maximum loss of pressure not over 10 kPa.

3.4 Adjustment

.1 Adjust equipment to satisfaction of FCC and authorities having jurisdiction.

3.5 Protection of Completed Work

.1 Assume responsibility for protecting sprinkler heads during painting. Replace damaged and improperly painted components.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Fire protection general: Section 15500

.2 Sprinkler equipment: Section 15510.

.3 Services to mechanical equipment: Section 16010

.4 Fire detection and alarm system: Section 16601.

1.2 Reference Standards

.1 Conform to the following:
- .1 FCC 403-1982.
- .2 NFPA 13-1983

1.3 Design Criteria

.1 Flammable Liquid Storage: design for 0.34 L/s/m² over entire area.

.2 Helicopter Hangar: design for 0.12 L/s/m² over 279m².

.3 Hangar Support Facilities: design to 0.10 L/s/m² over entire area or to ordinary schedule pipe size.

.4 Spray Paint: design to 0.34 L/s/m² over entire area.

.5 Shops: design to 0.09 L/s/m² over 186 m².

.6 Electrical Room: design to ordinary group one hazard over entire zone.

.7 Construction Materials: design to 0.09 L/s/m² over 186 m².

.8 Support facilities: design to 0.10 L/s/m² over 139.5 m².

.9 Offices: design to 0.068 L/s/m² over 139.5 m².

.10 Pipe size to change to meet scheduled design.

1.4 Water Flow Test

.1 Before commencing with the work obtain results of the water test performed on the site.

.2 Water flow tests to be conducted in accordance with the requirements of Insurance Advisory Organization of Canada as outlined in the booklet G-13 paragraph titled "IAO water supply analysis". Test result including plotted water supply curve on semi-logarithmic type graph paper to be submitted to FCC and to the Engineer.

PART 3 - EXECUTION

3.1 Installation .1 Terminate all work 1500 mm from outside of building wall.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340 and FCC, and authorities having jurisdiction for approval before commencing work.

.2 Shop drawings shall clearly indicate:

.1 Name of Department or Agency.
.2 Location, including street address.
.3 Point of compass.
.4 Ceiling construction.
.5 Full height cross section.
.6 Location of fire walls.
.7 Occupancy of each area or room.
.8 Location and size of blind spaces and closets.
.9 Any questionable small enclosures in which no sprinklers are to be installed.
.10 Size of city main in street, pressure and whether dead-end or circulating and if dead end, direction and distance to nearest circulating main, with city main test results.
.11 Other sources of water supply, with pressure or elevation.
.12 Make, type and orifice size of sprinklers.
.13 Temperature rating and location of high temperature sprinklers.
.14 Number of sprinklers on each riser and on each zone by floors, and total area protected by each zone on each floor.
.15 Number of sprinklers on each riser and total per floor.
.16 Make, type, model and size of alarm or preaction pipe valve.
.17 Cutting lengths of pipe or centre to center dimensions.
.18 Crosses, riser nipples and size.
.19 Type of hangers, inserts and sleeves.
.20 All control valves, checks, drain pipes and test pipes.
.21 Provision for flushing.
.22 Name and address of contractor.

1.1 Shop Drawings (Cont'd)

.3 Over and above that called for in 1.4.2 above, show the following for hydraulically designed systems:
.1 Hydraulic reference points to be designated by letter or number and to correspond to the comparable reference points shown in the hydraulic calculation sheets.
.2 Description of sprinklers used.
.3 System design criteria: minimum rate of water application density, design area of water application and water application for both inside and outside hose streams.
.4 Actual calculated requirements: total quantity of water and pressure required at a common reference point for each system.
.5 Elevation data including relative elevation of sprinkler junction points and supply of reference points.

.4 Submit calculations of hydraulically designed systems on form sheets, including summary sheet, detailed work sheets and graph sheet.

.5 On summary sheet, clearly indicate:
.1 Date.
.2 Location.
.3 Name of department or agency.
.4 Building number or other identification.
.5 Description of hazard.
.6 Name and address of contractor or designer.
.7 Name of approving agency.
.8 System design requirements, including design area of water application, minimum rate of water application, density and area per sprinkler.
.9 Total water requirements as calculated including allowance for inside hose and outside hydrants.
.10 Water supply information:
.1 Perform water test adjacent to the property prior to commencement of sprinkler system installation and record results.

1.1 Shop Drawings (Cont'd)

.6 On detailed work sheets or computer printout sheets, clearly indicate:
.1 Sheet number.
.2 Sprinkler description and discharge constant K.
.3 Hydraulic reference points.
.4 Flow in L/s.
.5 Pipe size.
.6 Pipe lengths, centre to centre of fittings.
.7 Equivalent pipe lengths for fitting and devices.
.8 Friction loss in kPa/m of pipe.
.9 Total friction loss between reference points.
.10 Elevation head in kPa between reference points.
.11 Required pressure in kPa at each reference point.
.12 Velocity pressure and normal pressure if included in calculations.
.13 Notes to indicate starting points, reference to other sheets or to clarify data shown.

.7 Graph paper of semi-logarithmic type to contain water supply curves and systems requirements plus inside and outside hose requirements so as to present a graphic summary of complete hydraulic calculation.

1.5 Certificates

.1 Provide certificate indicating that sprinklers meet FCC requirements and quantity specified.

1.6 Maintenance Materials

.1 Provide maintenance data in English for sprinkler equipment for incorporation into maintenance manual specified in Section 01730.

.2 Provide lockable metal cabinet containing spare sprinklers of each type and melting point temperature. Install cabinet where indicated. Include sprinkler wrenches and keys, for emergency repair work. Number of spare sprinklers shall be governed by NFPA 13 1983.

PART 2 - PRODUCTS

2.1 Sprinklers

.1 Provide standard upright type or pendant type ULC listed sprinklers of current manufacture where indicated.

2.1 Sprinklers (Cont'd)

.2 Sprinklers shall be listed with and bear certification marking of nationally recognized testing agency.

.3 Provide minimum NPS 1/2 and 17/32 diameter discharge orifice, sprinkler heads as shown on drawings.

2.2 Wet Pipe System

.1 Provide complete with following:
.1 Alarm valves.
.2 Indicating control valves.
.3 Excess pressure pump.
.4 Water gauges.
.5 Piping and fittings.
.6 Valves.
.7 Hangers
.8 Floor and ceiling escutcheon plates.

.2 Provide alarm valves complete with excess pressure pump and standard accessories, drain valves, check valves, alarm connections and water gauges. Provide indicating type valves for controlling water supply and alarm shut-off.

.3 Provide standard water flow, valve alarm devices and main control valve. Provide trouble transmitter, water flow circuit closer for complete central station electrical supervision of system.

.4 Water flow and supervisory switches shall be ULC listed and with two sets of Form 'C' contacts.

.5 Provide excess pressure pump capable of pumping system to 170 kPa within 30 min, in excess of normal pressure. Provide pump with supports, safety valve, gauge, starter and connections to wet pipe sprinkler system. Set safety valve 70 kPa above operating pressure.

.6 Provide complete supervision of water flow, alarm, and control valves for each floor to building fire alarm system and central station.

2.3 Preaction Sprinkler System

.1 A pre-action sprinkler system shall be provided for the area shown.

2.3 Preaction Sprinkler System (Cont'd)

.2 The pre-action system shall operate as follows:
.1 heat detectors shall be cross-zoned and upon activiation of any detector within the area protected an alarm will be transmitted within the room, transmit an external signal to a fire department/control centre or to a central station, and cause a visual and audible signal at an annunciator.
.2 upon activation of a second zone, the water control valve will open to allow water into the sprinkler pipes and shut down the computer and air handling equipment.

.3 A water control valve and a water flow indicator shall be provided outside of the area protected by the pre-action sprinkler system. They shall be physically protected against tampering and monitored to detect unauthorized manipulation.

.4 Should the air in system drop 14.0 kPa a trouble condition will be monitored at the control panel. Control panel shall have enough Form 'C' contacts built in for future remote annunciation of alarm condition and summary of all trouble conditions.

2.4 Pumper Connections

.1 Pumper connections will be installed under Section 15530.

PART 3 - EXECUTION

3.1 Installation

.1 Install alarm valves and electric switches as indicated and as specified.

.2 Install horizontal valves with stems upright where space allows.

.3 Installer is to properly identify a hydraulically designed system by providing a sign at the main alarm valve in accordance with 7-1.2 and A-7.1.2 of NFPA 13, 1983.

.4 Do not install any branch line sprinklers in mechanical and electrical rooms and in Paint Spray booth room until all mechanical and electrical equipment has been put in place.

3.1 Installation (Cont'd)

.5 Where remote inspector's test connections are not indicated, provide test and drain equipment as per NFPA 13, 1983, Fig. A.3.9.1.2.

3.2 Protection of Completed Work

.1 Paint exposed steel pipe and fittings, except special finishes, in accordance with Section 09900.

.2 Provide red wire guards for sprinkler heads in mechanical and electrical rooms and around ventilation equipment, as indicated.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Fire protection: Section 15500

.2 Automatic sprinkler systems: Section 15510.

.3 Portable extinguishers: Section 15540

.4 Fire detection and alarm system: Section 16601.

1.2 Reference Standards

.1 Conform to the following:
.1 NFPA 14-1978, standpipe and hose systems and FCC 402, 1977.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340 and FCC.

.2 Provide shop drawings for fire hose cabinets, hose, rack, valves, nozzles and equipment.

1.4 Engineering Data

.1 Provide necessary calculations.

1.5 Maintenance Data

.1 Provide maintenance data in English for fire hose and standpipe system for incorporation into maintenance manual specified in Section 01730.

PART 2 - PRODUCTS

2.1 Standpipe

.1 Standpipes to be connected to sprinkler systems as shown on Drawings.

2.2 Fire Hose Cabinets

.1 Fire hose and extinguisher cabinets; flush type as indicated, constructed of 1.6 mm thick steel with full opening door of 2.5 mm thick steel. Construct and hinge door to prevent sway or sag when opened.

.2 Provide back of flush cabinets with fire resistance equal to fire resistance of wall or partition in which they occur.

.3 Equip cabinet door with approved latching.

.4 Provide cabinet door with 5 mm full glass panel.

2.2 Fire Hose Cabinets (Cont'd)

.5 Provide angle valve, swing type hose rack, fire hose nozzle and spanner, and fire extinguisher of type and capacity as shown on Drawings.

2.3 Fire Hose, Nozzle and Spanner

.1 Hose: Underwriters' Laboratories of Canada labelled 23 m long, 40 mm nominal dia., synthetic-rubber lined, mildew and rot resistant.

.2 Nozzle: adjustable, combination fog-straight stream with shut-off.

.3 Spanner: 40 mm nominal hose coupling spanner.

2.4 Hose Racks and Reels

.1 Rack: swivel type with pins to permit hose to be hung in folds or stationary-type rack with pins designed for 180° movement. Locking pin shall prevent flow of water into hose until last fold is removed from rack.

2.5 Angle Valves

.1 Angle valve: NPS 1½ cast or forged brass valve with hand wheel.

.2 Provide valve with open or drip connections or hydrolator valve so installed that leakage past valve seat will not enter hose.

.3 Where water pressure exceeds 550 kPa provide orifice restriction to prevent water pressures in excess of 550 kPa from entering hose.

.4 Locate valve 1.5 m above floor.

.5 Angle valve must bear U.L.C. label.

2.6 Finishes

.1 Fire hose cabinet, shall be fully recessed with chrome plated valves, nozzle, hose rack and fittings.

PART 3 - EXECUTION

3.1 Installation

.1 Install system in accordance with approved shop drawings.

.2 Arrange drains as indicated so that they can be fully opened without flooding.

3.1 Installation (Cont'd)	.3	Install fire hose and extinguisher cabinets so angle valve is 1.5 mm above floor, and door, when open, does not obstruct any other door opening.
	.4	Install extinguishers specified in Section 15540 in fire hose cabinets.
3.2 Field Quality Control	.1	Test system in accordance with NFPA 14-1983 and requirements of FCC authorities having jurisdiction.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere .1 Extinguisher cabinets: Section 15530

1.2 Reference Standards .1 Conform to the following standards:
.1 NFPA 10-1983 for portable fire extinguishers
.2 FCC No. 401-M1976 for fire ex-extinguishers.

1.3 Maintenance Data .1 Attach tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

PART 2 - PRODUCTS

2.1 Water Pump Tank Extinguishers .1 Water pump tank extinguishers: stainless steel construction, labelled by Underwriters' Laboratories of Canada 9.5 L size.

2.2 Multi-Purpose Dry Chemical Extinguishers .1 Multi-purpose dry chemical extinguishers: stored pressure type with integral shut-off nozzle, labelled by Underwriters' Laboratories of Canada in-cabinet installation. Size 4.5 kg.

2.3 Carbon Dioxide Extinguishers .1 Carbon Dioxide Extinguishers: Durable glossy enamel finish, labelled by Underwriters' Laboratories of Canada size 4.5 kg.

2.4 Extinguisher Brackets .1 Extinguisher wall brackets: type recommended by extinguisher manufacturer.

PART 3 - EXECUTION

3.1 Installation .1 Install extinguishers in cabinets specified in Section 15530 or brackets provided by extinguisher manufacturer as per FCC No. 401 (M) 1976.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1	Excavating and backfilling:	Section 02220
.2	Cast-in-place Concrete:	Section 03300
.3	Metal fabrication:	Section 05500
.4	Flashing and Sheet Metal:	Section 07550
.5	Painting:	Section 09900
.6	Louvres and vents:	Section 10200
.7	Electrical:	Section 16010

1.2 Reference Standards

.1 Oil tanks, including controls and piping shall conform to:
.1 Provincial Inspection Department, FCC, ULC, NFPA, of flammable liquids not under pressure.
.2 ULC S603-1977 and API 620-1970.

.2 Boilers shall conform to:
.1 ASME, ASTM, ANSI and CSA requirements and bear Canadian Registration number.
.2 Manufacturers Standardization Society (MSS) SP-25-1964, ANSI and ASME requirements for valves.
.3 ANSI B31.1-1977 and ULC C203-1975 for boiler pipes and fittings.
.4 ASME code and Provincial Board of Labour Regulations for welding materials and labour.
.5 CGA B149.1-1976 for gas piping.
.6 CSA B139-1976 for oil piping.

.3 Burners and controls shall conform to:
.1 CSA, provincial code and ULC requirements.
.2 FIA, FM and Province of Ontario Energy Act for firing train.

.4 Package rooftop cooling units conform to CSA, CGA, ARI requirements.

1.3 Description of System

.1 Heat the Hangar using propane fired infrared heaters.

.2 Heat the Shop Wing using hot water as provided by gas/electric hot water boilers with a water supply temperature of 93.3°C.

.3 Heating of the Administration Wing is accomplished with the use of two scheduled hot water systems and secondary pumps taking hot water from the boilers in the Shop Wing. Control will be of the indoor/outdoor type.

.4 Cooling will be provided by a packaged roof mounted air cooled cold generator with a single pump and cooling coil in the main supply unit.

.5 Termination Points:
.1 Fuel systems.
.1 Gas system: Pressure regulating station downstream of main reducing valve and flow measuring devices to boiler and Paint Spray Booth air supply unit as indicated is minimum required.

.6 Packaged equipment from manufacturer's:
.1 Provide all equipment, factory assembled, piped, wired ready for automatic operation, except for external piping and electrical connections with field instruction.

1.4 Qualifications

.1 Use welders fully qualified and licensed by Provincial Authorities.

.2 Packaged equipment shall be product of locally represented manufacturer engaged in production of units of type and size specified who issues complete catalogue data on such products, and accepts responsibility for selection, operating characteristics, quality and assembled package. Local representation must include service agency.

1.5 Source Quality Control

.1 Provide authorized boiler inspection test report prior to shipment and submit one copy of inspection report to Engineer.

.2 Fire test packaged boilers prior to shipment.

1.6 Shop Drawings and Engineering Data

.1 Submit shop drawings in accordance with Section 01340

.2 Clearly indicate:
.1 Equipment, piping, and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware, and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections.
.2 Piping, valves, fitting shipped loose by packaged equipment supplier, showing their final location in field assembly.
.3 Control equipment shipped loose, by packaged equipment supplier, showing their final location in field assembly.
.4 Complete internal panel pneumatic tube piping and wiring and any external panel pneumatic tube piping and wiring, both as schematics and as actually assembled.
.5 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads.
.6 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories, controllers.
.7 For pumps and fans submit shop drawings of curves for review.

.3 Submit engineering data as follows:
.1 Performance data of HVAC equipment; show input and output and coefficient, in accordance with ASHRAE 90-75.
.2 State radiant heat load expected at full load.
.3 Pump curve from shut-off L/s to wide open L/s.
.4 For engineering data and manufacturer's specifications, provide test data and performance curves.

.4 Provide packaged equipment manufacturer's data and test report.

1.7 Maintenance Data and Instruction

.1 Provide maintenance data for heating and cooling plant for incorporation into maintenance manual specified in Section 01730.

.2 Provide brief description of systems and include same at beginning of manual, properly indexed, with details of function, operation, control and service for each piece of apparatus.

.3 Manufacturer's instructions shall govern installation and unless otherwise noted, operation, maintenance and service of items. Include names and addresses of spare part suppliers.

.4 Data shall constitute more than general advertising information, include following:

.1 Provide, for each piece of equipment and system manufacturer's name, type, year, serial number, number of units, capacity and identification to related systems.

.2 For boilers, give manufacturer's stated conditions such as fuel firing rate at MCR and 100%, 75%, 50% and also at low firing range (turndown), flue gas temperature at above mentioned fractions of MCR, pressure at boiler flue gas outlet at MCR in Pa.

.3 For circulating pump and circulator, state service and identify boiler, zone distribution, cooling coil on air handling unit and air cooled cold generator.

.4 For diesel oil pump state W at temperature of operation 20°C. and type of medium in SSU.

.5 For air cooled cold generator, conduct comprehensive demonstration to accustom maintenance staff on operation and care of equipment.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 Read this section in conjunction with Sections 15601 and 15799.

.2 Supply and install complete water treatment systems for:
.1 Hot water heating system.
.2 Chilled water system.

.3 All closed systems (2) shall have bypass feeders, micron filtration and corrosion test coupon stations. They shall also be chemically cleaned and certified by the chemical treatment supplier. They shall have suitable sample valves, the location and type as recommended by the chemical specialists.

.4 Water treatment chemicals and 20 micron filter cartridges shall be supplied for the initial start up. Include all supervision, field service calls, written reports, equipment installation and system certification reports.

2.2 Hot Water Heating System

.1 One E5700 bypass feeder 7.5 L.

.2 One E5751 micron filter 1.3-2 L/s.

.3 One two position corrosion test coupon station.

2.3 Chilled Water System

.1 One 20 L bypass feeder E5705.

.2 One E5765 micron filter 7.5-11 L/s.

2.4 Supply of Chemicals

.1 Supply chemicals for initial charging of all systems and a quantity to properly inhibit the systems during the first three months until acceptance of the systems operation by their maintenance personnel. The following Specialty Chemicals products shall be used:
.1 Closed system cleaner as required.
.2 Inhibitor for scale and corrosion control.
.3 Inhibitor for closed systems.
.4 Biocides for closed systems.

2.5 Systems Accessories

.1 One - case of 30 (20 micron) filter tube refills.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 Read this section in conjunction with Sections 15601 and 15799 and 15442.

.2 This section shall pertain to Diesel Oil, Diesel Fuel, Gasoline and Helicopter Fuel Storage Tanks.

.3 Existing fuel shall be transferred from existing tanks to new tanks. Provide additional fuel as required for each system such that the new tanks shall be filled.

.4 Provide full tank of diesel oil for emergency generator system. Day tank and buried tank to be included.

2.2 Fuel Storage

.1 Tanks shall bear ULC label, and conform to municipal bylaws for underground tanks.

.2 Provide underground fuel storage tanks and piping systems as shown on the Drawings. Excavating and backfilling for the tanks will be done under Division 2 and the concrete pads above and below the tanks will be done under Division 3. Excavating and backfilling for the piping between the tanks and the dispensers shall be done under this Section.

.3 Each tank shall be Underwriters approved and shall be designed to support 900 mm of earth above the tank and an additional minimum 12 kPa live load over the tank when empty.

.4 Sounding and fill lines shall be extended to grade as shown and terminated with locked caps in concrete boxes 300 mm x 300 mm x 300 mm deep. The concrete boxes will be installed under Division 3 and cover plates shall be installed under this Section.

.5 Vent lines shall terminate as shown on the Drawings with weatherproof hoods, flame arrestors and screens.

2.2 Fuel Storage (Cont'd)

.6 Dipstick and chart shall be provided for each tank, graduated in litres.

.7 Provide standard pipe thread fibreglass fittings.

.8 Manhole: 520 Ø manhole with steel bolted and gasketted cover plate as shown.

.9 Nameplate:
.1 Factory fabricated ULC approved nameplate.

.10 Glass fiber reinforced polyester chemical resistant tanks: to ASTM D3299-74, ULC labelled for storage of flammable liquids, NFPA 30-1983 flammable and combustible liquids code and NFPA 31-1983 installation of oil burning equipment.
.1 Acceptable manufacturers: CAE Fiberglass Products, Owens-Corning Fiberglas Corp.

.11 Accessories:
.1 Suction stubs of fibreglass pipe with suction riser pipe to 150 mm above invert of tank.
.2 Hold down straps for cast-in-place anchoring slab.
.3 Piping:
.1 Conform to sections of ANSI B31.1-1977 for pressure piping and to NFPA 30 1983 for Flammable and Combustible Liquids Code, and FCC 106(M) 1979 for Flammable and Combustible Liquids.
.2 Provide materials, accessories as per Section 15701.
.4 Provide 860 Ø fibreglass sleeve for each tank.
.5 Provide 915 Ø cast iron manhole cover and frame.
.6 Acceptable Products: Don Wheel and Foundry DS4446.

2.3 Diesel Day Tank

.1 Provide a diesel fuel oil day tank complete with openings for fill, vent, gauge, engine supply and return lines, drain valve and controls. Tank size as listed in Schedule.

2.3 Diesel Day (Cont'd)

.2 Tank and saddles shall be factory Tank painted with two coats of primer paint.

.3 Provide sight gauges of mechanical indicating type showing amount of oil in day tank.

.4 Provide 100 mm diameter flanged stand pipes for level and pump controls as shown.

.5 Provide level and pump controls in standpipes.

.6 Acceptable Products: Magnetrol, Varec, Omnitrol.

2.4 Leakage Detection System

.1 Monitor Instrument

.1 Temperature compensated solid state circuitry shall continuously monitor leak detection circuits for open circuit or alarm condition. Alarm condition shall be indicated by visual indicator light and operation of isolated relay to allow interface with other equipment.

.2 Supply voltage 120 V AC.

.3 Module to be complete with Power-On Lamp, Alarm Lamp, Test Switch and Reset Switch.

.2 Lead detection cable: twisted pair of 20 AWG woven conductors insulated with liquid hydrocarbon degradable dielectric, with loose interlocking aluminum alloy armour.

.3 Control cable: twisted pair of 20 AWG woven conductors with 300 V insulation and PVC jacket.

.4 Acceptable manufacturer: Leak-X.

**********END**********

PART 2 - PRODUCTS

2.1 General .1 Read this section in conjunction with Sections 15601 and 15799.

2.2 Boilers General .1 Conform to requirements of regulations of Province of Ontario, and following:
.1 CSA B51-1975, Canadian Interprovincial Boiler Code.
.2 Boiler and Pressure Vessel Code, ASME Section I-1974 and ASME Section IV-1974.
.3 Canadian Electrical Code.
.4 Piping to ANSI standards and Ontario Energy Act for Gas.
.5 Stack: Environment Acts.

.2 Provide Canadian registration number (CSA B51-1975, refers) of unit attesting to unit's meeting requirements of the Chief Boiler Inspector of Ontario.

.3 Unit shall bear seal attesting its meeting standard set individually by Hydronic Institute IBR and Canadian Gas Association.

.4 Provide three (3) packaged units complete with components, accessories and hardware, piped, wired, and fire tested prior to shipment with actual unit test data submitted to Engineer.
.1 One (1) boiler shall be suitable for use on electric power or propane gas (for emergency use).
.2 Two (2) boilers shall be suitable for use on electric power with provision for future gas (natural).

.5 Performance of each boiler as follows:
.1 Boiler capacity (electric): IBR rated.
.1 Hot Water: 195,000 W input and 187,170 W output low pressure, maximum water temperature rise of 11°C. and outlet temperature of 93.3°C when using electric immersion element.
.2 Available electric power: 575 V, 3 phase, 60 Hz, and 115/1/60 for control circuit.
.3 Minimum efficiency: 96% electric.

2.2 Boilers General (Cont'd)

.2 Boiler capacity (gas): IBR rated.
.1 Hot Water: 351,590 W input, 281,280 W output low pressure, maximum water temperature rise of 11°C and outlet temperature of 93.3°C when fired with propane gas having a heat content of 93,800 kJ/m³.
.2 Flue gas temperature leaving boiler shall not exceed 260°C. or be lower than the dew point temperature at minimum firing conditions.
.3 Minimum efficiency: 80%.

.6 Boiler shell shall be constructed of welded steel boiler plate.

.7 Boiler shall be constructed with adequately sized upper drums, water legs and tube headers, providing proper thermal internal water circulation, not requiring an external circulation source.

.8 Water tubes are to be NPS 1 OD, 2.5 mm steel, six-pass, flexible serpentine bend design, not subject to thermal shock damage. Individual water tubes shall be easily removable and replaceable without requiring either welding or rolling.

.9 Boiler shall have not less than .46 m² of heating surface per boiler horsepower.

.10 Each boiler shall be furnished with an adequate number of tappings and inspection openings to facilitate internal boiler inspection and cleaning. The entire tube area shall be easily accessible for fireside cleaning.

.11 Each boiler shall be complete with an insulated metal jacket, consisting of not less than 38 mm fiberglass insulation and a heavy gauge rust-resistant, zinc coated steel casing, painted with a suitable heat resisting primer and lacquer. Complete jacket and insulation shall be easily removable and re-installed, if necessary.

2.2 Boilers General (Cont'd)

.12 Each boiler shall be furnished with a refractory type combustion chamber constructed of high temperature insulating firebrick and properly insulated from steel base.

.13 The manufacturer's representative must be able to demonstrate the removal and replacement of one tube with no major dismantling of the jacket rear entry into the combustion chamber. Upon completion of this demonstration, the boiler will be re-assembled to it's original state prior to the demonstration.

2.3 Boiler Trim

.1 Equip hot water boilers with:

.1 Combination water pressure and temperature gauge.

.2 Pressure relief valves ASME rated.

.3 Low water cut-off controllers shall automatically prevent burner or electric element operation when boiler water level falls below safe level.

.4 Manual set point electric operating temperature controller with range adjustment 50°C. to 98°C. shall control burner or electric element operation to maintain boiler water temperature.

.5 Limit temperature controller shall control burner or electric element to prevent boiler water temperatures above 99°C.

.6 Boiler air vent and vacuum breaker assembly.

.2 Gas Burner Section

.1 One boiler as indicated on drawings shall be furnished with a forced draft, flame retention gas burner. Burner shall be complete with integral motor and blower for supplying sufficient combustion air with normal vent conditions.

.2 Unit shall be suitable for use when fired with propane gas and in accordance with applicable provincial energy acts.

.3 The following trim and controls shall be furnished:

.1 combination thermometer and pressure gauge

2.3 Boiler Trim (Cont'd)

.2 water temperature control aquastat
.3 high limit safety control
.4 low water cutoff
.5 ASME safety relief valves
.6 automatic gas valve operator
.7 auxiliary main gas safety shutoff valve
.8 pilot solenoid valve
.9 pilot ignition assembly
.10 ignition transformer
.11 main manual gas shutoff valve
.12 lubricated manual gas cock
.13 pilot and main gas pressure regulators
.14 air safety switch
.15 electronic combustion safety control with UV sensor
.16 high-low-off switch complete with low fire start firing

2.4 Hot Water Boiler (Gas/Electric)

.1 Packaged hot water, electric and/or forced draft boiler with insulated jacket, burner and burner controls, electric immersion heater, refractory combustion chamber, controls and boiler trim.

.2 Certify boiler for 206 kPa working pressure.

.3 Finish: factory painted insulated metal jacket.

.4 Electric Power Section:
.1 Electrical
.1 Electrical power panel cabinets shall be provided. There shall be no operating nor limit controls mounted in this cabinet. It shall be equipped with louvres which will facilitate natural air circulation to minimize temperature rise.
.2 The cabinet hinged doors shall be equipped with a keylock handle to prevent access by unauthorized personnel.
.3 The main power supply to the boiler shall be from one source and shall be 575 volts, 3 phase, 60 Hz,

2.4 Hot Water Boiler (Gas/Electric) (Cont'd)

3 wire system supplied to the electrical cabinets by one 250 MCM conductor per phase and the copper bus bars located in the cabinets shall be equipped with lugs to accommodate these incoming conductors.

.4 The distribution of power within the unit shall be from the copper bus bar through Class 'J' fuses, through magnetic contactors to the elements. The Class 'J' fuses shall be installed in reinforced fuse clips. One of the fuse clips for each fuse shall be mounted directly on the copper bus bar and the other clip shall be mounted on a laminated insulating bar.

.5 All power wiring in the unit shall terminate in box type connectors. Crimp connections in the power circuit will not be acceptable.

.6 The power wiring from the Class 'J' fuses to the magnetic contactor shall be of size not less than No. 8 AWG with insulation of a rating not less than 75°C. The power wiring from the magnetic contactors to the elements shall be of a size not less than No. 8 AWG with insulation of a rating not less than 125°C.

.2 Controls:

.1 A control cabinet shall be provided. The control circuit shall be 120 volts, single phase, 60 Hz, supplied by a stepdown control transformer of the proper size.

.2 Both sides of the control transformer primary shall be protected by Class 'J' fuses located in the electrical cabinet. One side of the control transformer secondary shall be grounded and the other side fused.

.3 The control circuit shall also include: An on-off switch to shut off current to controls, high limit control which will interrupt

2.4 Hot Water Boiler (Gas/Electric) (Cont'd)

control circuit if operating conditions are exceeded, low water cutoff, recycle relay which will, in case of circuit interruption, cause the modulating step controller to return to the start position before the circuit will be re-energized, operating control, modulating step controller with seven (7) steps, and one (1) indicating light for each step of the step controller.

.5 Heating Elements:

.1 Incoloy sheathed wire type having maximum watt density of 0.17 watts per mm^2.

.2 One immersion accessible heating element, with 210 kW rated capacity.

.3 Attach each element to tube sheet by mechanical assembly permitting single unit to be replaced without replacing entire tube bundle.

.4 Tube supports shall be solid silicon copper. Waterfacing side of tube sheet shall have incoloy lining.

.6 Control:

.1 Mercury in cup hermetic contactor type only, ULC approved (for 600 V service they must be wired - Y). Hot water boilers to have flow-switch (McDonnell-Miller FS-4) mounted between boiler isolating valve and boiler. Wire so boiler cannot operate unless flow has been mechanically proven.

.2 Prewire and factory assemble electric controls enclosed in cabinet.

.3 Lead-lag sequence control system for multiple unit installation complete with override control to allow the gas fired boiler only to be used during emergency conditions.

.4 Continuous reading hour meter suitable for 120 V, 60 Hz, 1 phase power.

.7 Gas burning system (suitable for one (1) boiler):

.1 Design to fire propane gas, electric combination with burner and gas train in accordance with installation drawings and applicable provincial energy acts.

2.4 Hot Water Boiler (Gas/Electric (Cont'd)

.2 Burner operation shall be high-low-off. Maintain fuel-air ratios automatically.

.3 Line combustion chamber with interlocking refractory insulating panels of high temperature cement, asbestos-free fiber and refractory clay.

.4 Fuel-air ratios shall be maintained automatically for optimum firing efficiency at all times. Excess air shall not exceed 40% at any firing rate. Bacharach smoke spot shall not exceed 2.

.8 Acceptable Products:
Bryan Steam Corporation - Energy Selector Boiler, Model CL-120.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 Read this section in conjunction with Sections 15601 and 15799.

2.2 Burner and Controls

.1 General

.1 Burner and controls shall not be adversely affected by radiated or conducted heat from combustion chamber.

.2 Built-in flame proving control for steel boilers.

.2 Gas Burner: forced draft, high radiant annular entry, premix, power burner with gas-electric ignition.

.3 Include gas-electric selector switch for changeover.

.4 All burners: burners with ambient noise rating above Industrial Safety Acts standard noise levels shall be shrouded within approved sound hood.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 Read this section in conjunction with 15601 and 15799.

.2 Supply and install an electric steam generator complete with all valves and wiring as required or indicated on drawings.

2.2 Electric Steam Generator

.1 Cabinet to be stainless steel construction with front access to controls.

.2 Unit to be suitable for a maximum operating pressure of 90 kPa steam. Actual operating pressure to be 21 kPa.

.3 Unit to be provided with an ASME listed safety valve.

.4 Unit to be suitable for electrical connection at 208 volt/3 Ø/60 Hz maximum 24 kW.

.5 Immersion heaters to be resistance wire encased in incoloy sheaths suspended in corrosion resistant stainless steel tank.

.6 Unit capacity shall be 20 kgm/hr.

.7 Acceptable Products: Hobart Model G-18A.

**********END**********

PART 2 - PRODUCTS

2.1 General

.1 This section to be read in conjunction with Section 15601 and 15799.

2.2 Fittings and Valves

.1 Valve materials:
.1 Cast iron: ASTM A126-73 Class B.
.2 Bronze: ASTM B61-76, ASTM B62-76
.3 Stem materials: ASTM B139-79, ASTM B98-79, ASTM B21-78.
.4 Composition disc: suitable for service encountered.

.2 Welding outlets: provide where indicated or specified.

.3 Bolts and nuts: carbon steel stud bolts and semi-finished hex head nuts except where specified otherwise.

.4 Plug cocks: iron body, bronze plug and washers, air tested, flanged or threaded ends.

.5 Drain Valves:
.1 Drain valves NPS 3/4: ball valve
.2 Acceptable Product: Dahl Fig. No. 50430.
.3 Drain valves NPS 1 and over: gate valve bronze compression stop with nipple and cap, or hose bibb.

.6 Valve operators:
.1 Provide one plug cock wrench for every ten plug cocks, minimum of one. Provide notched operators for each plug valve used as isolating valve.
.2 Provide valves located more than 2.1 m from floor with chain operated sheaves. Extend chains to about 1.5 m above floor and secure to clear walking aisles.

.7 Strainers:
.1 Body: "Y" type, cast iron, semi-steel or bronze.
.2 Screen: stainless steel or monel mesh.
.3 Perforations:

water	up to NPS 3	- 0.8 mm
water	NPS 4 and over	- 3.0 mm
comp. air	all sizes	- 0.8 mm

2.2 Fittings and Valves (Cont'd)

.7 Strainers: (Cont'd)
.4 For sizes over NPS 1½, provide drain valve with hose connection for strainers in fluid lines.
.5 Ends: threaded for sizes NPS 2 and smaller, flanged for sizes NPS 2½ and over.
.6 Suitable for Class 125, gauge pressure of 860 kPa wsp or 1½ system working pressure whichever is greater.
.7 Acceptable Product: Erwel Inc.

.8 Air vents: screwdriver vents in cabinet accessible on side or top.
.1 Acceptable Products: Maid-O-Mist No. 7, Armstrong, Braukmann E122, Amtrol 700 and 702.

.9 Gaskets: 1.5 mm to ASME Sect VIII Div 1 VA-49.1 asbestos-free with suitable binder for operating conditions, full face for flat face flanges, ring for raised faced flanges, 1.5 mm full face red rubber for make-up water services.

.10 Thermometer well: 20 mm npt x 65 mm socket x 150 mm nominal length at insulated piping, at temperature measuring devices.

.11 Thermometers: variable angle 175 mm scale, 150 mm stem, 1°C. divisions, standard ranges to suit purpose. Provide 10° major division except for ranges above 150°C. See Section 15010.

.12 Rad valves:
.1 Shut-off valve at supply,
.1 Acceptable Products: Dahl 11022 Series; Fx Union, backseating, 1 MPa Class 150, swp; or Angle 11021; or reversed Union xF, to suit application.
.2 Lockshield flow control valve at return, key operated.
.1 Acceptable Products: Dahl 11022-LS, or 11021-LS, or reverse xF, to suit application.

2.3 Table 120°C. HTW

.1 Use for constant and scheduled hot water, chilled water. Maximum operating temp 120°C.

.2 Use for Emergency Make-up water with plant side isolating valve on plant side having stop-check feature.

ITEM	SIZE-NOMINAL	DESCRIPTION	MATERIAL SPEC
Pipe	NPS ½ to NPS 2 NPS 2½ to NPS 10	Schedule 40 continuous weld, seamless, plain end or screwed. Schedule 40 continuous ERW or seamless, plain end	ASTM A53-78
Fittings	NPS ½ to NPS 2	Class 150, 1 MPa threaded	ANSI B16.3-1971
	NPS 2½ to NPS 12	Schedule 40 wrought steel butt-welded	ASTM A234-78
Couplings	NPS ½ to NPS 2	Class 150, 1 MPa M1 Threaded	ANSI B16.3-1971
Nipples	NPS ½ to NPS 2	Schedule 40 screwed	ASTM A53-78
Unions	NPS ½ to NPS 2	Class 150, 1 MPa MI brass to iron ground seat & dielectric couplings at dissimilar metal junctions	ANSI B16.3-1971
Flanges	NPS 2½ to NPS 12	Class 150, 1 MPa FF Slip-on or Weld-neck	ASTM A181-77 ASTM A105-77
Gate Valves	NPS ½ to NPS 2	Class 125, 860 kPa screwed bronze body solid wedge disc and rising stem	

2.3 Table 120°C HTW (Cont'd) .1 (Cont'd)

ITEM	SIZE-NOMINAL	DESCRIPTION	MATERIAL SPEC
		Acceptable Products: Crane 440, Jenkins 810	
	NPS 2½ to NPS 12	Class 125, 860 kPa FF flange cast iron body OS&Y bronze trim	
		Acceptable Products: Crane 465½, Jenkins 454 or 404	
Globe Valves	NPS ½ to NPS 2	Class 150, 1 MPa Screwed bronze screwed over bonnet renewable composition disc	
		Acceptable Products: Crane 7, Jenkins 106A	
	NPS 2½ to NPS 12	Class 125, 860 kPa FF flange cast iron body bronze trim OS&Y bolted bonnet bronze disc and seat ring	
		Acceptable Products: Crane 351, Jenkins 2342	
Check Valves	NPS ½ to NPS 2	Class 125, 860 kPa bronze body screwed end Swing disc, screw in cap	
		Acceptable Products: Jenkins 92, Crane 37	
	NPS 2½ to NPS 12	Class 125, 860 kPa iron body flanged ends regrind-renewable swing check bronze disc and seating bolted cover	
		Acceptable Products: Jenkins 587, Crane 373, Victaulic	

2.3 Table 120°C HTW (Cont'd) .1 (Cont'd)

ITEM	SIZE-NOMINAL	DESCRIPTION	MATERIAL SPEC
Joints	NPS ½ to NPS 2	Threaded with teflon tape	
	NPS 2½ to NPS 12	Welded	

2.4 Table Oil .1 Use for diesel oil inside building - 860 kPa max.

ITEM	DESCRIPTION	MATERIAL SPEC
Pipe	Schedule 40 continuous weld or ERW pipe	ASTM A120-78
Fittings Including Couplings	Class 150, 1 MPa Socket welded	ANSI B16.3-1971
Flanges	Class 150, 1 MPa forged steel welding neck, raised face flange	ANSI B16.3-1971
Gaskets	Red rubber sheet 1.6 mm thick	
Gate Valves	Class 600, 4.2 MPa forged steel socket weld Acceptable Products: Jenkins 8800W, Crane 3605 UX	
Globe Valves	Class 800, 5.6 MPa forged steel socket weld Acceptable Products: Jenkins, Crane 3652	
Check Valves	Class 600, 4.2 MPa forged steel socket weld, lift check Acceptable Products: Crane 3682X, Jenkins 8C80-W	

2.4 Table Oil (Cont'd)

.2 Use for diesel oil from 150 mm inside of building wall to buried oil tank, diesel fuel, gasoline and helicopter fuel.

ITEM	DESCRIPTION	MATERIAL SPEC
Pipe	Fibreglass reinforced epoxy resin pipe	
Acceptable Product:	A.O. Smith Inland Red Thread (RTRP-11AD)	
Fittings	Fiberglass reinforced epoxy resin, bell x bell ends, bell x flange for connection to steel pipe	
Acceptable Product:	A.O. Smith Inland Silver Thread	
Adhesive	Epoxy adhesive	
Acceptable Product:	A.O. Smith Inland Kit No. 7069	

2.5 Fittings

.1 Union or flanged connections between steel pipe and copper tube shall have ratings as specified for screwed fittings.

.2 Acceptable Products:
Epco - Di-Electric

.3 Fittings used with copper pipe shall be wrought copper streamline type.

.4 Silver brazing alloy

.5 Acceptable Products:
Handy & Harman - Sil-Fos, All-State Welding Alloys Co. Inc. - Silflo #5

2.6 Table Diesel Exhaust

ITEM	SIZE-NOMINAL	DESCRIPTION	MATERIAL SPEC
Pipe	Up to NPS 8	Schedule 80 electric resistance weld black steel	ASTM A53-63R Grade B
	NPS 10 & Over	.500 wall	

2.6 Table Diesel Exhaust (Cont'd)

ITEM	SIZE-NOMINAL	DESCRIPTION	MATERIAL SPEC
Joints	All	Welded	
Fittings	All	Class 150,1MPa forged steel butt welding, extra strong	ASTM A234-78
Elbows	All	Class 150, 1MPa, seamless welding, long sweeping radius of five (5) pipe diameters	
Flanges	All	Class 150, forged steel slip-on, raised face	ASTM A181-77

2.7 Table 860 kPa Steam .1 Use for LP steam-maximum pressure 860 kPa.

ITEM	SIZE-NOMINAL	DESCRIPTION	MATERIAL SPEC
Pipe	NPS ½ to NPS 10	Schedule 40 continuous weld, bevelled end or threaded	ASTM A53-78
Fittings	NPS ½ to NPS 2	Class 150, 1 MPa cast iron, threaded and banded	ANSI B16.3-1971
Couplings	NPS ½ to NPS 2	Class 150, 1 MPa MI threaded and banded	ANSI B16.3-1971
Nipples	NPS ½ to NPS 2	Schedule 40 screwed	ASTM A53-78
Unions	NPS ½ to NPS 2	Class 150, 1 MPa MI brass to iron ground seat and dielectric unions at dissimilar metal junctions	

2.7 Table 860 kPa Steam (Cont'd)

ITEM	SIZE-NOMINAL	DESCRIPTION	MATERIAL SPEC
Gate Valves	NPS ½ to NPS 2	Class 125, 860 kPa screwed bronze body solid wedge disc and rising stem	
Acceptable Product: Jenkins 810 - Crane 428 - Toyo 293	NPS ½ to NPS 2	Class 125, 860 kPa screwed bronze body solid wedge disc non rising stem	

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate the following:
.1 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories, controllers.
.2 Submit shop drawings of pump curves for review.
.3 Piping, valves and fittings shipped loose by packaged equipment supplier, showing their final location in field assembly.

1.2 Maintenance Data

.1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

PART 2 - PRODUCTS

2.1 Vertical In-Line Pumps

.1 Pumps shall have rotation and be as listed in Pump Schedule or as shown on Drawings.

.2 Pumps shall be driven by standard protected type motors.

.3 Pump casings shall be of close grained cast iron, and shall be fitted with casing or impeller wear rings, or both. Inlet and outlet ports shall be standard flanged.

.4 Impellers shall be enclosed bronze, dynamically balanced, mounted on stainless steel shafts fitted with bronze or monel sleeves for full length of stuffing box as determined by service, suction pressure and head requirements of pump. Actual impeller diameter shall not exceed 90% of maximum impeller diameter that can be put into casing. Performance characteristic curve shall be continually rising to shut-off. Pump shall operate within a flow range of 30% below to 10% above best efficiency point for selected impeller diameter.

2.1 Vertical In-Line Pumps (Cont'd)

.5 Pumps shall have approved type balanced mechanical seals and seal cage piping.

.6 Pump types, capacities, horsepower and heads required, are shown in Pump Schedule.

.7 Acceptable Products: Armstrong, Paco, Aurora.

2.2 Diesel Fuel Transfer Pump

.1 Pump shall have rotation and be as listed in pump schedule.

.2 Pump shall be driven by standard protected type motor suitable for outdoor operation.

.3 Pump shall be turbine type designed to pump No. 2 Oil 50 S.S.U. at 4°C and shall have a suction lift of 50 kPa.

.4 Pump shall be capable of operating at ambient temperatures of -29°C.

.5 Diesel fuel transfer pump set shall consist of:

.1 One (1) pump
.2 Suction strainer
.3 Oil suction pressure gauge
.4 Oil discharge gauge
.5 Relief valve. Stainless steel trim, piped for full capacity of pump.

2.3 In-Line Commercial Duty Circulating Pumps

.1 Volute: cast iron radially split, with tapped openings for venting, draining and gauge connections, with screwed flange suction and discharge connections.

.2 Impeller: brass or bronze.

.3 Shaft: alloy steel with bronze sleeve bearing, integral thrust collar.

.4 Seal assembly: mechanical

.5 Motor: resilient mounted, drip proof, sleeve bearing.

.6 Capacity and size: as indicated.

.7 Acceptable Product: Armstrong Series 1000; ITT Bell and Gossett Series 60; Taco Series 1600.

PART 3 - EXECUTION

3.1 Installation

.1 In-line pumps: install as indicated by flow arrows. Support at flanges or near unions on outlets of unit. Install with bearing lubrication points accessible. Check rotation.

.2 Ensure that pump body does not support piping or equipment. Provide stanchions or hangers for this purpose. Refer to manufacturer's installation instructions for details.

.3 Pipe drain tapping to floor drain.

.4 Install volute venting pet cock in accessible location.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate:
.1 Equipment, capacity, piping and connections.
.2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.

1.2 Maintenance Data

.1 Provide maintenance data for convectors for incorporation into maintenance manual specified in Section 01730.

PART 2 - PRODUCTS

2.1 General

.1 Provide factory applied baked primer coat on metal surfaces of enclosure and cabinet unless otherwise specified.

.2 Provide for noiseless expansion of all components.

2.2 Standard Continuous Wall Convectors

.1 Heating elements: NPS 1¼ seamless copper tubing, 1.2 mm minimum wall thickness, mechanically expanded into flanged collars of evenly spaced aluminum fins, 100 x 100 mm nominal, 130 fins per metre suitable for sweat fittings.

.2 Heating elements: NPS 1¼ steel tube 3.1 mm minimum wall thickness, mechanically expanded into flanged collars of evenly spaced steel fins 100 x 100 mm nominal fins, 105 fins per metre.

.3 Element hangers: ball bearings or plastic lined cradle type providing unrestricted longitudinal movement on enclosure brackets. Space brackets 900 mm centres maximum.

2.2 Standard Continuous Wall Convectors (Cont'd)

.4 Enclosures: 1.6 mm thick steel complete with components for wall to wall installation. Joints and filler pieces to be flush with cabinet. Support rigidly top and bottom, on wall mounted brackets. Enclosures shall be as detailed on Drawings.

.5 Acceptable Products: Trane; Mark Hot; Dunham Bush.

2.3 Cabinet Convectors

.1 Heating element: seamless copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins and cast iron headers, steel side plates and supports.

.2 Cabinet: type as indicated, 1.6 mm thick steel back and ends, exposed corners rounded, secured removable front panel, braced and reinforced for stiffness.

.3 Catalogue rating: certified IBR ratings.

.4 Acceptable Products: Trane; Mark Hot; Dunham Bush.

2.4 Cabinet Unit Heaters

.1 Cabinet: type as indicated, 1.6 mm thick steel with rounded exposed corners and edges, removable panels, glass fiber insulation and integral air outlet and inlet.

.2 Coils: water with aluminum fins mechanically bonded to copper tubes. Capacity as indicated.

.3 Fans: centrifugal double width wheels, statically and dynamically balanced, direct driven, sleeve bearings, resilient mounted.

.4 Motor: multi-speed, tapped wound permanent split capacitor type with sleeve bearings, built-in thermal overload protection and resilient rubber isolation mounting.

2.4 Cabinet Unit Heaters (Cont'd)

.5 Filters: removable 25 mm thick permanent washable type.

.6 Provide integral control system incorporating heavy duty switch with integral thermal overload with remote line voltage thermostats having relay and terminal block for wiring, in field, to thermostat and low limit aquastat strapped on hot water supply line in units subject to freezing, set to prevent fan operating at supply temperature under 27°C.

.7 Control: 3 speed switch located in cabinet.

.8 Acceptable Products: Trane; Mark Hot; Dunham Bush.

PART 3 - EXECUTION

3.1 Installation

.1 Install according to piping layout. Provide for pipe movement during normal operation.

.2 Maintain proper clearance around equipment to permit performance of service maintenance. Check final location with Engineer if different from that indicated prior to installation.

.3 Should deviations beyond allowable clearances arise, request and follow Engineer's directive.

.4 Refer to manufacturer's installation drawings. Verify electrical service work with characteristics stamped on unit.

.5 Check that all openings for appurtenances and operating weight conform to shop drawings.

.6 If accessories, ancillaries, are received knocked down, check assembly with Engineer.

.7 Valves:
.1 Install valves with stems upright or horizontal unless approved otherwise.
.2 Install isolating gate valves and lockshield globe balancing valves on each unit.

3.1 Installation (Cont'd)

.8 Provide screwdriver vent on all up-fed convectors and radiators. At liquid type units provide standard air vent with cock. Clean all finned tubes and comb straight.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate:
.1 Equipment, capacity, piping, and connections.
.2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.

1.2 Maintenance

.1 Provide maintenance data for unit heaters for incorporation into maintenance manual specified in Section 01730.

PART 2 - PRODUCTS

2.1 Water Horizontal Unit Heaters

.1 Casing: 1.2 mm thick cold rolled steel, glossed enamel finish, with threaded connections for hanger rods.

.2 Coils: seamless copper tubing, silver brazed to steel headers and with evenly spaced aluminum fins mechanically bonded to tubing. Leak test pressure to 1 MPa hydrostatically.

.3 Fan: direct drive propeller type, factory balanced, with anti-corrosive finish and fan guard.

.4 Motor: speed as indicated continuous duty, built-in overload protection, and resilient motor supports.

.5 Air outlet: four-way adjustable louvres.

.6 Capacity: as indicated.

.7 Acceptable Products: Trane; Mark Hot; Dunham Bush.

2.2 Water Vertical Unit Heaters

.1 Casing: 1.2 mm thick cold rolled steel, glossed enamel finish, with threaded connections for hanger rods.

2.2 Water Vertical Unit Heaters (Cont'd)

.2 Coils: seamless copper tubing, silver brazed to steel headers and with evenly spaced aluminum fins mechanically bonded to tubing. Leak test pressure to 1 MPa hydrostatically.

.3 Fan: direct drive propeller type, factory balanced, with anti-corrosive finish.

.4 Motor: speed as indicated continuous duty ball bearing motor with built-in overload protection, and resilient motor supports.

.5 Air outlet: adjustable multi-vane diffuser with finish to match casing.

.6 Capacity: as indicated.

.7 Acceptable Products: Trane; Mark Hot; Dunham Bush.

PART 3 - EXECUTION

3.1 Installation

.1 Install according to piping layout. Provide for pipe movement during normal operation.

.2 Maintain proper clearance around equipment to permit performance of service maintenance. Check final location with Engineer if different from that indicated prior to installation.

.3 Should deviations beyond allowable clearances arise, request and follow Engineer's directive.

.4 Refer to manufacturer's installation drawings. Verify electrical service work with characteristics stamped on unit.

.5 Check that all openings for appurtenances and operating weight conform to shop drawings.

.6 Valves:

.1 Install isolating gate valves and lockshield globe balancing valves on each unit.

3.1 Installation (Cont'd)

.7 At liquid type unit heaters, provide standard air vent with cock. Clean all finned tubes and comb straight.

.8 Install unit heaters at heights indicated. Where not indicated, follow Engineer's instruction. Set discharge pattern required.

.9 Provide supplementary suspension steel as required.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate:
.1 Equipment, capacity, piping and connections.
.2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.

1.2 Maintenance

.1 Provide maintenance data for unit heaters for incorporation into maintenance manual specified in Section 01730.

PART 2 - PRODUCTS

2.1 Propane Gas Fired Infrared Heaters

.1 Combustion surface shall be of perforated ceramic refractory suitable for continuous operation at 988°C. and capable of withstanding thermal shock when water quenched.

.2 Heaters shall be equipped with an 120 V AC, 60 Hz, 1 Ø manual pilot ignition/-glo-coil control system.

.3 Complete unit shall be suitable for operation with propane-gas at an inlet pressure of 3.5 kPa and having a heat content of 93,800 kJ/m³.

.4 Heaters shall be certified by C.G.A., have U.L.C. listing, and F.I.A. and F.M. acceptance.

.5 Units shall be thermostatically operated with 100% shut-off.

.6 Element assembly shall incorporate a stainless steel venturi tube and shall be so designed to aspirate 100% of the required air for combustion.

.7 Aluminum reflector shall provide uniform irradiance levels.

.8 Infrared elements and heater control components shall be easily removed.

2.1 Propane Gas Fired Infrared Heaters (Cont'd)

.9 Infrared element shall provide the required oxidation and corrosion resistance for the type of atmosphere the heater is to operate in.

.10 Heater shall incorporate a secondary radiating surface constructed of high temperature resistance material of minimum diameter of 2.8 mm.

.11 Infrared element assembly and secondary radiating surface including radiating surface retaining devices shall be guaranteed for a period of ten (10) years by manufacturer.

.12 Acceptable Products: Re-Verber-Ray; Schwank Ltd.

PART 3 - EXECUTION

3.1 Installation

.1 Install according to piping layout. Provide for pipe movement during normal operation.

.2 Maintain proper clearance around equipment to permit performance of service maintenance. Check final location with Engineer if different from that indicated prior to installation.

.3 Should deviations beyond allowable clearances arise, request and follow Engineer's directive.

.4 Refer to manufacturer's installation drawings. Verify electrical service work with characteristics stamped on unit.

.5 Check that all openings for appurtenances and operating weight conform to shop drawings.

.6 Valves
.1 Install gas plug valve and dirt pocket at each unit.

.7 Install heaters at heights and direction instructed by Engineer.

.8 Provide supplementary suspension steel as required.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Clearly indicate:

.1 Equipment, piping, and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware, and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections.

.2 Piping, valves, fittings shipped loose by packaged equipment supplier, showing their final location in field assembly.

.3 Control equipment shipped loose, by packaged equipment supplier, showing their final location in field assembly.

.4 Complete internal panel pneumatic tube piping and wiring and any external panel pneumatic tube piping and wiring, both as schematics and as actually assembled.

.5 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads.

.6 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories, controllers.

.7 For pumps and fans submit performance curves.

.8 Provide estimate of sound levels to be expected across each individual octave band in dB referred to A rating for further evaluation by Engineer.

1.2 Maintenance Data

.1 Provide maintenance data for cooling plant for incorporation into maintenance manual specified in Section 01730.

.2 Provide brief description of systems and include same at beginning of manual, properly indexed, with details of function, operation, control and service for each piece of apparatus.

1.2 Maintenance Data (Cont'd)

.3 Manufacturer's instructions shall govern installation and unless otherwise noted, operation, maintenance and service of items. Include names and addresses of spare part suppliers.

.4 Data shall constitute more than general advertising information; include following:
.1 Provide, for each piece of equipment and system manufacturer's name, type, year, serial number, number of units, capacity and identification to related systems.

PART 2 - PRODUCTS

2.1 Package Roof Top Cooling Unit General

.1 Roof mounted packaged air cooled cold generator unit with DX refrigeration and bear label of CSA, CGA and ULC.

.2 Units shall consist of cabinet and frame, shell and tube evaporator, compressor, condenser coil and fans.

.3 Cabinets: weatherproofing tested and certified to AGA rain test standards and soundproofing tested to ARI 270-1975.

.4 Conform to ARI 210-75 Standard for Unitary Air-Conditioning Equipment rating for unit larger than 40 kW nominal.

2.2 Cabinet

.1 Framing and supports: 2mm thick galvanized steel, having lifting lugs. Outer casing: weathertight 2 and 1.6 mm thick galvanized steel with baked enamel finish, complete with easily removable gasketted access doors or panels with screwdriver operated flush cam type fasteners.

2.3 Refrigeration

.1 Conform to CSA B52-M1977 and UL 465-1978 requirements.

.2 Condensing section
.1 Vibration isolated, with multiple semi-hermetic or hermetic compressors with flexible suction and discharge connections, oil sight glass, oil pressure switch, crankcase heater and automatic pump down system with control to liquid line solenoid.

2.3 Refrigeration (Cont'd)

.2 Fans: propellor type with single piece spun venturi outlets and zinc plated guards. Motors shall be sequenced for head pressure control.
.3 Electrical system shall have operating controls, oil and refrigerant pressure protection, motor overload protection, weatherproof electrical wiring with weatherproof, rain tight disconnect.
.4 Include refrigerant piping with automatic hot gas bypass, sight glass, filter and valves.
.5 Condenser: staggered copper tube aluminum fin coil assembly with sub-cooling circuit.
.6 Compressors capacity reduction: hot gas bypass and cylinder unloading. Hot gas side port distribution. Provide fan control sequencing for head pressure control with low ambient.
.7 Provide four step capacity control in response to return chilled water temperature.

.3 Evaporator
.1 Rated to ARI standard 210-75.
.2 Direct-expansion, shell-and-tube design evaporator with: seamless copper tubes roller expanded into the tube sheets; dual refrigerant circuits and designed for 1550 kPa working pressure on the water side.
.3 Insulation shall be 20 mm thick expanded polyvinyl chloride.

2.4 Remote Panel .1 Provide remote readout panel for unit containing: signal lights indicating system status, cooling system failure; check switches proving signal light operation; system on-off switch, cooling system on-off switch.

PART 3 - EXECUTION

3.1 Installation .1 Install as per manufacturer's instructions and as indicated.

.2 The machine manufacturer shall provide initial charges of refrigerant and shall provide at no charge to the Owner any loss of same during the first year of operation of the unit.

**********END**********

PART 3 - EXECUTION

3.1 General

.1 This section to be read in conjunction with Section 15601 and the following Part 2 - Products Section .

3.2 Installation

.1 Locate unit or equipment upon arrival; level and make secure.

.2 Install according to piping layout. Provide for pipe movement during normal operation. Pipe drains and blow off connections to nearest drain.

.3 Maintain proper clearance around equipment to permit performance of service maintenance. Check final location with Engineer if different from that indicated prior to installation.

.4 Should deviations beyond allowable clearances arise, request and follow Engineer's directive.

.5 Refer to manufacturer's installation drawings. Check electrical service work with characteristics stamped on unit.

.6 Check that all openings for appurtenances and operating weight conform to shop drawings.

.7 If accessories, ancillaries, are received knocked down, check assembly with Engineer.

.8 Piping: meet Provincial and local codes for assembly.

.1 Connect water equipment as per manufacturer's installation literature and as instructed.

.2 Provide flexible connections, vibration and expansion connectors at equipment noted.

.3 Route piping in orderly manner and maintain proper grades. Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping wherever practical for trapeze hangers.

.1 Acceptable Products: Unistrut, Powerstrut Systems.

3.2 Installation (Cont'd)

.4 Slope water piping up in direction of flow 1:700 and drain at low points.
.5 On closed systems, equip low points with NPS 3/4 drain valves and hose nipples. Provide, at high points on lines and on equipment connections, collecting chambers and high capacity float operated automatic air vents.
.6 Make reductions in water pipe sizes with eccentric reducing fittings installed to provide drainage and venting.
.7 Grade horizontal drainage and vent piping 1:25 minimum.
.8 Provide clearance for installation of insulation and for access to strainers, valves, air vents, drains, cleanouts, unions, expansion joints and flex connectors.
.9 Ream pipes and tubes. Clean scale and dirt, inside and outside, before and after assembly.
.10 The use of main sized saddle type branch connections or directly connecting branch lines to mains in steel piping will be permitted for low pressure systems, if main is at least one pipe size larger than the branch up to NPS 6 mains and if main is at least two pipe sizes larger than branch for NPS 8 and larger mains. Do not project branch pipes inside main pipe.
.11 Make connections to equipment and branch mains with unions, pipe couplings, or flanges.
.12 Flushing and cleaning procedure for piping systems.
    .1 Flush and clean out after pressure tests.
    .2 Fill with solution of water and non-foaming, phosphate-free detergent.
    .3 Flush and drain. Remove and clean strainers.
    .4 Refill water system and clean water.
    .5 Remove moisture from interior surfaces of fuel oil systems using dry compressed air before filling with oil.

3.2 Installation (Cont'd)

.9 Valves
.1 Install valves with stems upright or horizontal unless approved otherwise.
.2 Install globe or angle valves with solid plug for throttling service and control device or meter bypass.
.3 Use lubricated plug cocks for gas service.
.4 Install antisiphon valves and fusible valves on oil lines as indicated.

.10 Calibrate controlling apparatus after installation.

.11 Strainers
.1 Install strainer in horizontal or down flow lines.
.2 Ensure clearance for removal of basket.
.3 Install strainer ahead of each pump, control valve and as indicated.

3.3 Tanks

.1 Tanks above ground locate supports or cradles at quarter points on horizontal tanks and anchor. Furnish anchorage for setting into place with locating templates prior to concrete pour. Level, shim and grout where required. Pipe as indicated, with piping supported to prevent stressing of outlet connections. Vent relief devices as indicated. Pipe drain valve to drain.

3.4 Pumps

.1 In line circulators: vertical, vertical base mount. Support at flanges or near unions on outlets of unit. Check motor bearing lubrication points. Check rotation and flow direction arrows.

.2 Ensure that pump body does not support piping or equipment. Provide stanchions or hangers for this purpose. Discuss with Engineer where critical. Refer to manufacturer's installation instructions for details.

3.5 Roof Mounted Unit

.1 Check unit for damage before and after placement.
.1 Protect and cover exposed units to the elements during construction.
.2 Conform to installation drawings. Mount units on factory built roof mounting frame.

3.6 Oil Tanks Controls and Piping

.1 Tanks

.1 Obtain Engineer's written approval for changes to arrangement.

.2 Soap test buried tanks at a gauge pressure of 35 kPa prior to lowering tank into place.

.3 Fill materials around buried tank shall be approved pea gravel 10 mm dia. compacted to 95% Standard Proctor.

.4 Pitch piping to drain to tank and for venting.

.2 Piping

.1 Obtain Engineer's written approval prior to modification.

.2 For copper tubing, provide double swing joint expansion bends to permit settling of tanks, and/or structure.

.3 Provide scissors action double swing joints on FRP pipe, assembled with not less than 4 elbows at each part of tank for fill, vent, supply and return, and at the building.

.3 Level gauging system

.1 Provide leak, and vapour-proof caulking at all connections.

.2 Provide wood tank-gauging-stick standard to manufacturer for underground tanks.

3.7 Boilers

.1 Follow manufacturer's erecting instructions for installation and assembly.

.2 Level unit. Install vibration isolation specified, prior to setting in place.

.3 Combustion air supply: check non-firing sequence for air pressure differential between ambient and boiler room. Conform to Engineer's instruction.

.4 Piping and controls inspection

.1 Ensure that pipe lines have been tested for leaks, cleaned and purged with dry air.

3.7 Boilers (Cont'd)

.2 Check flame safeguard control, to meet specifications.
.3 Arrange so that burner can be removed without interference.
.4 Gas piping
.1 Modify to instructions of gas utility, factory-piped gas assembly to suit the particular local gas codes.
.2 Clean gas line to burner. Test to gas code mains back to downstream of isolating plug at gas regulating station provided by utility.
.3 Lock and seal gas valve prior to operational start up testing.

.5 Connect piping, breeching and coordinate wiring required.

.6 Notify Engineer prior to site firing test. Adjust as instructed by him.

3.8 Owner's Equipment

.1 Connect piping to equipment supplied under Division 7, 10, 11 and 14 as indicated or specified.

3.9 Water Treatment

.1 Test methods
.1 Manufacturer's chemical engineer representative shall visit plant four times minimum within period of Contract following cleaning and initial start-up. Visit to check treatment, test procedures test frequencies, and review problems with Operating staff. Advise staff with concise and clear typewritten instructions modifying initial treatment instructions. Furnish sufficient standard forms for recording of results of tests per shift, or day and quantity of chemicals of various types added. Amend instructions until system stabilizes (first six weeks); thereafter, visit plant and advise on isolated imbalances and how to keep these at minimum for balance of Contract period.
.2 Chemical Engineer shall perform test during service visit.

.2 Boiler cleaning
.1 Manufacturer's representative shall supervise boil out of generators prior to start-up. Submit sketch of apparatus

3.9 Water Treatment (Cont'd)

on temporary hook up, amount of chemicals to be used, duration of boil out, and flushing of system.

.2 Chemically clean hot water systems at same time as boil out. Follow instructions given in ASME Boiler Code under "Suggested Rules for Care of Power Boilers", Section VII, 1974. Submit type of detergent to be used to Engineer for approval. During boil out and system cleaning leave strainer screens and water pressure gauges in system. Periodically stop operation and remove sludge build up.

.3 Phosphate treatment is not allowed.

.4 Protect control systems during system clean out. Use system pumps for clean out. At end of clean out period, drain system, flush by circulating clean water, drain again, then refill with clean water ready for service. Prior to last refill, open strainers and remove baskets, (leaving it beside the strainer for Engineer to witness as to its state of cleanliness prior to re-assembly).

.5 During boil out, do not exceed 70°C. in hot water boilers, and circulate until water reaches 50°C. Add heat as required to keep average circulation temperature at 55°C., for at least 12 h minimum.

.3 On chilled water system circulate with detergent and room temperature water for 24 h, or greater, dependent on size. Drain, refill and flush system for further 8 h, or greater, dependent on size, then drain. Remove strainer baskets, clean, return to system, and refill with clean city water. Do not use hot water.

3.10 Balancing

.1 Balance all water systems.

.2 Submit three (3) copies of water balancing showing:

.1 L/s flow at each coil.

.2 L/s flow at each pump.

.3 kPa pressure drop across each coil.

.4 kPa pressure drop across each boiler.

3.10 Balancing (Cont'd)

.5 kPa inlet and outlet pressure for each pump.

.3 Provide all fittings and take-off points for balancing.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings .1 Submit shop drawings and technical information in accordance with Section 01340.

1.2 Maintenance Data .1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.3 Maintenance Materials .1 Provide maintenance materials in accordance with Section 01730.

.2 Provide keys for equipment with Allen head screws such as thermostats, sensors, and access panels as required and/or directed by the Engineer.

1.4 Manufactured Items .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 - PRODUCTS

2.1 Fans General .1 Provide with capacity, total static-pressure, revolutions per second, power, model and size and sound power level as indicated.

.2 Sound ratings shall comply with AMCA (Air Moving and Conditioning Association) 301-77 tested to AMCA 300-67. Unit shall bear the AMCA certified sound rating seal.

.3 Fans shall be statically and dynamically balanced, constructed in conformity with AMCA 2408-69.

.4 Base ratings on tests performed in accordance with AMCA 210-74, and ASHRAE 51-75. Unit shall bear AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

.5 Bearings: equip with split pillow-box grease lubricated ball or roller bearings of self aligning type with oil

2.1 Fans General (Cont'd)

.5 (Cont'd)
retaining, dust excluding seals and 100,000 hour service in accordance with ANSI B3.15-1972 for ball bearings and ANSI B3.16-1972 for roller bearings and AFBMA (Anti-Friction Bearing Manufacturers Association) L-10 life standard. Provide bearing lubrication system.
.1 Acceptable Manufacturers: SKF, NTN Seal Master, Timken, FAG.

.6 Provide electric motors as follows:
.1 Acceptable Manufacturers:
Canadian General Electric
Westinghouse
Brook Electric Motors
Leland - Prestolite Co.
Brown Boveri Canada
U.S. Motors
Lincoln Electric
Etatech Ind. Inc.

.7 Provide accessories and hardware including V-belt drives, adjustable slide rail motor bases, belt guards, coupling guards, and fan inlet safety screens, inlet dampers and vanes as indicated.

.8 Fans shall have smooth rising pressure characteristics.

.9 Fan motors shall be:
.1 Not less than the motor kW shown in the schedule.
.2 Sized in accordance with criteria specified under "Motors" in another section of this Specification.
.3 Capable of satisfactory operation over a range of ± 10% on selected r/min.

.10 Factory prime in colour standard to manufacturer. Paint before assembly.

.11 Provide scroll drains where indicated.

.12 Approved fan manufacturers when conforming to the specification and application unless indicated otherwise in the fan schedule shall be:
Sheldons
Woods
Canadian Blower/Canada Pumps

2.1 Fans General (Cont'd)

.12 (Cont'd)
Trane
Mark-Hot
Chicago Blower
Joy Manufacturing Co.

2.2 Centrifugal Fans

.1 Fan Wheels:
.1 Welded steel construction.
.2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.
.3 Air foil backward inclined blades, unless otherwise specified.

.2 Housings:
.1 Provide airtight access doors with handles.

.3 Variable volume devices:
.1 Provide adjustable inlet vanes operated from a centre mechanism linked to each damper vane. Support each vane at ends in bronze bearings. On DWDI fans interconnect vanes to operate in unison. Provide locking devices for manual operation.

2.3 Cabinet Fans

.1 Single or multiple wheel with DWDI centrifugal fans in factory fabricated casing complete with motor, V-belt drive inside or outside casing.

.2 Fabricate casing of zinc coated or phosphate treated steel reinforced and braced for rigidity. Provide removable panels for access to internal parts. Uncoated, steel parts shall be painted over with corrosion resistant paint to CGSB 1-GP-181M. Finish inside and out, over prime coat, with rust resistant baked on enamel.

2.4 Utility Sets

.1 Characteristics and construction shall be as per centrifugal fans.

2.5 Propeller Fans

.1 Fabricate multibladed propellers of sheet steel or airfoil shape within bell mouth entrance on integral mounts, with grease lubricated ball bearings suited

2.5 Propeller Fans (Cont'd)

for operating in any position, direct or belt driven, complete with motor as indicated.

.2 Provide blade guards, birdscreen and automatic back draft dampers on discharge with gasketted edges.

2.6 Axial Flow Fans .1 Fabricate casing of welded steel with welded motor support, hinged or bolted access plates, streamlined inlet cone and discharge bell sections.

.2 Provide floor mounted units with reinforced legs. Provide ceiling suspended units with support brackets welded to side of casing.

.3 Direct Drive:
.1 Adjustable blades in motion wheels shall be totally enclosed, air over motors.
.2 Diameter of wheel hub shall be at least equal to that of motor frame.
.3 Submit performance data for adjustable blade wheels for at least 5 blade settings, including maximum and minimum.
.4 Blades shall be adjustable pitch in motion for varying range of volume and pressure. Hubs shall facilitate indexing of blade angle.

.4 Belt Drive:
.1 Adjustable blades shall be driven by externally mounted motors through V-belt drive. Provide internal belt fairing, external belt guards and adjustable motor mounts.
.2 Submit performance data for adjustable blade wheels for at least 5 blade settings, including maximum and minimum.
.3 Adjust blades for varying range of volume and pressure. Hubs shall facilitate indexing of blade angle.

2.7 Kitchen Exhaust .1 For Hangar and Administration Lunch Rooms provide standard kitchen recirculatory type stove hood to be located above hot plate cooking areas.

2.7 Kitchen Exhaust (Cont'd)

.2 Hoods to have replaceable filters.

.3 Provide local or hood mounted on/off switches.

PART 3 - EXECUTION

3.1 Fan Installation

.1 Install fans as indicated.

.2 Install flexible connector bands between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum 25 mm flex between ductwork and fan during running.

.3 Install fan restraining snubbers as specified. Flex connectors shall not be in tension during running.

.4 Provide sheaves required for final air balance.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings .1 Submit shop drawings and technical information in accordance with Section 01340.

1.2 Maintenance Data .1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.3 Maintenance Materials .1 Provide maintenance materials in accordance with Section 01730.

1.4 Manufactured Items .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 - PRODUCTS

2.1 Fans .1 Refer to Section 15820 Commercial Fans.

2.2 Units General .1 Provide field assembled system components to form a unit supplying air at design conditions specified.

2.3 Casing .1 General:

.1 Factory manufactured phosphate treated steel casing of 1.2 mm thick steel reinforced and braced for rigidity and flanged for bolted sub-assemblies, all to withstand a pressure differential as indicated.

.2 Provide access to internal parts and component removal.

.1 For walk-in access doors, provide insulated sandwich panel construction of same material as casing, of sizes indicated and complete with hinges, 2 way latches and Georgian wire glass ports as indicated.

.2 For removable panels, provide insulated sandwich panel construction of same material as casing, of sizes indicated and complete with hex head bolts and nuts welded to rear of frame.

2.3 Casing (Cont'd)

.1 (Cont'd)

.3 For inspection doors, provide insulated factory manufactured access panels complete with latches.

.3 Internally insulate casing with 25 mm thick 2 kg density rigid duct liner pinned and cemented in place.

.4 Seals: Seal all openings and gasket all bolted sections, access doors and panels.

.5 Provide vapour tight marine lights complete with gaskets and cast aluminum guards as indicated.

.6 Install baffles in mixed air plenums to prevent stratification. Additional baffles to be provided as required after system is put into operation during winter.

2.4 Coils

.1 General:

.1 Ratings: ARI Certified. Submit with shop drawings actual cooling and heating fluid entering and leaving conditions for stated air side requirements.

.1 Circuit cooling coils for PD water of 30 kPa maximum. Water velocity in coils shall not exceed 1.2 m/s. Under 0.6 m/s turbulators may be used if that is standard practice of manufacturer.

.2 Coil design shall facilitate rapid and complete draining of coil.

.3 Coils shall be return bend type constructed of 16 mm O.D. tubes.

.4 All non-ferrous tubes and headers: brazed assembly.

.5 Maximum tube length 3 m unless indicated otherwise.

.6 Coil casings:

.1 Die formed 1.6 mm thick galvanized sheet steel designed for bolting to other sections zinc coated or hot dipped galvanized (hdg) after fabrication.

.2 Tube supports to allow for expansion and contraction.

.3 Supports: steel channel or double angle frames or other approved support. Provide brass supports for copper coils.

.4 Blank-off plates of similar material to prevent air bypass.

2.4 Coils (Cont'd)

.7 Coils shall be factory tested at air under water.
.8 Fit each vent and drain outlet with a hose and valve of packless type and a pipe cap.
.9 Coils shall be designed for counter-flow between air and water.

.2 Chilled water coils: plate spiral wound fin coils.
.1 Tubes: copper
.2 Fins: aluminum
.3 Headers: cast iron or steel
.4 Tests: 1.7 MPa

.3 Acceptable Manufacturers: Aerofin, Trane, Keeprite.

2.5 Drip Pans

.1 Provide each cooling coil section with 1 mm thick galvanized steel drip pan with drain connection. Extend at least 75 mm from face of coils on entering air side, and 150 mm from face of coils on leaving air side.

2.6 Filter Box

.1 Material to match casing and of bag arrangement as indicated using throw-away type. Provide access to filter through hinged door or suitable hardware on removable panels.

PART 3 - EXECUTION

3.1 Installation

.1 Fabricate and joint to provide smooth air path along components and when subject to 2.5 kPa suction pressure, air leakage shall be limited to 1% of rated L/s.

.2 Sealing and installation of casings: apply sealer into seams prior to assembly. Secure toe angles continuous along entire length of assembly.

.3 Submit coil mounting detail drawing for approval before commencing installation.

.4 Coils to be installed in accordance with details shown on plans.

.5 Outside surfaces shall have one coat of prime, left ready for finishing.

3.1 Installation (Cont'd)

.6 Where built up units indicate acoustic lining the cooling coil section shall be of double walled construction to prevent wetting of the acoustic insulation.

.7 Cooling coils will be installed a minimum of 300 mm off the floor. Blank off section below coils.

3.2 Fans

.1 Provide sheaves required for final air balance.

.2 Suspension must be four part hanger type, ceiling flange, top hanger, bottom hanger and vibration isolator with takeup for levelling.

.3 Install flexible connector bands at fan inlets and outlets. Ensure metal bands of connectors are parallel and not touching.

**********END**********

PART 1 - GENERAL

1.1 Reference Standards

.1 The unit must conform to Standard B203.7 of the Canadian Standards Association.

.2 The unit must be approved by the Canadian Gas Association to -40°C.

.3 The installation shall meet the requirements of the Canadian Standards Association, Gas Installation Code B149 and local authorities having jurisdiction.

1.2 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

1.3 Maintenance Data

.1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.4 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

1.5 Manufactured Items

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 - PRODUCTS

2.1 Unit General

.1 Unit shall be a direct gas fired air replacement unit, indoor design, assembled, wired and fire tested prior to shipment, fueled by propane with a modulating turndown ratio of 25:1.

.2 Unit shall have a dual volume capacity of 9/4.5 m^3/sec and 586 kW input.

.3 Unit shall be as manufactured by Temprite Industries Ltd. Alternate manufacturer, Davis Energy Systems.

2.2 Casing

.1 The unit casing and accessories shall be heavy gauge galvanized steel, finish coated with heat resistant alkyd enamel. The unit casing shall be suitably reinforced to ensure rigidity and shall be supplied with a channel iron base. The unit casing shall be air tight.

2.2 Casing (Cont'd)

.2 An observation port shall be located on the control side of the unit to provide a view of the pilot and main flame.

.3 Hinged access panels shall be supplied to allow physical entry to the fan-burner section and the electrical and piping control section.

2.3 Fans

.1 Fans shall be two speed, complete with 11 kW, 3 phase, 60 cycle, 575 volt, open dripproof motor. The fan shall be complete with an AMCA rated forward curved, double inlet, statically and dynamically balanced centrifugal fan assembly.

.2 The fan shall be mounted on a heavy duty, turned, ground and polished steel shaft designed with its maximum operating speed not exceeding 75% of its first critical speed.

.3 The bearings shall be of the heavy duty prelubricated type. V-belt drives shall be sized with a capacity 25% greater than motor horsepower.

2.4 Burner Section

.1 The unit shall be supplied with a Maxon dual fire burner with a modulating turndown ratio of 25:1. Adjustable profile plates shall be supplied.

.2 A motorized damper shall be provided in the profile to maintain constant velocity over the burner for the high and lower volume.

.3 Ultraviolet flame supervision system of main and pilot flames complete with an approved switchover relay and alarm contacts shall be supplied.

.4 The burner assembly and gas manifold shall be prepiped to C.G.A. specifications and shall include:

.1 Main manual shut-off valve

.2 Appliance regulator

.3 Motorized slow opening-fast closing safety shut-off valve with parabolic guide

2.4 Burner Section (Cont'd)

.4 Lubricated firing valve
.5 Pilot plug valve
.6 Pilot regulator
.7 Pilot solenoid valve
.8 Pilot pressure test shut-off valve
.9 Orifice needle valve

2.5 Control Enclosure

.1 The unit shall be supplied with a hinged control enclosure and a C.G.A. approved locking device. All controls shall be mounted in the control enclosure and wired to a numbered terminal strip. All wiring shall be colour coded and number tagged at each end to match the circuit diagram supplied with the unit.

2.6 Controls

.1 The unit shall come complete with the following components required to provide automatic operation and low fire start.

.1 Control circuit transformer
.2 Main fused disconnect switch
.3 Control circuit fuses
.4 High temperature limit switch
.5 High ambient temperature limit switch
.6 Supply fan high and low velocity air proving differential switches
.7 Flame safeguard relay with alarm contacts
.8 Ultraviolet flame sensors
.9 Ignition transformer
.10 Low fire holding relay
.11 Pilot automatic valve
.12 Main gas automatic modulating safety shut-off valve
.13 Electronic modulating system
.14 Main fan starter and overloads
.15 Motorized inlet damper
.16 Filter box with replaceable media filters
.17 Filter clog sensing and annunciation system
.18 Two exhaust proving switches - shipped separately
.19 Discharge plenum complete with two motorized dampers
.20 Remote station complete with: summer/off/winter switch, "Burner On" light, "Supply Fan On" light, "Exhaust Fan #1 On" light, "Supply Damper #1 Open" light, "Exhaust Fan #2 On" light, "Supply Damper #2 Open" light

2.6 Controls (Cont'd)

.2 The exhaust fans shall be interlocked with the supply fan and the paint sprayer, so that no painting can be done with the exhaust fan off.

.3 Interlock fans with main entry door to Paint Spray Booth to prevent fans and paint sprayer operating when door is open.

2.7 Operation

.1 The air replacement unit shall deliver 4.5 m^3/sec with either exhaust fan on and 9 m^3/sec with both exhaust fans on. The corresponding damper on the discharge plenum shall open to deliver air to the appropriate spray booth as per the control sequence.

.2 Provide special "IN OPERATION" sign on entrance door to indicate when painting is in operation. Wire to lighted sign and interlock with the fans.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings .1 Submit shop drawings and technical information in accordance with Section 01340.

1.2 Maintenance Data .1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.3 Maintenance Materials .1 Provide maintenance materials in accordance with Section 10730.

1.4 Manufactured Items .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 - PRODUCTS

2.1 Units General .1 Provide dust collector for woodworking exhaust complete with electric shaker, two 200 L drums, heavy duty stand, 100% recirculating air system with return air fire damper, and two floor sweeps with a two way divertor for return air.

.2 Maximum flow rating not to exceed 1.46 m^3/sec for 1.7 kPa external static.

.3 Maximum height not to exceed 4.0 m.

.4 The unit shall have an air to cloth ratio no less than 8.6:1.

.5 Provide access door in a suitable location.

.6 Unit to come complete with 5.6 kW, 3600 rpm totally enclosed fan cooled motor.

.7 Unit to be complete with inline silencer, silencer transition, and weather hood.

.8 Acceptable Products: N.R. Murphy, model FBMW-10-S, arrangement G, as supplied by Davis Energy Systems.

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Addendum #1

2.2 Connections to Equipment

.1 Provide the necessary adapter and all hardware necessary for connecting to the existing equipment including radial arm saw, table saw, planer, jointer, band saw and combination belt/disc sander.

.2 Provide an individual full collar blast gate at each piece of equipment for shut off as supplied by Davis Energy System.

2.3 Special Duct Materials

.1 Interior of all ducts shall be smooth and free from obstructions with joints either welded or soldered air tight.

.2 The following metal thickness shall be applied:

100 mm to 150 mm diameter 20 ga
175 mm to 350 mm diameter 24 ga

.3 Elbows and angles shall be a minimum of two gauges heavier.

.4 All longitudinal seams shall be air tight.

.5 Girth joints of duct shall be made with an inner lap in the direction of the air flow, and shall be kept airtight.

.6 Elbows and angles shall have a centre line and radius of two pipe diameters whenever possible. Construct elbows 150 mm or less in diameter in at least five sections. Over 175 mm in diameter in seven sections. Prefabricated elbows of smooth construction may be used.

.7 Branches shall enter mains at gradual expansions and at an angle of 30° or less to 45° if necessary.

PART 3 - EXECUTION

3.1 Installation

.1 Install equipment according to manufacturer's specifications and as shown.

.2 Install equipment so that it does not interfere with the operation of overhead equipment.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

.2 Clearly indicate the following:
.1 Fan supports
.2 Fan

1.2 Manufactured Items

.1 Catalogue or published ratings shall be those obtained from tests carried out by the manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

1.3 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

PART 2 - PRODUCTS

.1 The underground portion of the tailpipe exhaust system including fittings, will be provided under Section 15851.

.2 Ductwork above floor line shall be 20 ga galvanized located as shown on Drawings.

.3 Exhaust fans shall be a utility set complete with V-belt drive and guard.

PART 3 - EXECUTION

3.1 Testing

.1 Test assembled and sealed ductwork from fan inlet to suction inlets under 2.5 kPa water column pressure for 30 min. Leakage not to exceed 1% of design total air flow.

.2 Test apparatus to include calibrated orifice and manometer.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Low and Medium Pressure Ductwork

.1 Ductwork to be constructed to withstand 1½ times working static pressure with leakage rate of 5% maximum and designed for less than 500 Pa operating pressure.

.2 All joints in medium pressure ductwork shall be caulked and sealed.

2.2 Galvanized Steel Ductwork

.1 Ducts: lock forming quality steel with G90 designation zinc coating to ASTM A525-79. Gauge of ducts shall be in accordance with recommendation of ASHRAE or SMACNA.

.2 Fabrication: ducts and fittings configuration in accordance with recommendation of SMACNA and ASHRAE.

.3 Joints: to ASHRAE or proprietory manufactured duct joint. Submit for approval.

.1 Acceptable Products: Namasco Ductmate, Exanno Nexus for proprietory joints.

PART 3 - EXECUTION

3.1 Duct Installation

.1 Install steel duct in accordance with SMACNA standards.

.2 Do not break continuity of insulation vapour barrier by hangers or rods.

.3 Ground across flexible connector with No. 2/0 braided copper strap.

.4 Install balancing dampers at all branch ducts and as indicated.

.5 Anchor all risers.

.6 Install fire dampers to NFPA 90A-1978.

.7 Make fresh air intake ducts watertight up to end of transition. Fit drain connections on bottom with minimum 20 mm pipe to funnel drain.

3.1 Duct Installation (Cont'd)

.8 Hangers shall be steel angles with supporting rods, locking nuts and washers to the following table:

Duct Size	Angle Size	Rod Size	Spacing
up to 750 mm	25 x 25 x 3 mm	6 mm	3 m
775 to 1050 mm	40 x 40 x 3 mm	6 mm	3 m
1075 to 1500 mm	40 x 40 x 3 mm	10 mm	3 m
1525 to 2100 mm	50 x 50 x 3 mm	10 mm	2.5 m
2125 to 2400 mm	50 x 50 x 5 mm	10 mm	2.5 m
2425 and over	50 x 50 x 6 mm	10 mm	2.5 m

.9 Cap off ends of unfinished sections of duct unless that particular section is actually being worked on. Continue this protection until finishing operations are completed.

.10 Variations to given duct sizes will be permitted provided that the equivalent cross sectional area is maintained and provided that the revised duct aspect ratio is not greater than 4:1.

.11 Water or other pipes may pass through duct provided the pipe is covered by streamline deflectors and the free area of the duct is maintained.

3.2 Instrument and Test Holes

.1 Install 25 mm test plugs with chain and cap, where required to accommodate testing and balancing instruments.

3.3 Duct Leakage Testing

.1 Make trial leak test, as instructed to demonstrate workmanship. Ensure at least five transverse joints, and typical fittings plus one 90° elbow are included.

.2 Install no additional ductwork until trial test has been passed.

.3 Leak test low pressure ductwork at 500 Pa and medium pressure at 2.5 kPa.

.4 Ductwork shall be free of audible leaks in quiet ambient. Low pressure and medium pressure duct leakage shall not exceed 1½%, ½% of design L/s respectively proportioned to length under test.

3.4 Air Balancing

.1 Testing and balancing personnel shall be experienced in balancing of mechanical systems in accordance with AABC procedures.

.2 Submit 4 copies of the final air balancing report complete with index page and certified by balancing specialist who is not affiliated with any firm involved in any phase of the project.

.3 Use approved instruments. Include types, serial numbers, and dates of calibration of all instruments used.

.4 Include following for air systems:

.1 Installation data, manufacturer and model size, arrangement discharge and class, motor type, watts, voltage, phase, cycles and full load amps. Location and local identification data.

.2 Design data, total volume flow rate, static pressure, motor W, r/min and amps, outside air flow rate, fan r/min, fan power.

.3 Recorded data, air flow rates, static pressure, fan r/min, motor operating amps, motor power.

.4 System schematic:

.1 Complete system schematic with required and actual flow rates at each outlet or inlet. Show room numbers and floors.

.2 Duct air quantities: for mains, branches and maximum and minimum for outside air and exhausts; duct size, pressure readings, sum of velocity measurements, average velocity, duct recorded flow rates, duct design flow rates.

.3 Air inlets and outlets, supply or exhaust outlet identification. Location and number designation.

3.4 Air Balancing (Cont'd)

.4 Manufacturers catalogue identification and type, application factors, designated area, design and recorded velocities, design and recorded air flow rates, deflector vane or diffusion cone settings.

.5 Permissible air deviation from design air quantities shall be ± 5%.

.6 After submission of report, perform random check of 10% of air inlets and outlets.

.7 Following recheck and acceptance of report, permanently mark settings of all splitters, dampers and other adjustment devices.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

1.2 Manufactured Items

.1 Flexible ductwork shall be factory fabricated.

.2 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 - PRODUCTS

2.1 Flexible Ductwork

.1 Comply with requirements for Class 1 air duct material in ULC "Standards for Safety, Air Ducts", ULC S110-1970, and NFPA 90A-1981.

.2 Provide between air outlet and duct as indicated. Length, unless otherwise noted, shall be kept to a minimum. Unit must withstand 2.5 kPa internal pressure.

.3 Ductwork: spiral wound flexible aluminum.

.4 Acceptable Products: Thermaflex Wiremold Co; Flexmaster Ltd. Triple-Lock, Laval Spiro Tube.

PART 3 - EXECUTION

3.1 Duct Installation

.1 Locate as indicated.

.2 Support flexible ducts at 1.2 m centres.

.3 Maximum length of flexible duct connections shall be 1525 mm.

.4 Connections between flexible duct and terminal devices to be made airtight with duct tape. Make further mechanical connection using sheet metal screws.

.5 Flexible duct shall not penetrate through masonry or metal enclosures.

.6 Sharp bends of flexible duct with centreline radius less than the diameter of the duct will not be accepted.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings .1 Submit shop drawings and technical information in accordance with Section 01340.

1.2 Samples .1 Submit duplicate samples and mock-ups in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Acoustic Duct Lining .1 Acoustic line inside of ducts where indicated.

.2 Acoustic lining in ductwork: 25 mm thick rigid duct liner with neoprene coated vapour barrier, fastened to interior sheet metal surfaces with an approved fire resistant bonding adhesive and metal pins and washers, spaced on not more than 300 mm centres. Seal edges and joints with an approved fire resistant mastic. Protect leading and trailing edges with sheet metal edging.

.3 Flame spread on interior lining shall not exceed 25. Maximum smoke developed rating of 50.

.4 Materials:
.1 CGSB 51-GP-10M fibrous glass rigid board coated on one side with black neoprene compound.
.2 Acceptable Products: Fiberglas Canada Ltd. rigid coated duct liner, Canadian Johns-Manville Co. Ltd.

PART 3 - EXECUTION

3.1 Installation .1 Install lining in accordance with manufacturer's recommendations.

.2 Repair any damage to the neoprene coating of the ductliner by spraying or brush coating with a suitable compound after the installation is complete.

**********END**********

PART 1 - GENERAL

1.1 Description of System
.1 Provide complete system as indicated complying with NFPA No. 91-1973.

1.2 Reference Standards
.1 See detail on Drawings.

1.3 Shop Drawings
.1 Submit shop drawings and technical information in accordance with Section 01340.

.2 Required shop drawings:
.1 floor casting and coverplates
.2 stainless steel hose complete with tailpipe adapter

1.4 Maintenance Data
.1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.5 Maintenance Materials
.1 Provide maintenance materials in accordance with Section 01730.

.2 Furnish list of individual manufacturer's recommended spare parts for equipment such as bearings and seals, and addresses of suppliers of same, together with list of specialized tools necessary for adjusting, repairing or replacing of same, for placement into operating manual.

PART 2 - PRODUCTS

2.1 Garage Carbon Monoxide Removal System
.1 Acceptable Products: Ventair (H.R. Runciman & Co.), Car Mon Products Inc., Engwald.

.2 Type of inlets: underground.

.3 Floor inlets: single type as indicated, with hinged lids and retractable flexible hoses.

.4 Hoses: 100 mm dia stainless steel flexible hose complete with plug-in ends and tail pipe adapter including chain and hook. Provide five hoses 2.4 m long.

.5 Ducts
.1 Buried ductwork shall be bell and spigot vitreous glazed tile pipe and fittings, extra strength ASTM C700-75.

2.1 Garage Carbon Monoxide Removal System (Cont'd)

Make up joints with bituminous base compound which shall not melt below 120°C., adhere to glazed surfaces and permit slight movement without damage to joint. Pump-out connection shall be cast iron and black steel pipe and fittings as indicated. Bends at floor inlets shall be shop fabricated, long sweep pattern, 1.2 mm thick galvanized with brazed joints, concrete encased.

.6 Exhaust fan will be provided under Section 15837.

PART 3 - EXECUTION

3.1 Installation

.1 Install ducts and inlets in accordance with manufacturer's instruction, with pump out connection at low point in system.

.2 Make joints watertight and gastight when subjected to 1.5 kPa water column pressure.

.3 Support underfloor piping.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings .1 Submit shop drawings and technical information in accordance with Section 01340.

1.2 Maintenance Data .1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.3 Manufactured Items .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 PRODUCTS

2.1 Breechings .1 Type 2: chimney, 425°C. rating maximum ULC type B, gas vent only.
.1 Sectional prefabricated double wall chimney and breeching with mated fittings and couplings.
.2 ULC certification.
.3 Acceptable manufacturers: Selkirk, Metalbestos, Type B.

PART 3 - EXECUTION

3.1 Breeching and Chimneys .1 Follow manufacturer's installation recommendations for pre-fabricated components.

.2 Suspend breeching using trapeze hangers at 1.5 m centres.

.3 Provide gasketted bolted inspection doors.

.4 Support chimneys at bottom, roof and intermediate levels as indicated. Install thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney.

3.2 Flashing .1 Provide flashing to suit installation.

.2 Follow details for chimneys penetrating roofs.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

.2 Clearly indicate the following.
.1 Duct Access Doors

1.2 Samples

.1 Submit duplicate samples in accordance with Section 01340.

1.3 Manufactured Items

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

1.4 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

PART 2 - PRODUCTS

2.1 Flexible Connections

.1 General HVAC System:
.1 Provide where indicated, at fans and at air handling units, neoprene coated glass fabric, minimum density 1.22 kg/m², factory fabricated, not more than 150 mm long between metal parts and installed with just sufficient slack to prevent vibration transmission. Allow 100 mm movement to high pressure fans and 50 mm movement to low pressure fans.
.2 Acceptable Products: Duro-Dyne of Canada Ltd: Durolon, Vent Fabrics Inc: Ventglas, Elgen Mfgr: Neoprene.

2.2 Sealants and Tapes

.1 Acceptable Products: Duro-Dyne, Arno, 3M, to suit application. Submit sample for approval.

2.3 Duct Access Doors

.1 Provide as indicated for access to fire or other dampers and for service or inspection, and for cleanouts where required on specialty systems, hinged or screwed panel type access doors, 400 x 500 mm unless otherwise stated, complete with two sash locks.

.2 Acceptable manufacturers: Non-insulated: Buensod Type S-1, complete with 2-way latches. Insulated: Buensod Type F-2 Duro-Dyne.

2.4 Turning Vanes .1 Provide small arc air foil hollow vanes as indicated in duct elbow where centre-line radius is less than 1½ times turning dimension of duct.

.1 Acceptable manufacturers: Duro-Dyne, Tuttle and Bailey.

PART 3 - EXECUTION

3.1 Installation .1 Install flexible connections, sealants and tapes, duct access doors and turning vanes in accordance with manufacturers recommendations.

.2 Ground across flexible connector with No. 2/0 braided copper strap.

.3 Maximum length of flexible duct connections shall be 150 mm.

.4 Securely anchor ductwork to building structure at the flexible connection and select a length of flexible material to allow 100 mm movement of supply air equipment and 50 mm for other fans.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

.2 Clearly indicate the following:
.1 Fire dampers
.2 Fire damper installation instructions.

1.2 Maintenance Data

.1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.3 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

1.4 Manufactured Items

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 - PRODUCTS

2.1 Dampers

.1 Provide approved units of thicknesses and type of construction in accordance with SMACNA Duct Construction Standards, or as indicated.

2.2 Balancing Dampers

.1 Provide splitter dampers in branch supply duct takeoffs with control rod with locking device on exterior of duct.
.1 Dampers to be airfoil shape double thickness one gauge heavier than duct.

.2 Provide multi-leaf opposed blade dampers designed to SMACNA details with locking quadrant.

.3 Factory manufactured adjustable extractors to be provided where indicated.
.1 Acceptable Products: Tuttle and Bailey, Anemostat, Titus.

2.3 Fire Dampers

.1 Fire dampers: listed and bear label of ULC and shall meet requirements of Provincial Fire Marshal, FCC and NFPA 90A-1978 authorities having jurisdiction.

2.3 Fire Dampers (Cont'd)

.2 Nationally recognized mutually agreed upon independent fire test laboratory labels and listings may be substituted in lieu of ULC labels provided that re-examination services are offered.

.3 Factory fabricated for fire rating requirement to maintain integrity of membrane being pierced; rating shall be 1½ hour as defined by codes. Fusible link shall be selected at 60°C.

.4 Mild steel, fire link actuated top hinged door, offset single damper, round or square, multi-blade hinged or interlocking type, roll door type, guillotine type, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow, sized to maintain full flow cross section as indicated.

.5 Provide complete with frame and 40 x 40 x 3 mm angle iron on full perimeter of frame on both sides of barrier being pierced.

.6 Free area of damper section shall not be less than 80% of duct cross sectional area.

.7 Position duct access door at each fire damper to permit visual inspection and replacement of fusible link.

2.4 Back Draft Dampers

.1 Automatic gravity operated, multileaf, steel construction, counterweighted or spring assisted as required.

2.5 Relief Dampers

.1 Automatic multi-leaf steel dampers with ball bearing and counterweights.

PART 3 - EXECUTION

3.1 Installation

.1 Install fire dampers to ULC and manufacturer's requirements and to NFPA 90A-1978 and SMACNA Standard "Fire Damper Guide for Air Handling Systems". Locate in fire walls and partitions where indicated.

.1 Seal around fire damper assembly.

.2 After completion, have installation approved prior to concealment.

3.1 Installation (Cont'd)

.3 Install in accordance with manufacturer's instructions, with sleeve, duct connections and angle supports to comply with ULC listing conditions.

.2 Install balancing dampers at all branch ducts and as indicated.

.3 Where round duct connections are made at the branch duct for connection of flexible duct install a butterfly damper for balancing purposes.

.4 Position duct access door at each fire damper to permit visual inspection and replacement of fusible link.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

.2 Clearly indicate the following:
.1 VAV boxes

1.2 Samples

.1 Submit duplicate samples in accordance with Section 01340.

1.3 Test Reports

.1 Submit published test data on DIL, per ASHRAE 36-72 made by independent testing agency for 0, 2.5 and 6 m/s branch velocity or inlet velocity. Sound power level with minimum inlet pressure of 0.25, 0.5, 1, 1.5 kPa in accord with ASHRAE 36-72 for 2nd through 7th octave band, also made by independent testing agency. Pressure loss through silencer shall not exceed 60% of inlet velocity pressure maximum. To AMCA 210-74 standard. Name of independent testing agency to be submitted for approval.

1.4 Maintenance Data

.1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.5 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

1.6 Manufactured Items

.1 Terminal units shall be the product of one manufacturer for generic type.

.2 Catalogue or published ratings shall be those obtained from tests carried out by the manufacturer, and witnessed by the Engineer or his representative signifying adherence to codes and standards in force.

.3 Terminal unit manufacturer shall substantiate equipment selection indicating NC level, system design, acoustical analysis, selecting units to meet room sound level specifications and sound requirements.

.4 Each terminal control unit shall be factory tested and calibrated to individual air quantity requirements.

PART 2 - PRODUCTS

2.1 Terminal Unit (Interior Zones)

.1 Units shall be volume regulator type, of sizes shown on Drawings. Units shall have factory catalogue performance ratings which conform to L/s, kPa, discharge and radiated Sound Power levels designated.

.2 Casing shall be 0.90 mm (minimum) thickness zinc coated steel fully insulated with 25 mm minimum thickness thermal and acoustic insulation. Insulation shall be of glass fibre material, surface treated to prevent erosion and having ULC approval meeting NFPA and NBFU 90 A. Leakage through casing not to exceed 3% of design volume with 2 kPa upstream and 0 kPa downstream of regulator while maintaining flow regulation to within 5% of setting.

.3 Acoustic performance and standards shall ensure room NC of 35 assuming 5 dB room attenuation.

.4 Performance of units shall be based on tests conducted in accordance with ASHRAE 36-72 and ADC 1062R4 with no duct work between unit discharge and sound room.

.5 Acceptable manufacturers when conforming to the above specifications shall be: Tempmaster, Carrier, E.H. Price, Canadian Advanced Air, Lloydaire, Tuttle & Bailey.

PART 3 - EXECUTION

3.1 Installation

.1 Install in accordance with manufacturers recommendations.

.2 Support independently of ductwork hung from building structure with angles and hanger rods.

.3 Units shall be selected so that the capacity falls into the lower 2/3 of the catalogued range to maintain an NC 35 level at 250 Pa inlet static pressure and 5 dB room attenuation. Submit data for approval before fabrication.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Door grilles: Section 10200

1.2 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

1.3 Samples

.1 Submit duplicate samples in accordance with Section 01340 as directed by the Engineer.

1.4 Maintenance Data

.1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.5 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

1.6 Manufactured Items

.1 Grilles, registers and diffusers shall be product of one manufacturer for generic type, i.e. grilles and registers by one, diffusers by one, or same.

.2 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 - PRODUCTS

2.1 Grilles Registers and Diffusers General

.1 Sizes indicated are nominal. Provide correct standard product nearest to nominal for capacity throw, noise level, throat and outlet velocity.

.2 Frames:

.1 Steel: prime coated, stamped, cold rolled steel with exposed joints welded and ground flush and completely closed.

.2 Aluminum: satin finish with mechanical fasteners and completely closed corners.

.3 Provide full perimeter sponge rubber gaskets.

.4 Provide plaster frames as plaster stops where set into plaster or gypsum board at all locations.

.3 Acceptable Manufacturers: Titus, Tuttle and Bailey, Anemostat, Lisi, Lloydaire.

2.2 Supply Registers	.1	19 mm border double deflection with airfoil shape, horizontal face and vertical rear bars complete with opposed blade dampers (OBD) with concealed manual operator, and gaskets.
2.3 Exhaust Registers	.1	19 mm border, single deflection, air foil shape, horizontal bar type 20° max turn up complete with opposed blade damper with concealed operator and rubber sealing strips.
2.4 Diffusers	.1	Circular, square, rectangular, slot, linear slot type, finish, size and capacity indicated for neck diameter or size indicated, having fixed pattern, and volume control dampers with flow straightening devices and blank-off quadrants. Refer to Schedule on drawings.
2.5 Linear Grilles	.1	Bar core linear grilles with margin as indicated sealing strip and accessories as indicated.
	.2	Refer to drawings for type of margin, bar spacing, anchorage and accessories.
2.6 Finishes	.1	Primer: to CGSB 1-GP-40M, colour as indicated.

PART 3 - EXECUTION

3.1 Installation	.1	Install in accordance with manufacturers instructions.
	.2	Fit frame with gasket to prevent leakage, and smudging.
	.3	Install with flat head cadmium plated screws in countersunk holes where fastenings are visible.
	.4	Drawings showing position of outlets are essentially diagrammatic, co-ordinate exact locations with other elements on the reflected ceiling drawings.
	.5	Select trim to suit ceiling materials listed in the Finish Schedule.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings .1 Submit shop drawings and technical information in accordance with Section 01340.

1.2 Samples .1 Submit samples in accordance with Section 01340.

1.3 Manufactured Items .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

1.4 Test Reports .1 Submit certified data from independent laboratory substantiating acoustic aerodynamic performance to ASTM E90-75.

PART 2 - PRODUCTS

2.1 Factory-made Gravity Roof Fresh Air Intakes, and Relief Vents .1 Galvanized steel complete with integral 12 mm mesh of 2.7 mm dia. aluminum wired birdscreen and vertical, backdraft dampers on faces.
.1 Shape: as indicated.

.2 Acceptable products: Penn Airette: Type FAl, Sheldons: Type SRH, Jenn Air: Type PR, Carnes: Type IR.

PART 3 - EXECUTION

3.1 Installation .1 Install in accordance with manufacturer's recommendations.

.2 Install to SMACNA details.

.3 Reinforce and brace air vents and intakes for wind speed as per NBC for location.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings and technical information in accordance with Section 01340.

.2 Clearly indicate the following:
.1 Prefilters
.2 Final Filters
.3 Paint Arresters

1.2 General

.1 Provide temporary roughing filters ahead of filter banks during initial operation of the supply air handling systems.

.2 Remove temporary filters and ensure that the filter banks are complete with appropriate cartridges and media when building is turned over to the Owners.

1.3 Maintenance Materials

.1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

1.4 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

1.5 Manufactured Items

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 - PRODUCTS

2.1 General

.1 Provide filter media, frames, seals, gaskets per NFPA and ULC code; Class II construction.

.2 Use incombustible materials in fabrication of filter assembly.

.3 Provide air filter gauges, 0-250 Pa range for prefilters and 0-1000 Pa for final filters.
.1 Acceptable Products: Dwyer 250 AF series inclined solid acrylic plastic manometer, Magnehelic 2000 series diaphragm actuated direct reading dial type, Airflow Developments Ltd. Type FL1BM.

2.1 General (Cont'd)

.4 Efficiency: ASHRAE Standard 52-76 Sect 3-16, Atmospheric dust spot efficiency.

.5 Frames:
.1 Provide prefabricated filter frames and supporting structure of galvanized steel or extruded aluminum with gasketing between frames and walls. Holding frames: 1.6 mm thick "T" section construction.

.6 Medium efficiency prefilters in the fan room shall be installed for upstream servicing, elsewhere side access servicing will be provided. High efficiency final filters shall be installed for downstream servicing.

.7 Filters shall be suitable for air at 100% RH.
.1 Acceptable Products: American Air Filter of Canada Ltd. (AAF), Cambridge Filter Corporation, Farr Company Limited.

2.2 Panel Filters

.1 Renewable glass fibre media to CGSB115-GP-10 with adhesive. Mount in permanent galvanized steel frame of 1.2 mm thick minimum with 3 mm diameter wire mesh screen at entry and outlet, hinged at entry.

2.3 Bag Cartridge Type Filters, efficiency 80%-85%

.1 Media: high efficiency disposable bag type to CGSB 115-GP-11M throwaway cartridge type of ultrafine glass, selfinflating with holding frame and not requiring rigid supporting basket.

.2 Unit size: as shown on Drawings.

2.4 Table

	Efficiency (ASHRAE 52-76)	Rated Resistance at 2 m/s static pressure Pa	Nominal Thickness or depth mm	media m^2 (min) $m^2/m^3/s$
Panel		25	50	
Cartridge	30-35%	50	380	1.8
Bag Cartridge	80-85%	100	900	8.5

PART 3 - EXECUTION

3.1 Installation

.1 Install in accordance with manufacturers recommendations with careful sealing between adjacent holding frames and between holding frames and plenum walls, roof and floor.

.2 Filters shall be installed a minimum 300 mm off the plenum floor. Blank off area below filters.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Indicate on complete control diagrams, positions, model numbers, setting of proportional band, gain and authority percent, set point and reset schedules, air piping and wiring layouts.

.3 Provide valve and damper schedule indicating size, configuration, capacity and locations. If size varies greater than 10%, obtain approval of Engineer.

.4 Provide technical literature on system components.

1.2 Maintenance Data and Service

.1 Provide maintenance data for incorporation into maintenance manual specified in Section 01730.

.2 Check and adjust control systems every three (3) months during first year from date of acceptance. Report in writing, results or resettings made.

.3 Provide as-built information in accordance with Section 01720.

1.3 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty the Queen in right of Canada stating that the controls and instrumentation are guaranteed against faulty material and workmanship for a period of three (3) years from the date of the Final Certificate of Completion.

PART 2 - PRODUCTS

2.1 General

.1 Supply and install controls as indicated and as hereinafter specified.

.2 Control equipment and installation shall be the product and service of one manufacturer unless otherwise specified.

.3 Control system installed to be fail-safe.

2.7 High Temperature Protection (Cont'd)

.2 Bimetallic thermostat set at 57°C. shall shut down supply fan and activate alarm. Location as indicated.

.3 Pilot light indicators: on local panel.

.4 Shunt type ULC approved manual reset firestats: where indicated to shut down fans and activate alarm.

2.8 Gauges

.1 Air pressure indicating gauges: minimum 40 mm dia., with applicable range at controllers.

.2 90 mm panel mounted receiver gauges for each transmitter. Indicating range of gauge shall match range of transmitter. Accuracy: 0.5% of full scale.

2.9 Pilot Positioners

.1 Full relay type: with interconnecting linkage for mechanical feedback on damper operators and valves acting in unison or sequenced from a single controller.

.2 Provide position indicators on valves larger than 25 mm.

2.10 Valves

.1 Pressure rated valves: as indicated.

.2 Valve operators: spring return for "fail safe" in normally open or normally closed position, as indicated.

.3 Water valves:

.1 Two-way: equal percentage characteristics, or quick opening as indicated.

.2 Three-way mixing: linear characteristics.

.3 Three-way diverting: linear, or quick opening as indicated.

2.11 Damper Operators

.1 Operators for fans and mixing boxes to be factory mounted.

.2 Provide spring return for "fail-safe" in normally open or normally closed position.

.3 Size operators to control dampers against maximum pressure or dynamic closing pressure, whichever is greater.

2.11 Damper Operators (Cont'd)

.4 Provide piston type operators with adjustable spring and stroke.

.5 Provide adjustable external stops to limit stroke in either direction.

.6 Where pneumatic damper operators are connected into a fire alarm, freeze protection system, provide additional relays to allow dampers to respond and go to required position upon a signal in less than 15 s.

2.12 Dampers

.1 Sizes:
.1 Blades maximum 150 mm wide and 1200 mm long.
.2 Modular maximum 1200 mm wide and 2400 mm high.
.3 Multiple sections with stiffening mullions and jack shafts.

.2 Materials:
.1 Frame: 2.5 mm thick galvanized sheet steel.
.2 Blades: two sheets 0.8 mm thick or 1.6 mm thick galvanized sheet steel.
.3 Bearings: oil impregnated sintered bronze nylon. Provide additional thrust bearings for vertical blades.
.4 Linkage: zinc plated steel.
.5 Seals: replaceable neoprene seals or ss spring on side, top and bottom of frame and along all blade edges and blade ends.

.3 Performance characteristics:
.1 50 L/s.m² maximum allowable leakage against 1.0 kPa static pressure.
.2 Temperature range -40°C. to 90°C.

.4 Acceptable products: Honeywell D642 (parallel), D643 (opposed); Johnson D1200 (parallel, D1300 (opposed); Powers 65 PB (parallel), 65 OB (opposed).

.5 Dampers:
.1 Mixing dampers: dampers mixing cold and warm air shall be parallel blade mounted at right angles to each other with blades opening to mix the air streams.
.2 Face and bypass dampers: parallel blade sections as indicated. Provide anti-wiping dampers on both sides of the coil face.

2.13 Temperature Sensor Wells	.1	Brass wells of size to suit bulb with union and dielectric element.
2.14 Nameplates	.1	Provide in accordance with Section 15020.
2.15 Local Panels	.1	Provide rigid panelboard for main air handling unit.
	.2	Mount panelboard in 2.5 mm thick furniture steel, cabinet with baked enamel finish.
	.3	Mount relays, switches and controllers in cabinet. Mount temperature indicator, gauges, pilot lights, push buttons and control point adjustments on cabinet face.
	.4	Hinged key-lock access door.
	.5	Common terminal strip within cabinet.
	.6	Mount panels adjacent to associated equipment on vibration free walls or free standing frames.
	.7	Mount system schematic drawings in rigid clear plastic enclosure on cabinet or adjacent wall.
2.16 Control Compressor Station	.1	Control air will be provided from the central compressed air system.
	.2	Dehydrate compressed air using continuous operating refrigerated type dryers, complete with refrigerant evaporator and mechanical condensate separator. Provide dehydrator for a gauge pressure of 1.4 MPa maximum operating pressure capable of reducing dew point to -23°C. when dehydrating at a gauge pressure of 0.7 MPa. Pressure drop across unit not to exceed 20 kPA at rated capacity. .1 Acceptable products: Devilbiss, Ingersoll-Rand, Buffalo.
	.3	Filters: to remove oil and solid particles from compressed air. Filters shall have at least 99% efficiency in removing both one half micrometre dia. solid particles and oil aerosol.

2.16 Control Compressor Station (Cont'd)

Provide two filters in double valved bypass arrangements with replaceable oil absorbing filter element which changes colour to indicate saturation with oil. Mount in transparent acrylic tube for visibility and inspection. Protect tube with perforated steel safety shield.

2.17 Mixed Air Variable Volume Control

.1 Supply air: to controls when fan is started.

.2 Freeze and fire protection: as indicated.

.3 Modulate mixing dampers to maintain required mixed air temperature.

.4 Provide manually adjusted minimum fresh air damper.

.5 Control damper motor on variable volume box using room thermostat. With an increase in room temperature, room thermostat shall gradually position volume regulation from minimum to maximum volume setting. Minimum setting to be 25% of specified air flow.

2.18 Sequence of Operation

.1 Refer to drawings for Sequence of Operation for the various systems.

PART 3 - EXECUTION

3.1 Installation

.1 Install systems and related controls using factory trained journeymen certified by Province of Ontario.

.2 Code tubing in bundles within flexible armour at every branch and at each piece of equipment.

.3 Use copper tubing type 'L' with flared fittings in following locations:

.1 Inaccessible areas.
.2 Where single lines travel from tube tray to instruments.
.3 Areas of heat above 80°C.
.4 Mechanical rooms.
.5 Rooms where piping subject to damage.
.6 Adjacent to heating pipes passing through common sleeve.
.7 Where air pressures above 200 kPa.

3.1 Installation (Cont'd)	.4	Follow building lines. Do not cover with insulation. Install drip legs and drains at low points.
	.5	Locate thermostat and room sensors 1200 mm above floor, as indicated. Coordinate with Engineer for exact location.
	.6	Supervise installation of orifice plates and baffles for volume and temperature control.
3.2 Start-Up and Adjustment	.1	Upon completion of installation, test, adjust and regulate controls or safety equipment provided under this Section.
	.2	Adjust and place in operating condition.
3.3 Monitoring	.1	Monitoring of equipment shall be covered by Section 15901.

**********END**********

PART 1 - GENERAL

1.1 General

.1 The "provide" in this Division shall be interpreted as "supply and install".

.2 All work shall conform to Canadian Metric Practice Guide CSA CAN3-2234.1-76.

.3 Provide all required adapters between "metric" and "Imperial" components.

.4 Metric descriptions in this Division are nominal equivalents of Imperial values.

.5 All equipment and material to be new, CSA certified, manufactured to minimum standard quoted including additional specified requirements.

.6 Where there is no alternative to supply equipment which is not CSA certified, submit such equipment to Inspection Authorities for special inspection and obtain approval before delivery of equipment to site.

.7 Use material and equipment available from regular production by manufacturer concerned.

1.2 Contractor

.1 The Contractor shall be fully responsible for the complete installation and proper operation of the Energy Monitoring System, including, but not limited to, interfacing of all Energy Monitoring and Control System equipment, sensors and controls and peripheral devices, communication links, and RPU's. After the installation, the Contractor shall be responsible for the debugging and calibration of the EMCS, including all software. The Contractor must:

.1 Have a staff, or approved contracted arrangements to provide a staff, of factory trained personnel capable of giving instructions and providing routine and emergency maintenance on the System and all system components.

.2 Have a proven record of experiences in the supply and installation of similar computer based systems.

1.2 Contractor (Cont'd)

.1 (Cont'd)

.3 Employ permanent in-house programmers in Canada.

.4 Have local facilities to co-ordinate all service and warranty work.

.5 Maintain or have approved contracted access to supplies of essential expendable parts.

.6 Approved Contractors when conforming to the above requirements shall be: Honeywell Controls Ltd., Johnson Controls Ltd., Powers Regulator Company and Windeler Electric.

1.3 Scope of Work

.1 The work covered by this Specification and related sections consists of providing shop drawings, equipment, labour, materials, engineering, technical supervision, and transportation as required to furnish and install a fully operational Energy Monitoring and Control System (EMCS) to monitor and control the facilities listed in the Points List, and as required to provide the operation specified in strict accordance with these Specifications and the Contract Drawings, and subject to the terms and conditions of the Contract. The work in general consists of but is not limited to, the following:

.1 The preparation of submittals and provision of all related services.

.2 Furnish and install data communication equipment necessary to affect an EMCS data transmission system.

.3 Furnish and install Remote Processing Units (RPU), field interface devices (FID), sensors, control devices, conduit and wiring, in the facilities indicated in the attached Points List, or as required to provide the operation specified.

.4 Furnish and load all software required to implement a complete and operational EMCS.

.5 Furnish complete operating and maintenance manuals and field training of operators, programmers, and maintenance personnel.

.6 Perform factory and acceptance tests as indicated.

1.3 Scope of Work (Cont'd) .1 (Cont'd)
.7 Provide full documentation for all software and equipment.
.8 Miscellaneous work as indicated in these Specifications and the Contract Drawings.

1.4 System Structure .1 The Energy Monitoring and Alarm System shall be configured as a distributed processing network having the following components:
.1 Sensed data shall be obtained from Remote Processing Units and/or Field Interface Devices within their particular data environments.
.2 Remote panels shall be grouped in three locations throughout the base:
.1 Helicopter hangar to monitor points in the hangar as listed in the Points List.
.2 Boiler room to monitor points throughout the shop area and boiler room itself, as listed in the Points List.
.3 Ground floor fan room to monitor points in the fan room, penthouse and Administration Area as listed in the Points List.
.3 Remote panels will stand alone, i.e. their basic operation will not depend upon any other processor in the network. The basic operation covers functions such as scanning of digital/analog inputs, scaling and conversion to engineering units for analog points, digital state change detection, analog alarm detection and report on-off digital control with required sequential logic, analog limit alarms and software programmes as required.
.4 Provide a means for local readout at each panel by means of panel mounted LED display with coded output or plug-in mnemonic operators terminal.

1.5 Alarm Centres .1 Provide one (1) hard copy alarm printer in the Boiler Room. This printer shall receive all alarms from every panel on the base. The printer shall be capable of English Language printout with

1.5 Alarm Centres (Cont'd)

.1 (Cont'd)
instructions to base personnel as to procedure for dealing with the alarm, i.e. directive as to who to inform, possible correction of alarm, etc.

.2 Provide two remote alarm stations each consisting of three trouble lights labelled "Hangar", "Boiler Room" and "Fan Room", one to be located in the Yard Office, the other in the Guard House. Any and all alarms detected at the control panel(s) in the hangar shall light the trouble light labelled "Hangar", alarms from the panel(s) in the Boiler Room will light the trouble light labelled "Boiler Room" and alarms from the panel(s) in the Fan Room will light the trouble light labelled "Fan Room".

1.6 Products

.1 Materials and equipment shall be essentially the catalogued products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest standard design that complies with the Specification requirements. Where two units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of a single manufacturer. Each major component of equipment shall have the manufacturer's name and address and the model and serial number on a nameplate securely attached in a conspicuous place.

1.7 Electrical Work and Safety Requirements

.1 Electrical work shall be in accordance with OHEC, NFPA 70 and ANSI C2. Electrical wiring, terminal blocks and other high voltage contacts shall be fully enclosed or properly guarded and marked to prevent accidental injury to personnel.

1.8 Manufacturer's Recommendations

.1 Where installation procedures, or any part thereof, are required to be in accordance with the recommendations of the manufacturer of the material being

1.8 Manufacturer's Recommendations (Cont'd)

.1 (Cont'd) installed, printed copies of these recommendations shall be furnished to the Contracting Officer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations shall be cause for rejection of the material.

1.9 Wiring

.1 All wiring associated with and required by the EMCS shall be the responsibility of the Contractor. The term "wiring" shall be construed to include furnishing of wire, conduit, miscellaneous material and labour as required to install a total working system. If departures from the Contract Drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefore, shall be submitted with the drawings to the Contracting Officer for approval.

.2 Review Mechanical and Electrical Drawings for wiring and conduit provided by Divisions 15 and 16.

1.10 Preliminary Design Review

.1 The Contractor shall submit a preliminary design document for review by the department. This document shall contain the following information:

.1 Location of local office.
.2 Description and location of technical staff available for installation and service.
.3 Location of programming design and programming support staff.
.4 Location of spare parts stock, and list of spares necessary.
.5 Name of Project Manager.
.6 Names of all Sub-contractors.
.7 Specification sheets for each piece of equipment proposed.
.8 Layout of equipment in control centre.
.9 Single line diagram showing cable routing between field cabinets.

1.10 Preliminary Design Review (Cont'd)

.1 (Cont'd)

.10 Description of system operation including speed and type of data transmission used, type of cable or wire used, operator action necessary to execute demands, obtain data displays, or respond to alarms, automatic features provided.

.11 Description of the requirements for changing set points, limits, start time etc.

.12 System capacity and limits of expansion.

.13 Statement of spare capacity.

.14 Description of energy management programs included.

.15 An indication of additional information required in order to provide the complete operational system.

1.11 Drawing Requirements

.1 Manufacturer's Data: Before start of construction 4 copies of information in one completely marked and co-ordinated package, to assure full compliance with the Contract requirements, shall be submitted for approval. Piecemeal submittal of data is not acceptable and such submittals will be returned without review. Information shall be submitted for all material and equipment the Contractor proposes to furnish for accomplishment of the Contract work. Submittals for each manufactured item shall be manufacturer's descriptive literature (equipment specification), equipment drawings, diagrams, performance and characteristic curves, and catalogue cuts and shall include the manufacturer's name, trade name, catalogue model or number, nameplate data, size, layout dimension, capacity, specification reference, applicable specification references, and all other information necessary to establish Contract compliance.

.2 Shop Drawings: Before start of construction 4 copies of drawings in one completely marked and co-ordinated package:

.1 Control centre layouts.

.2 Interconnection schematics.

.3 Wiring diagrams.

1.11 Drawing Requirements (Cont'd)

.2 (Cont'd)
.4 Control schematics with sequence of operation fully showing and describing operation and/or manual procedures available to operating personnel to achieve proper operation of the building upon complete failure of the EMCS.

1.12 Tests

.1 This work shall include field testing and adjustment of sub-systems and of the complete EMCS, and an on-site final operational acceptance test of the complete operational EMCS. The Contracting Officer shall be advised at least 14 days in advance of the dates of all tests and may attend at his discretion. If the Contracting Officer witnesses the test, such tests shall be subject to his approval prior to the release of equipment. If the Contracting Officer elects not to witness the tests, performance certification shall be provided by the Contractor. Acceptance of tests by the Contracting Officer shall not relieve the Contractor of responsibility for the complete system meeting the requirements of these Specifications after installation.

.2 At the request of the Engineer, the Contractor shall demonstrate the capabilities of the system and software at an existing installation.

.3 Final Operational Acceptance Test:
.1 A final operational test shall be conducted on each phase of the installed and operational Energy Monitoring and Control System to demonstrate that it is functioning properly in accordance with all requirements of this Specification. The correct operation of all monitored and controlled points shall be demonstrated as well as the operation and capabilities of all sequences, reports, specialized control algorithms, diagnostics, and all other software.

1.13 Operation, Maintenance and Design Manuals

.1 A description of each instruction and reference manual is contained within the following paragraphs. Five copies shall be provided bound in hard back, loose-leaf binders or an approved equivalent. One complete set of manuals shall be furnished prior to the time that system or equipment tests are performed, and the remaining manuals shall be furnished at initial acceptance. The identification of each manual's contents shall be inscribed on the cover. The manuals shall include the names, addresses and telephone numbers of each Sub-contractor installing equipment and systems and of the local representatives for each item of equipment and each system. The manuals shall have a table of contents and be assembled to conform to the table of contents with the tab sheets placed before instructions covering the subject. Additionally, each manual shall contain a comprehensive index of all manuals submitted in accordance with this paragraph. Manuals and specifications shall be furnished which provide full and complete coverage of the following subjects:

.1 Operational Requirements: this document shall describe, in concise English terms, all the functional and operational requirements for the system and its functions that have been established. It shall not require knowledge of digital processor programming or electronic techniques or control system theory.

.2 System Operation: Complete guidance and procedures for operation of the system, including required actions at each operator station; operation of computer peripherals; input and output formats and procedures; and emergency, alarm, and failure recovery procedures. Step-by-step instructions for system startup, backup equipment operation, and execution of all system functions and operation modes shall be provided.

1.13 Operation, Maintenance and Design Manuals (Cont'd)

.1 (Cont'd)
.3 Functional Description: Detailed documentation, in language readily understandable to non-technical personnel, of the operation and specific functions of the system. Known or established constraints on system operation shall be fully described. Any operating procedures currently implemented or planned for implementation in an automatic mode shall be stated and described.

.2 Software:
.1 Documentation of the design and functions of all software modules and systems for all digital processors in the EMCS. This shall include test and verification .procedures and detailed descriptions of program requirements and capabilities. All software shall be provided individually for each remote panel while a single section shall reference all common parameters and functions.

.3 Maintenance:
.1 Documentation of all maintenance on all system components including inspection, periodic preventive maintenance, and replacement of defective units.

.4 Test Procedures and Reports:
.1 The test implementation shall be recorded with a description of the test exercise script of events and documented as Test Procedures.

1.14 Training

.1 Instructions to Government Personnel: The Contractor shall provide the services of competent instructors who will give full instruction to designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements, of the equipment and system specified. The training shall be oriented toward the system installed rather than being a general (canned) training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach.

1.14 Training (Cont'd)

.2 Training Programme: The training programme shall be accomplished in three phases corresponding to construction. Provide a minimum of 20 hours of instruction for the entire system. At each phase, ensure that the operators have sufficient training to operate the system:

.1 Phase 1 - Helicopter Hangar

Operating personnel will be trained in the functional operations of the system installed and the procedures that the operators will employ for system operation. Training shall include the following:

.1 System description
.2 Operation of operator's terminal/keypad
.3 Procedure for alarm reporting
.4 Operator control functions
.5 Point access and description

.2 Phase 2-Boiler Room

A second training session shall be provided after the installation of the panel(s) in the Boiler Room. Training shall include the following:

.1 Familiarization with alarm points added
.2 Operator control functions
.3 Point access and description
.4 Use of hard copy alarm printer
.5 Use of operators terminal/ keypad

.3 Phase 3-Fan Room

A third training session shall be provided to instruct personnel of the operation of the panel(s) in the Administrative Wing.

1.15 Maintenance

.1 The Contractor shall provide all services, materials and equipment necessary for the maintenance of the entire Energy Monitoring System for a period of one year concurrent with the warranty period. Any necessary material required for the maintenance work shall be provided by the Contractor.

.2 The work covered in this Specification shall include maintenance of equipment including all computer equipment, transmission equipment and links, remote

1.15 Maintenance (Cont'd)

.2 (Cont'd) panels and all related sensors and control devices. As a minimum the Contractor shall provide the manufacturer's required preventative maintenance and all other maintenance stated hereinafter.

.3 The Contractor shall furnish sufficient qualified personnel, equipment, supplies and materials to accomplish promptly and satisfactorily all work under this Specification. Prior to commencement, the Contractor shall advise the Contracting Officer in writing of the name of the designated representative of the Contractor. Changes in representatives shall be furnished to the Contracting Officer in writing prior to making such changes.

.4 The Contractor shall furnish the required supervision, satisfactory to the Contracting Officer, at all times during progress of the work, and with full authority to act for the Contractor. Such supervision shall be provided for all work done by the Contractor's employees to assure performance in strict accordance with the provisions contained in this Specification.

.5 Service personnel shall be certified by the supplier to maintain the installed Energy Monitoring System.

.6 The Contractor shall provide one minor inspection per quarter or as required by the manufacturer and two major inspections per year, and all service for the required maintenance.

.7 Emergency Service: The government will initiate service calls when there is indication that the EMS is not functioning properly. The contractor shall have qualified control personnel available during the contract period to provide service to the "critical" control system components whenever required at no

1.15 Maintenance (Cont'd)

.7 (Cont'd)
additional cost to the Government. The Contractor shall furnish the Contracting Officer with a telephone number where the service mechanic can be reached at all times. The service mechanic shall be on the job ready to service the control system within 24 hours or the next working day, whichever is greater, after receiving a request for service and the work shall be prosecuted continuously until the control system is back in reliable operating condition.

.8 Operation: The performance of the foregoing noted items and all other services required shall provide proper sequencing of the equipment and satisfactory operation of the Energy Monitoring and Control System based on original design conditions and shall be as recommended by the manufacturer.

.9 Records and Logs: Records and logs shall be kept of each maintenance task. Cumulative records for each major component and for the complete aggregate system shall be organized chronologically.

.10 System Modifications: Recommendations for system modification shall be provided in writing to the Contracting Officer. No system modification, including operating parameters and control settings, shall be made without prior approval of the Contracting Officer.

.11 Software: Provide implementation of all software maintenance updates. These shall be accomplished as required and full co-ordination with EMS supervisory personnel shall be maintained.

1.16 System Functions

.1 Start/Stop/Status
.1 As specified in the points list, the system shall be capable of initiating start/stop commands for equipment. Feedback shall be employed on all

1.16 System Functions (Cont'd)

.1 (Cont'd)
start/stop points to ensure that a monitored device received the command instruction(s) and responded as commanded by the system. Any request not responding as commanded shall cause an operator advisory message to be output.

.2 Time Programming Functions
.1 Time programmes shall automatically be initiated based on an operator pre-established time schedule. These outputs shall be based on a time of day and day of week basis.

.3 Change of State Alarms
.1 The system shall continuously scan each connected data point in search of status changes or contact alarm point changing status. All detected changes shall initiate programmed reactions.
.2 Alarm monitoring points going into alarm shall automatically annunciate themselves on the hard copy printer and light the appropriate remote trouble light.
.3 All change of state outputs shall contain a descriptor, system formatted point ID, point data, date and time.
.4 The system shall output an alarm message text, up to 60 characters in length, for each point specified as having an alarm message. The associated message text will be printed immediately after the standard alarm notification printout for the point.
.5 When multiple changes of state are received, they will be output on the hard copy device chronologically, i.e. in the order of occurrence.

.4 Analogue Limits
.1 Each analogue data point shall have an appropriate engineering unit assigned and shall be capable of having multipliers offset values, and decimal conversions applied for proper and accurate display. No display range or sensor range shall exceed three times

1.16 System Functions (Cont'd)

.4 (Cont'd)
the normal maximum value anticipated. Engineering units are to be those of the measured value.
.2 Analogue points as noted in the points list shall have adjustable high and low value alarm limits. Each time analogue values are scanned, their current values shall be compared to their respective assigned limits for existing alarm conditions.

.5 Night Setback
.1 Allow for night setback of the system. Night setback will be achieved by reducing the main hot water supply temperature on a time-programmed basis.

.6 Morning Warm-Up
.1 By use of Energy Management Programs, the system shall accomplish the following:
.1 Reset the building to normal operating temperature after night setback to allow the building to reach a suitable temperature by occupancy time.
.2 Start the Administration Area Supply System in the recirculatory mode at a time to allow the building to reach normal operating temperature by occupancy hours.
.3 Programming of Energy Management and Time Scheduling Operations, set up of log printouts to be performed by the Energy Monitoring Contractor.

1.17 Printer Operation

.1 General
.1 The printer provides a number of functions to record system data and operation. The functions include the following:
.1 Control Action Log - provides a record of each control action performed. The printout includes:
.1 point identification
.2 description of control action, e.g. ON or OFF
.3 date and time of control action

1.17 Printer Operation (Cont'd)

.2 Status Review

.1 The printout begins with the time and day and sequentially lists the current status of each point.

.3 Control Point Review

.1 Provide a record on the printer of all data programmed for each point. This includes all schedule data.

.4 Analog Review

.1 Provide the capability for reviewing on the printer all the information for analogue points, including current value and alarm high and low limits.

1.16 System Functions (Cont'd)

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PANEL LOCATION	POINT	TYPE	ALARM
Helicopter Hangar	Domestic Hot Water Recir. Pump P-18	Start/Stop Status Time Programme	Pump Failure
Helicopter Hangar	Hangar Toilet Exhaust Fan F-18	Status On/Off	Fan Failure
Helicopter Hangar	Helicopter Hangar Exhaust Fans F-20A, F-20B	Interlocked with Infra-red Heaters	Fan Failure
Helicopter Hangar	Hanger Battery Room Exhaust Fan F-16	Status On/Off	Fan Failure
Helicopter Hangar	Hangar Oil Storage Room Exhaust Fan F-17	Status On/Off	Fan Failure
Helicopter Hangar	Lift Station Sewage Pumps (Marine)	Status - Enable	Pump Failure
Helicopter Hangar	Flammable Storage Circulatory Fan F-20	Status	Fan Failure
Helicopter Hangar	Flammable Storage Building	Space Temperature	High Temperature Alarm

PANEL LOCATION	POINT	TYPE	ALARM
Boiler Room	Boilers ME-1, ME-2, ME-3	Status On/Off	Any alarm from boiler panels to 1 trouble alarm per boiler
Boiler Room	Constant Temperature Hot Water Pump P-1 Constant Temperature Hot Water Pump P-2 (standby)	Status On/Off	Pump Failure
Boiler Room	N.E. Zone Hot Water Heating Pump P-4 N.E. Zone Hot Water Heating Pump P-5 (standby)	Status On/Off	Pump Failure
Boiler Room	S.W. Zone Hot Water Heating Pump P-6 S.W. Zone Hot Water Heating Pump P-7 (standby)	Status On/Off	Pump Failure
Boiler Room	Constant Temperature Heating Supply	Supply Water Temperature Control Point Adjustment	Supply Water Temperature Low Limit
Boiler Room	N.E. Zone Heating Supply	Supply Water Temperature	Supply Water Temperature Low Limit
Boiler Room	S.W. Zone Heating Supply	Supply Water Temperature	Supply Water Temperature Low Limit
Boiler Room	Outside Air	Temperature	

PANEL LOCATION	POINT	TYPE	ALARM
Boiler Room	Domestic Hot Water Recirc. Pump P-3	Start/Stop/Status Time Programme	Pump Failure
Boiler Room	Air Compressor ME-4	Status - Enable	Enable Status Off
Boiler Room	Air Compressor Receiver	Receiver Pressure	Receiver Pressure Low Limit
Boiler Room	Shops Toilet/Janitors Room Exhaust Fan F-9	Start/Stop/Status Time Programme	Fan Failure
Boiler Room	Battery Charging Room Exhaust Fan F-7	Status On/Off	Fan Failure
Boiler Room	Diesel Generator	Status On/Off	Change of State Alarm
Boiler Room	Diesel Generator Alarm Panel		Any Alarm From Diesel Panel to 1 Trouble Alarm
Boiler Room	Diesel Generator Room	Space Temperature	High Temperature Alarm
Boiler Room	Diesel Oil Day Tank	Level Status	Low Level Alarm

PANEL LOCATION	POINT	TYPE	ALARM
Boiler Room	Vehicle Hoist Sump	Level	High Level Alarm
Boiler Room	Dock Compressors	Status - Enable	Enable Status Off
Boiler Room	Workboat Wharf Power Outlet(5)	Status - Power	Power Off
Boiler Room	Main Substation Transformer		Alarm

PANEL LOCATION	POINT	TYPE	ALARM
Fan Room Administration	Main Office Supply Fan F-1	Start/Stop Status Time Programme Energy Management	Motor Failure Freezestat Alarm
Fan Room Administration	Main Office Return Fan F-2 (started by F-1)	Status On/Off	Fan Failure
Fan Room Administration	Main Office Supply Air	Supply Air Temperature	Supply Air Temperature High/Low Limit
Fan Room Administration	Main Office Return Air	Return Air Temperature	
Fan Room Administration	Main Office Air Handling Unit	Mixed Air Temperature	
Fan Room Administration	Chilled Water Pump P-8	Status On/Off	Pump Failure
Fan Room Administration	Chilled Water Supply	Chilled Water Supply Temperature	Chilled Water Supply Temperature High/Low Limit
Fan Room Administration	Main Office Washroom Exhaust Fan F-3	Start/Stop Status Time Programme	Fan Failure
Fan Room Administration	Elevator Sump	Level	High Level Alarm

Project

Parry Sound, Ontario
Transport Canada
Canadian Coast Guard

Base Reconstruction

Project Number

095074/354604

Project Date

May 31, 1984

This document is the document referred to as "Plans and Specifications" and marked "A" in the Articles of Agreement entered into

on the .....day of .....19.....
Between Her Majesty the Queen

and .....

Signed .....
(Minister)

.....
(Contractor)

VOLUME ONE

VOLUME ONE (continued)

VOLUME ONE (continued)

VOLUME TWO

VOLUME TWO (continued)

VOLUME TWO (continued)

VOLUME THREE

VOLUME THREE (Continued)

VOLUME FOUR

VOLUME FOUR (CONTINUED)

**********END**********

1 Codes and Standards

.1 The General Conditions of the Contract, as bound herewith, shall form part of this Specification as though written out in full herein.

.2 Do complete installation in accordance with CSA C22.1-1982 and Ontario Supplement except where specified otherwise.

.3 Comply with CSA Electrical Bulletins in force at time of tender submission, while not identified and specified by number in this Division, are to be considered as forming part of related CSA Part II standard.

.4 Do overhead and underground systems in accordance with CSA C22.3 No. 1-M1979 except where specified otherwise.

.5 Abbreviations for electrical terms: to CSA Z85-1963.

.6 Where requirements of this Specification exceed those of above mentioned standards, this Specification shall govern.

.7 Comply with CSA C22.1 Rule 26-006 Ontario Supplement for fabricating and protecting electrical distribution and generating equipment in sprinklered areas in the buildings using shielded louvered and gasketted equipment and fabricated by the manufacturer in such a way as to prevent the sprinkler fluid from entering the equipment and/or interfering with its operation.

.8 Ensure that suppliers include for and provide "Sprinkler proof" enclosures acceptable to the local area HEPC inspector.

2 Definitions

.1 Wherever the words "indicated", "designated", "shown", "noted", "listed", or similar words or phrases are used in the Specification they shall be understood, unless the context otherwise provides, to mean that material or item referred to is "indicated", "designated", "shown", "listed", or "noted" on the Drawings.

2 Definitions (Cont'd)

.2 Wherever the words "approved", "satisfactory", "as directed", "submit", "permitted", "inspected" or similar words or phrases are used in the Specification, they shall be understood, unless the context otherwise provides, to mean that material or item referred to shall be "approved by", "satisfactory to", "as directed by", "submitted to", "permitted by", or "inspected by" the Engineer.

.3 The term "provide" where used shall be udnerstood to include labour, materials and services necessary to supply and install the item or work referred to complete with all appurtenances and accessories necessary to integrate with related work thereby providing complete and operating systems.

.4 Wherever the words "local inspector", "inspection department", "Electrical Inspection Department" or similar words are used in the Specification, they shall be understood to mean the Authority and persons having jurisdiction to enforce the requirements of electrical codes and standards for materials and workmanship including the applicable edition of the Canadian Electrical Code Part I CSA Standard C22.1 with the Ontario Hydro Supplement.

.5 Wherever the term "sprinklerproof" is used in the Specifications and Drawings it shall be understood to apply to electrical equipment which is shield louvred and gasketted and fabricated by the manufacturer in such a way as to prevent the sprinkler fluid from entering the equipment and/or interfering with its operation. Shields on the top of equipment shall be watertight and overhang the equipment by approximately 0.5 metres and shall be sloped to shed water. Conduit and cable penetrations through the top shall be made watertight.

3 Permits, Fees

.1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

3 Permits, Fees (Cont'd)

.2 Pay associated fees.

.3 Engineer will provide drawings at no cost.

4 Shop Drawings, Product Data and Samples

.1 Submit shop drawings, product data and samples in accordance with Section 01340.

.2 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or materials.

.3 Where applicable, include wiring, single line and schematic diagrams.

.4 Include wiring drawings or diagrams showing interconnection with work of other Sections.

.5 Shop drawings shall each be noted with the following information:
.1 Manufacturer's and Supplier's name.
.2 Catalogue model number.
.3 Name of trade supplying item.
.4 Number of Contract Specification Article(s) which specifies item.
.5 Name of project and Engineer's project number.

.6 Each shop drawing to be checked and stamped as being correct, by trade purchasing item, and by Contractor, before drawing is submitted. If above requirements are not complied with, shop drawings will be rejected and returned forthwith.

.7 Before manufacture or assembly of the equipment, submit only the shop drawings showing general routing of bus ducts, dimensioned outlines of equipment and elevations illustrating locations of visible equipment such as breakers and their trip settings, windows, meters, and description of operation as well as single line diagrams. Do not submit drawings showing construction details, component assemblies or interior wiring diagrams which may be necessary for the correct functioning of the equipment.

4 Shop Drawings Product Data and Samples (Cont'd)

.8 Fabrication shall not commence until the shop drawings have been reviewed by the Engineer and all requirements as noted are met by the manufacturer and/or supplier.

.9 For lighting fixtures, submit for approval, folders or binders showing the fixture cuts and catalogue numbers. Each folder or binder shall be complete with all fixtures used on the job. Arrange the fixture cuts and catalogue numbers and identify in the same sequence as the specified fixtures list.

5 Operation and Maintenance Data

.1 Provide operation and maintenance data for incorporation into maintenance manual specified in Section 01730.

.2 Include in operations and maintenance data:

.1 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.

.3 Wiring and schematic diagrams and performance curves.

.4 Names and addresses of local suppliers for items included in maintenance manuals.

.5 Approved shop drawings.

6 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

7 Care, Operation and Start-up

.1 Instruct Engineer and operating personnel in the operation, care and maintenance of equipment.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.

7 Care, Operation and Start-up	.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.
8 Voltage Ratings	.1	Operating voltages: to CSA C235-1969 (R1979).
	.2	Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
9 Inspection	.1	Furnish a Certificate of Acceptance from Inspection Department on completion of work.
10 Materials and Equipment	.1	Provide materials and equipment in accordance with Section 01600.
	.2	Equipment and material to be CSA certified, and manufactured to standards quoted.
	.3	Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Inspection Department.
	.4	Factory assemble control panels and component assemblies.
11 Electric Motors, Equipment and Controls	.1	Supplier and installer responsibility is indicated in Mechanical Equipment Schedules on mechanical drawings.
	.2	The quality and types of electrical materials and workmanship are to be in accordance with Division 16.
	.3	A starter, and/or disconnect switch as required, together with required pilot lights and remote switches will be provided by trade Section of Division 15 for each motor or electrical item requiring control provided by that trade.

11 Electric Motors, Equipment and Controls (Cont'd)

.4 Where individual starters and controls are grouped together, a panel for mounting this equipment will be provided under Division 15.

.5 Where a separate disconnect switch is provided wiring between disconnect and starter will be by trade providing the starter.

.6 Wiring from splitter to disconnect switch or combination starter shall be under Division 16.

.7 Conduit and wiring to line side of remotely located starters or to line terminals of Motor Control Centres shall be provided under Division 16. Wiring, conduit and fittings, from these points to motor or item being controlled will be provided under Division 15 supplying the motor or item being controlled.

.8 Wiring to electric reheat coils, and water or steam unit heaters and cabinet unit heaters shall be under Division 16 and will terminate in a junction box installed adjacent to the motor or device being controlled. Wiring and conduit from this box to the starter, thermostat or other device including connections thereto will be under Division 15.

12 Finishes

.1 Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment grey" finish to EEMAC 2Y-1-1958.

.2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958 except where otherwise noted.

.3 Electrical equipment in electrical and mechanical rooms to be finished in blue or international orange as indicated.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

13 Equipment Identification

.1 Identify electrical equipment with nameplates and labels as follows:

.2 Nameplates:
.1 Lamicoid 3 mm thick plastic engraving sheet, black face, white core, with bevelled edges, mechanically attached unless specified otherwise. Locate nameplates on flush mounted panels on front of panel behind hinged door.

NAMEPLATE SIZES

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

.3 Labels:
.1 Labels for feeder conduits, cables and bus ducts to indicate their content shall comprise pressure sensitive tape. Labels shall be printed on plastic coated tape, 50 mm x 150 mm size with black printing on yellow background indicating applicable voltage, i.e. 600 volts.
.2 Labels shall be as manufactured by: W.M. Brady Co. of Canada Limited - B350, Ideal Electric Canada Ltd.

.4 Wording on nameplates to be approved prior to manufacture.

.5 Identification to be English and French.

.6 Use one nameplate or label for each language.

.7 Nameplates for junction boxes to indicate system and voltage characteristics.

.8 Nameplates for electrical panels shall indicate panel designation, mains voltage and panel and circuit number from which this panel is fed.

13 Equipment Identification (Cont'd)

.9 Nameplates for transformers shall indicate transformer primary and secondary voltage and transformer name and designation.

.10 Nameplates for disconnects, double throw switches, automatic transfer switches and contactors shall indicate equipment being controlled and voltage, and source of power.

.11 Nameplates for terminal cabinets shall indicate system, and voltage, and load of area served.

.12 Lighting, Receptacle and Power panels shall each be identified with an engraved lamicoid plate secured to top interior trim as:

LP-1A 12 mm high lettering
120/208 volts 5 mm high lettering
Fed from PP 'AA' 5 mm high lettering

.13 Supply each panel with a directory card holder welded to inside of door, complete with a neatly typewritten list showing information as follows:

Panelboard Name - LP-1A
Panel Voltage - 120/208 volts

Circuit Number	Description	Load
1	Lighting Room 34	1200W
2	Receptacles Room 34	6-15A
3	Room #17	0.25 kW

.14 Cover list with a 0.8 mm minimum thick clear plastic sheet to protect it.

.15 Identify other cabinets for low voltage systems, such as signals and communications, as for panelboards with a directory showing circuit numbers and room locations plus a blank for "Remarks", as well as a lamicoid plate designating panel name.

EXAMPLE: If cabinet is for telephone - TP-1A

13 Equipment Identification (Cont'd)

.16 Identify equipment not listed above, such as incoming service cables, communicating cables, switchgear, transformers, disconnects, contactor motors, instruments, fire alarm, and control panels, in a similar manner showing name and number of the equipment, voltage and load information.

.17 Identify feeder pull boxes and junction boxes with nameplates showing feeder or system concerned, voltage involved and data for both termination points whether equipment or panel.

.18 Apply a small dab of paint to inside of each outlet box, pull box and panel as it is installed, using colour code as follows:

Red	-	Fire Alarm System
Green	-	Bell Telephone System
Blue	-	Public Address
Yellow	-	Alarm System
Brown	-	Watch Tour System
Pink	-	Surveillance System
Orange	-	Building Monitoring System

.19 No colour code is required for regular lighting and power circuits.

.20 Junction boxes in furred ceilings shall have colour identification on both inside and outside.

.21 Connections in equipment shall be Phase A, B, C, from left to right when viewing wiring from front or accessible direction.

.22 Carry colour coding through from incoming utility supply down to and including panels as follows:

.1 Identify incoming utility service lines by Red - Phase "A", Black - Phase "B", Blue - Phase "C", with enamel paint.

.23 Band switchgear buswork in each switchboard cubicle with tape identified in accordance with service lines colour-coding. In addition, where neutral bus is introduced, it shall be banded white. Ground bus shall be banded green.

.24 Band feeder and sub-feeder bus or conductors as above.

13 Equipment Identification (Cont'd)

.25 Band main bus on lighting and power panels with tape as follows, to conform to the Canadian Electrical Code.

Red	-	Phase A
Black	-	Phase B
Blue	-	Phase C
White	-	Neutral
Green	-	Ground
Orange	-	Control

.26 Identify control conductors for motors and equipment by pressure sensitive tape markers at each main terminal point and wherever they are introduced into ducts or equipment. Schedule and chart marker numbers with corresponding machine numbers and locations and include with Record Drawings.

.27 Label feeder conduits, cables and bus ducts.

.28 Locate labels as follows:
.1 At every end of every conduit, duct or cable run, adjacent to item of equipment serviced.
.2 On each exposed conduit, duct or cable passing through a wall, partition or floor (one on each side of such wall partition or floor).
.3 At intervals of 15 m along every exposed conduit, duct or cable run exceeding 15 m in length.
.4 At every access point on concealed conduit duct or cable.

.29 Labels shall be visible from 1.5 m above adjacent floor or platform.

14 Wiring Terminations

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

15 Manufacturers and CSA labels

.1 Manufacturers nameplates and CSA labels to be visible and legible after equipment is installed.

16 Warning Signs

.1 Provide warning signs, as specified or to meet requirements of Inspection Department and Engineer.

.2 Use porcelain enamel signs, minimum 175 x 250 mm size.

17 Single Line Electrical Diagrams

.1 Provide single line electrical diagrams in glazed frames as follows:
.1 Electrical distribution system: locate in both main electrical rooms.
.2 Electrical power generation and distribution systems: locate in power plant rooms.

.2 Provide fire alarm riser diagram, plan and zoning of building in glazed frame at fire alarm control panel and annunciator.

.3 Electrical diagrams lettering shall be "LEROYED". Diagrams shall illustrate every component including interlocking scheme, switchgear, distribution system and panels. Diagrams shall be designed to permit removal, alteration or substitution of any portion of a diagram to accommodate changes and additions to distribution and interlocking scheme. Operating instructions for distribution and interlocking schemes shall be outlined on one side of diagram. Submit diagrams as shop drawings for approval.

18 Location of Outlets

.1 Locate outlets in accordance with Section 01005.

.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 3 m and information is given before installation.

.4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

19 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 indicated verify before proceeding with installation.

19 Mounting Heights (Cont'd)

.3 Install electrical equipment at the following heights unless indicated otherwise.

.1 Local switches: 1400 mm

.2 Wall receptacles:

.1 General: 300 mm

.2 Above top of continuous baseboard heater: 200 mm.

.3 Above top of counters or splash back: 175 mm.

.4 In electrical and mechanical rooms: 1400 mm

.3 Panelboards: 1.5 m or as required by Code.

.4 Telephone and interphone outlets: 0.3 m.

.5 Wall mounted telephone and interphone outlets: 1.5 m.

.6 Fire alarm stations: 1.5 m.

.7 Fire alarm bells: 2.1 m

.8 Wall mounted speakers: 2.1 m.

.9 Door bell pushbuttons: 1.5 m.

20 Protection

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts "LIVE 120 VOLTS" or with appropriate voltage in English.

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

21 Load Balance

.1 Measure phase current to panelboards 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, and revise panelboard schedules.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Submit, at completion of work, a report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

22 Conduit and Cable Installation

.1 Install conduit, and sleeves, prior to pouring of concrete. Sleeves through concrete: Schedule 40 galvanized steel pipe sized for free passage of conduit, and protruding 100 mm, both ends.

.2 Install cables, conduits, and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

.3 Arrange for holes through exterior walls and roof to be flashed and made weather-proof under Division 7.

.4 Provide sleeves of galvanized steel pipe for conduit and cable runs passing through concrete walls, beams, slabs and floor. Sleeves for bus ducts, wireways and cable trays shall be minimum 3 mm galvanized steel.

.5 Provide concrete curbs, minimum 100 mm high above finished floor surrounding openings where bus ducts, wireways and cable trays rise through slabs above grade to prevent debris and water from falling to floor below. Concrete curb shall have sufficient area to adequately carry bus duct support brackets. Curbs to be monolithic with floor.

.6 Provide concrete curbs, minimum 100 mm high above finished floor for telephone cable risers and other openings intended for electrical use in slabs above grade. Curbs to be monolithic with floor.

.7 Seal slots provided for telephone, bus duct, and other risers with suitable piece of 3 mm sheet metal bolted to the curb at each floor to prevent travel of flames and smoke from floor to floor. Suitably cap unused sleeves by packing with rockwool or Firebarrier firestop-ping and seal with caulking compound at both ends. Where 3 mm sheet metal is not acceptable to authorities having jurisdiction, propose alternate accept-able means of sealing and obtain appro-val.

22 Conduit and Cable Installation (Cont'd)

.8 Supply and deliver inserts to site in ample time to be built into work of other trades. Provide necessary templates and adequate instructions and assistance to locate and install inserts.

.9 Inserts for conduit and raceway hangers, for single, double and multiple runs shall be galvanized, as manufactured by: Burndy (Canada) Ltd. - Flexibar.

.10 Secure inserts firmly to formwork before concrete is poured.

.11 Provide sleeve and insert drawings, as required.

23 Sprinkler Protection

.1 Since buildings are generally sprinklered throughout, equipment, except weatherproof equipment, must be provided with hoods or shields and gasketting to protect equipment from sprinklers, to comply with Code and to the satisfaction of HEPC Inspection.

24 Fire Protection of Electrical Conductors

.1 Provide fire rated enclosures to form service spaces for conduits containing electrical conductors for emergency equipment, and life safety systems as required by Ontario Building Code 3.2.6.10(1).

.2 Obtain Engineer's approval of proposed enclosures prior to installation. Provide layout drawings showing proposed locations, and detail drawings satisfactory to Engineer. Modify drawings as necessary to obtain approval. Show locations of access panels on these drawings.

.3 Obtain Engineer's approval of completed enclosures.

.4 Provide suitable fire rated access panels where necessary. Submit proposed access panel shop drawings and obtain Engineer's approval.

.5 Note that some rooms such as generator room will be of fire rated construction acceptable as service space.

25 Tests

.1 Conduct and pay for tests of the following:

.1 Power, generation and distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits.

.3 Lighting and its control.

.4 Electric heating and associated control equipment.

.5 Systems: fire alarm system and voice communication system.

.2 Furnish manufacturer's, certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturers instructions, and in accordance with Drawings and Specifications.

.3 Carry out tests in presence of Engineer.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Submit test results, and obtain approval.

.6 Make tests of equipment and wiring at times requested.

.7 Tests shall include voltage and current readings to determine balance of panels and feeders under full load, and operation of each piece of equipment for correct operation.

.8 Test electrical work to standards and function of Specification and applicable codes in an approved manner. Replace defective equipment and wiring with new material and leave entire system in complete first class operating condition.

.9 Arrange and pay for services of applicable manufacturer's factory service engineer to supervise initial start-up of specialized portions of installation and to check, adjust, balance and calibrate components including related wiring and controls. Instruct Owner's operating personnel in the operation of the installations. Provide these

25 Test (Cont'd)

services for such periods, and for as many visits as may be necessary to put applicable portion of installation in complete working order, and to ensure that Owners' operating personnel are fully conversant with every aspect of the operation, care and maintenance thereof. Provide a record of such instruction showing date and names of those in attendance in each case.

26 Insulation Resistance Testing

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

27 Co-ordination Protective Devices

.1 Ensure circuit protective devices such as overcurrent trips, relays, fuses, are installed to values and settings as indicated. Refer to Section 16226, Protection System Co-ordination.

28 Cleaning

.1 Do final cleaning in accordance with Section 01710.

.2 At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt. Also clean switch and receptacle cover plates.

29 Excavation and Backfill

.1 Excavation and backfilling for electrical work is specified in Section 02220.

.2 Ensure that excavation for underground electrical services is in location and at depth indicated. Provide protective materials around and over services and be present at all times during excavation and backfilling to supervise work.

Pg. 2.0 Addendum No. 1 * .2

30 Cutting and Remedial Work

.1 Cutting and remedial work is specified in Section 01015.

.2 Set sleeves and mark openings in concrete forms and in masonry before placing of concrete and erection of masonry. Assume full responsibility for laying out electrical work and for any

30 Cutting and Remedial Work (Cont'd)

damage caused by incorrectly located equipment and electrical services.

31 Appliances .1 Provide any extension cords, lamps and miscellaneous materials, temporarily required for carrying out Work.

32 Protection of Work and Property .1 Each trade shall protect is own and other trade's finished and unfinished work from damage, due to the carrying out of its work. Cover floors and other work with tarpaulins, if required, for this purpose. Each trade shall assume responsibility for repairing damage to floor and wall surfaces resulting from its failure to provide such protection. Carry out such repairs in a satisfactory manner without expense to Owner.

33 Temporary Fire Protection .1 Provide and maintain temporary fire protection and fire extinguishers wherever welding, soldering or other open flame equipment is used. Provisions for temporary fire protection shall be co-ordinated with Owner.

34 Co-ordination .1 Work of each trade shall be laid out so that it does not conflict with Work under other Divisions of Spectification. Make good damage to Owner's property or other trade's work, caused by improper locating or carrying out of Work.

.2 Install services and equipment which are to be concealed, as close as possible to building structure so that necessary furring can be kept to minimum dimensions.

.3 Prepare field drawings, based on manufacturers' shop drawings, to show location of equipment and relative position of various services and routing of conduits and cables. Arrange layouts with due regard to maintenance and appearance. Obtain approval of these field drawings before proceeding with work involved thereon. Draw field drawings to a scale of 1:50.

34 Co-ordination (Cont'd)

.4 Prepare field drawings of existing exterior underground electrical services and communications lines. Locate services and other underground services. Indicate depth and dimension position relative to suitable permanent landmarks acceptable to Engineer. Draw field drawings to a scale of 1:250.

.5 Prepare field drawings of new underground electrical services including communications cables, light standards, service entrances to buildings and existing services to remain. Indicate location of services relative to permanent landmarks acceptable to Engineer and indicate depths below finished grades. Draw field drawings to a scale of 1:250.

.6 In addition to the normal complement of tradesmen for Division 16 work the Contractor under Division 16 shall have on the job at all times during working hours a competent project co-ordinator who shall be empowered to act for the Contractor in the faithful prosecution of this Contract and to receive instructions regarding the work from the Engineer. The superintendent shall be continuously employed on the work and may not be transferred without previous approval of the Engineer.

35 Work in Existing Buildings

.1 Work includes changes to the existing buildings and changes to junction of old and new construction to suit addition to existing building as shown or as specified herein.

.2 Carefully route new ducts, conduits and other new servcies so that they do not interfere with existing installation. Arrange and pay for any necessary relocation of existing pipe, duct, conduit, bus duct or any other services required for the proper installation of new Work, regardless of whether line or duct to be moved is the work of trade doing new Work.

35 Work in Existing Buildings (Cont'd)

.3 Remove existing panels, lighting fixtures, wiring, and equipment as necessary to suit new construction and alterations. Cut back conduits and electrical outlets not being used, in an approved manner, so that finished Work presents a neat and clean appearance.

.4 Divert existing electrical, fire alarm and communication services as required to suit the schedule of work.

.5 Building electrical equipment such as panels, transformers, light fixtures to be removed shall be handed over to the Owner.

.6 Remaining removed equipment and material such as scrap conduit and wire shall become the property of the Contractor and shall be removed from site.

.7 Where Owner wishes to take over certain areas ahead of project completion date and these areas are intended to be fed from the new distribution systems, make temporary connections to such areas using services existing in these areas. Re-connect these areas to the permanent services, as shown, at a later date when new distribution systems are available in the areas concerned.

36 Continuity of Existing Services

.1 Keep existing buildings in operation at all times with minimum length of shutdown periods.

.2 Obtain permission of Owner before shutting down or disconnecting mechanical, electrical and fire protection services. Co-operate with Owner and other contractors on the job and provide necessary piping and wiring so that existing buildings can be kept in operation at all times. Include in Tender Price for overtime work that may be required to tie-in of wiring at night or on weekends.

37 Provision for Future

.1 Provide capped services wherever noted and detailed to allow for future extension.

37 Provision for Future (Cont'd)

.2 In every place where a space is indicated as being reserved for future equipment, or for a future extension to building, leave such space clear and install piping, raceways and equipment in such a manner that necessary connections can be made to the future apparatus or building. Make such provision for future in close consultantion with Owner's representative. Properly identify terminations for such services on Record Set of Drawings.

38 Moving and Setting in Place of Owner's Equipment

.1 Items on Drawings marked S.B.O. (Supplied By Owner) will be purchased by Owner. General Contractor will receive, check, store and give receipt for and be responsible for such items. General Contractor will also unpack, uncrate and assemble such items, locate them at building were required and build them in as necessary. Provide service connections and wiring, as necessary.

39 Temporary and Trial Usage

.1 Temporary and trial usage by Owner of any mechanical or electrical device, machinery, apparatus, equipment or any other work or materials supplied before final completion and written acceptance shall not be construed as evidence of acceptance of same by Owners.

.2 Owners shall have the privilege of such temporary and trial usage, as soon as Contractor shall claim that said work is completed and in accordance with Drawings and Specifications, for such reasonable length of time as is deemed to be sufficient for making a complete and thorough test of same. Claims for damage shall not be made by Contractor for the injury to or breaking of any parts of such work which may be used, whether caused by weakness or inaccuracy of structural parts or by defective materials or workmanship of any kind whatsoever.

40 Drawings

.1 Drawings showing the Work do not show every structural detail and are diagrammatic only. Take any information involving accurate measurements of building from Architectural Drawings or at building.

40 Drawings (Cont'd)

.2 Equipment dimensions are based on the first or top named manufacturer. Dimensions of items by other listed manufacturers shall not exceed available space with necessary allowance for service and maintenance.

.3 Make necessary change to runs of piping, ductwork and raceways to accommodate structural conditions, where location of new pipes, ductwork, raceways and equipment must be altered to suit job conditions. Obtain approval from Engineer and note changes on Record Drawings.

.4 The general location and route to be followed by pipes, ductwork, and raceways is indicated on Drawings. Install these items to conserve headroom and interfere as little as possible with the free use of space through which they pass.

.5 Items on Drawings marked E.R. or Ex. Rel (Existing Relocated) or otherwise so identified will be moved from their present location and relocated under another Division of Specification unless otherwise noted. Disconnect and reconnect mechanical and electrical services if such is required to carry out these relocations.

41 Record Drawings

.1 An extra set of white prints of Drawings for Work will be supplied. Mark on these Drawings in coloured ink every change and deviation from runs of piping, ductwork, conduit and other services as originally shown so that, on completion of job, they will constitute a record of exact locations of those services as installed. Keep these Drawings in the site office and keep them up-to-date. Final certificate of job acceptance will not be issued until these Drawings are completed and submitted.

.2 Record drawings submitted, if not satisfactory, shall be corrected and re-submitted, with a fresh set of white prints taken from corrected transparencies, as often as necessary, until they are satisfactory and approved.

42 Examination .1 Carefully examine any existing buildings, local conditions affecting the Work and building site, together with the Mechanical and Electrical Drawings to make sure that Work under Specification and as shown on Drawings can be satisfactorily carried out without changes. Work of all trade Divisions shall be examined, before commencing Work, and any defect or interference affecting Work shall be reported at once.

.2 No allowance will be made for any expense incurred through failure to make these examinations or on account of any condition of site or any growth or item existing thereon which was visible or known to exist at time Tender for Work was submitted.

43 Final Inspection .1 Request in writing for a final inspection of electrical systems.

.2 Do not submit this written request until:

- deficiencies noted during job inspections have been completed.
- systems have been balanced and tested and are ready for operation.
- the cleaning up is finished in every respect.

44 Correction After Completion .1 Submit a written guarantee to Owner covering the remedy of defects in the Work at completion of Work but before issue of final certificate. This guarantee shall be for one year from date of final acceptance and in no way supplant any other guarantee of longer period called for on certain equipment or materials.

Pg. 07 Addendum #1. "DELETE"

.2 Submit a similar written guarantee for one year from date of acceptance for any part of Work accepted by Owner, before completion of whole Work.

Pg. 07 Addendum #1: "DELETE"

45 Concrete Formwork .1 Refer to Section 03300 for quality standards.

Concrete Formwork (Cont'd)

.2 Provide and install reinforced concrete equipment pads and trench bases of size, thickness and in locations shown on electrical drawings. Use 25 MPa concrete and reinforce with 10 M @ 300 mm c/c each way 40 mm below the top surface of pads.

* 1.6 Staging of Construction.
Pg 20, 21, 22
Addendum #1.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Excavation and backfilling:	Section 02220
	.2	Concrete form work:	Section 16010
	.3	Concrete reinforcement:	Section 16010
	.4	Cast-in-place concrete:	Section 16010
	.5	Brick and mortar:	Section 16010

PART 2 - PRODUCTS

2.1 Materials

.1 PVC underground telecommunication cable ducting: to CSA B196.3-1975.

.2 Plastic underground power cable ducting: to CSA B196.1-1972.

2.2 PVC Ducts

.1 Rigid PVC ducts, type EB1, encased in reinforced concrete, size as indicated. Bends and offsets shall be minimum 1525 mm radius.

2.3 PVC Duct Fittings

.1 Rigid PVC opaque solvent welded type couplings, bell end fittings, plugs, caps, adaptors as required to make complete installation.

.2 Expansion joints as indicated.

.3 Rigid PVC 5° angle couplings as necessary.

2.4 Concrete Manholes

.1 Concrete manholes and auxiliary sections fabricated in steel forms and as indicated.

.2 Aggregates: to CAN3-A23.1-M77.

.1 Aggregates graded and free of any deleterious substances so as to produce homogeneous concrete mix when blended with cement.

2.4 Concrete Manholes (Cont'd)

.2 (Cont'd)

.2 Use central batching facility to assure accurate weighing and mixing of materials to obtain suitable concrete mix.

.3 Cement: to CAN3-A5-M77.

.1 Use cement to produce minimum strength of 30 MPa on delivery. (4000 psi)

.4 Steel welded wire fabric mesh reinforcing: to CSA G30.3-1972(R1979). Openings and critical areas trimmed with steel reinforcing bars: to CSA G30.12-M1977.

.1 Place and secure reinforcing to withstand placement of concrete and maintain proper alignment within concrete.

.5 Pulling inserts and bolts for racks integrally cast in concrete: to ACI-347-68.

.6 Neoprene gasket seals between manhole sections: to ASTM D1056-78.

.7 Steel ladder.

.8 Cast-in-place manholes to above requirements are acceptable.

2.5 Drainage

.1 Floor drain fittings in each manhole consisting of floor drain, back water valve, trap and pipe connection to building drainage system.

.2 Sump pit 300 x 300 x 125 mm and as indicated.

2.6 Manhole Necks

.1 Concrete manhole neck to bring cover flush with finished grade in paved areas and 38 mm above grade in unpaved areas.

.2 Build up neck with concrete brick and mortar to achieve above if necessary.

2.7 Manhole Frames and Covers

.1 Cast iron manhole frames and covers as manufactured by: Canada Iron No. DS-579.

2.8 Grounding

.1 Ground rods to Section 16185 for cable rack grounding.

2.9 Cable Racks

.1 Hot dipped galvanized cable racks and supports.

.2 12 x 100 mm preset inserts for rack mounting.

2.10 Cable Pulling Equipment

.1 Pulling iron made of galvanized steel rods, as indicated, and as required.

.2 6 mm stranded nylon pull rope tensile strength 5 kN continuous throughout each duct run with 3 m spare rope tied at each end, through each duct.

2.11 Markers

.1 Concrete type duct markers as indicated, with arrows to indicate direction of duct runs.

PART 3 - EXECUTION

3.1 Installation General

.1 Install reinforced concrete encased duct banks and manholes including formwork.

.2 Build duct bank and manholes on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.

.3 Open trench completely between manholes to be connected before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.

.4 Prior to laying underground ducts, construct reinforced base slab as indicated.

.5 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400. Slope ducts away from building or toward a sump.

.6 Install base spacers at maximum intervals of 1.5 m levelled to grades for bottom layer of ducts.

.7 Lay PVC ducts with configuration and reinforcing as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 75 mm horizontally and vertically. Stagger joints in

3.1 Installation General (Cont'd)

.7 (Cont'd) adjacent layers at least 150 mm and make joints watertight. Encase ductbank with 75 mm thick concrete cover. Use galvanized rigid steel conduit for sections extending above finished grade level.

.8 Make transpositions, offsets and changes in direction using 5° bend sections, do not exceed a total of 20° with duct offset.

.9 Use bell ends at duct terminations in manholes or buildings.

.10 Use conduit to duct adapters when connecting to conduits.

.11 Terminate duct runs with a duct coupling set flush with the end of the concrete envelope when dead ending duct bank for future extension.

.12 Cut, rim and taper end of ducts in field to manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.

.13 Allow concrete to attain 50% of its specified strength before backfilling.

.14 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during pouring of concrete. Tie ducts to spacers with twine or other non-metallic material. Remove weights or wood braces before concrete has set and fill voids.

.15 Clean ducts before laying. Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.

.16 Immediately after pouring of concrete, pull through each duct a flexible mandrel not less than 300 mm long and of a diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Avoid disturbing or damaging ducts where concrete has not

3.1 Installation General (Cont'd)

.16 (Cont'd) set completely. Pull stiff bristle brush through each duct immediately before pulling-in cables.

.17 Install four 3 m lengths of 10 M reinforcing rods, one in each corner of duct bank when connecting duct to manholes or buildings. Wire the rods to 15M dowels at manhole or building and support from duct spacers. Protect existing cables and equipment when breaking into existing manholes. Place concrete down sides of duct bank filling space under and around ducts. Rod concrete with flat bar between vertical rows filling voids. Treat water leaks through duct bank and repair bank in a satisfactory manner.

.18 Arrange for duct banks to be inspected and obtain approval prior to pouring concrete.

.19 Where duct bank runs through building, provide, place, arrange for inspection and protect ducts. Supervise carefully while reinforcing and concrete are put in place to be sure ducts are not damaged. In case of duct damage, reinforcing or concrete work shall be stopped while ducts are made good. Formwork, reinforcing and concrete will be by other divisions where duct bank runs through building.

3.2 Manholes

.1 Build cast-in-place manholes as indicated.

.2 Place concrete in two pours with slab and sump in first, walls, roof and neck in second pour. Provide key in walls to slab. Place 100 x 6 mm pvc water bar vertically in key. Install ground rod before pouring slab and place reinforcing steel, inserts for cable rack, pulling irons, drain, duct outlets, duct run dowels before casting walls. Make manhole to duct connection as indicated.

.3 Provide 115 mm deep window to facilitate cable bends in wall at each duct connection. Terminate ducts in bell-end fit-

3.2 Manholes (Cont'd)

.3 (Cont'd) ting flush with window face. Provide four 10M steel dowels at each duct run connection to anchor duct run.

.4 Alternately connect large duct runs by leaving a square opening in wall, later pouring duct run and wall opening in one pour, and install the 10M x 3 m reinforcing rods in duct run at manhole and connection.

.5 Install manhole frames and covers for each manhole. Set frames in concrete grout onto the manhole neck.

.6 Drain floor towards sump with 1 to 48 slope minimum and install drainage fittings as indicated.

.7 Install cable racks, anchor bolts and pulling irons as indicated.

.8 Grout frames of manholes. Cement grout to consist of two parts sand and one part cement and sufficient water to form a plastic slurry.

.9 Ensure filling of voids in joint being sealed. Plaster with cement grout, walls, ceiling and neck.

3.3 Markers

.1 Mark location of duct runs. Place concrete duct markers at ends of duct runs. Construct markers and install flush with grade.

3.4 Inspections

.1 Advise Engineer so that he may inspect ducts prior to pouring and be present during pour of concrete and clean-out.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Excavation and backfilling: Section 02220.

PART 2 - PRODUCTS

2.1 Materials

.1 Interlocking cable blocks, vitrified clay planks.

.2 Concrete type cable markers as indicated, with word: "cable", impressed in top surface, with arrows to indicate direction of cable runs.

PART 3 - EXECUTION

3.1 Direct Burial of Cables

.1 After sand bed specified in Section 02220 is in place, lay cables maintaining 75 mm clearance from each side of trench to nearest cable. Pulling cable into trench, or dragging along trench, not permitted.

.2 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 m run, maintaining minimum cable separation and bending radius requirements. Offset cables 300 mm when passing through exterior building walls.

.3 Underground cable splices not acceptable.

.4 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables.

.5 Maintain 75 mm minimum separation between cables of different circuits. Maintain 305 mm horizontal separation between low and high voltage cables. When low voltage cables cross high voltage cables maintain 305 mm vertical separation with low voltage cables in upper position. At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 150 mm

3.1 Direct Burial of Cables (Cont'd)

between high voltage cables. Maintain 305 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables, with fire alarm and control cables in upper position. Install treated planks on lower cables 0.6 m in each direction at crossings.

.6 After sand protective cover, specified in Section 02220 is in place, install continuous row of overlapping 38 mm x 140 mm interlocking cable blocks as indicated to cover length of run.

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3.2 Cable Installation in Ducts

.1 Install cables, as indicated, in ducts.

.2 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 Before pulling cable into ducts and until cables properly terminated, seal ends of non-leaded cables with moisture seal tape.

.6 After installation of cables, seal duct ends with duct sealing compound.

3.3 Markers

.1 Mark cable every 150 m along duct runs and changes in direction.

.2 Lay concrete markers flat and centered over cable with top flush with finish grade.

3.4 Testing

.1 Perform tests in accordance with Section 16010.

.2 Perform tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:

.1 Circuits are continuous and free from short circuits and grounds;

.2 Each completed power cable withstands test voltage as recommended by cable manufacturer;

3.4 Testing
(Cont'd)

.3 Circuits are free from unspecified grounds; that resistance to ground of circuits is no less than 50 megohms.

.3 Provide Engineer with list of test results showing location at which each test was made, circuit tested and result of each test.

.4 Give witness minimum 7 days notice.

**********END**********

PART 1 - GENERAL

1.1 Related Work .1 Excavation and backfilling: Section 02220

PART 2 - PRODUCTS

2.1 Materials .1 Plastic underground power cable ducting to CSA B196.1-1972.

.2 PVC underground telecommunication cable ducting to CSA B196.3-1975.

.3 Fibreglass reinforced epoxy cable ducting to CSA B196.1-1972.

2.2 PVC Ducts .1 Rigid PVC ducts for direct burial with expanded flange ends, size as indicated with minimum wall thickness at any point of 2.8 mm. Nominal length 6 m ± 12 mm.

.2 Rigid PVC split ducts as indicated.

.3 Rigid PVC couplings, reducers, bell end fittings, plugs, caps, adaptors as required to make complete installation.

.4 Rigid PVC 90° and 45° bends as required.

.5 Rigid PVC 5° angle couplings as required.

.6 Expansion joints as required, and at building interfaces.

2.3 Solvent Weld Compound .1 Solvent weld compound for PVC duct joints.

2.4 Fibreglass Ducts .1 Fibreglass reinforced epoxy underground cable duct, watertight, self-extinguishing, underwater type, size as indicated.

.2 Couplings, reducers, plugs, caps, adaptors, and supports as required to make a complete installation.

.3 Expansion joints as required, and at building interfaces.

2.5 Plastic Polyethylene Pipe .1 Rigid plastic polyethylene pipe with approved couplings and fittings required to make a complete installation as indicated.

2.6 Cable Pulling Equipment .1 6 mm stranded nylon pull rope tensile strength 5 kN.

2.7 Markers

.1 Concrete type cable markers as indicated, with words: "cable", or "conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

PART 3 - EXECUTION

3.1 Installation

.1 Install plastic polyethylene duct as indicated and to manufacturer's instructions.

.2 Clean inside of ducts before laying.

.3 Ensure full, even support every 1.5 m throughout duct length.

.4 Slope ducts as indicated with 1 to 400 minimum slope.

.5 During construction, cap ends of ducts to prevent entrance of foreign materials.

.6 Pull through each duct a steel mandrel not less than 300 mm long and of a diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Pull stiff bristle brush through each duct immediately before pulling-in cables.

.7 In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Materials

.1 Poles:
- .1 Douglas fir: to CSA 015.4-1975.
- .2 Eastern white cedar: to CSA 015.1-1950(R1971).
- .3 Western red cedar: to CSA 015.2-1969.
- .4 Jack, lodgepole, red pine: to CSA 015.3-1960(R1973).

.2 Wood crossarms: to CSA 0116-1969.

.3 Wood insulator pins: to CSA 0124-1957-(R1972).

.4 Wood preservation: to CSA 080-1974, CSA080.S1-1975.

.5 Power line hardware: to CSA C83-1970, CSA C83S1-1973, CSA C83S2-1974.

.6 Guy wire: to CSA G12-1970.

.7 Insulators:
- .1 Strain type: to EEMAC 1B-1-1957.
- .2 Spool type: to EEMAC 2B-1-1957.
- .3 Pin type, low and medium voltage: to ANSI C29.5-1969(R1974), ANSI C28.50-1975.

.8 Lightning arresters to Section 16147.

.9 Wire connectors to Section 16182.

.10 Ground rods and ground conductors to Section 16185.

2.2 Poles

.1 Wood poles, western red cedar, Class I, pressure or vacuum treated with preservative.
- .1 13 m long poles for secondary circuits only.

2.3 Crossarms

.1 Wood crossarms, pressure or vacuum treated with preservative.

2.3 Crossarms (Cont'd)

.2 For dead end and corner poles double arms as indicated.
.1 For each crossarm:
1. Insulator pins as indicated.
2. Two 32 x 6 mm galvanized steel braces.
3. One 9 x 38 mm galvanized steel lag screw.
4. Two 9 x 114 mm galvanized steel bolts.
5. Through bolts and double arm bolts as required.

2.4 Insulators

.1 Secondary insulators:
.1 Spool type, 4 mounted on secondary racks, for secondary runs as indicated.

.2 Guy strain insulators:
.1 Strain type, nominal rating 4.4 kV, one per guy wire.

2.5 Guys and Anchors

.1 Guy wire: 9 mm nominal diameter, stranded, galvanized steel for dead ends and guys.

.2 Guy clamps, three-bolt heavy duty.

.3 19 mm thimble eye bolt, length to suit, four hole guy straps and 16 mm machine bolt with square washer to attach guy wire to pole.

.4 Anchor rod 19 mm diameter x 2.1 m long, galvanized steel with thimble eye.

.5 Anchor, heavy duty expanding type, four way, expanded area.

.6 Guy guard, half-round, galvanized steel 2.1 m long.

2.6 Equipment Identification

.1 Rustproof number nails to mark each pole with 50 mm high designated number as indicated.

PART 3 - EXECUTION

3.1 Preparation of Poles

.1 Where poles require shortening, cut piece from top only.

.2 Roof top of poles with two cuts forming planes at 45° to meet in horizontal ridge.

3.1 Preparation of Poles (Cont'd)

.3 Cut parallel plane crossarm gains in face of pole for single and double arming, spacing as indicated.

.4 Bore hole in center of each gain for crossarm bolt as indicated.

.5 Treat roof top, gains, bored holes with preservative before assembly.

.6 Drill crossarms for pins, through bolts, double arm bolts and brace bolts as indicated.

.7 Fasten wood insulator pins to crossarms with galvanized steel nails.

.8 Install crossarms and braces.

.9 Install secondary racks as indicated.

3.2 Installation

.1 Locate and dig pole holes as indicated. Make holes large enough to allow space for tamping backfill.

.2 Set poles to depth as indicated.

.3 Align poles with crossarms at right angles to pole line on straight runs.

.4 At change in direction of line, set crossarms to bisect angle formed by change.

.5 Set poles to maintain even grade. Allow for contour of terrain and do not exceed grading of 1.5 m per pole.

.6 Replace backfill in 150 mm layers. Tamp each layer, and apply final layer to drain water away from pole.

.7 Locate and install guy wires and anchors at dead-ends, corner poles, and start of branch feeders, as indicated.

.8 Insert anchor at least 1.8 m into ground. Backfill and tamp in 150 mm layers.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Cast-in-Place Concrete: Section 16010

.2 Concrete Reinforcement: Section 16010

.3 Grounding: Section 16185

1.2 Supply System Data

.1 Supply system data: 46 kV, 60 Hz, wye connected, 3 phase, 3 wire, grounded, 1500 mVA present, symmetrical fault capacity, 250 kV BIL.

.2 Obtain characteristic of supply authority's protection, and co-ordinate with substation protection.

1.3 Requirements of Supply Authority

.1 Submit shop drawings to supply authority and obtain certification that equipment meets their requirements, before submission of drawings to Engineer.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Obtain certification from inspecting authority, for all integrated items shown on plot plan to ensure compatibility.

.3 Indicate:

.1 Floor anchoring method and dimensioned foundation drawings.

.2 Foundation loadings under loaded conditions.

.3 Dimensioned position and size of bus bars and connections showing electrical clearances.

.4 Identified dimensioned layout of components.

.5 Protection co-ordination time current characteristics.

.6 Submit structure design criteria for Engineer's approval.

1.5 Operation and Maintenance Data

.1 Provide data for incorporation into maintenance manual specified in Section 01730 and 16010.

.2 Submit six (6) copies of maintenance data for complete substation including components in combined manual.

1.6 Maintenance Materials	.1	Provide maintenance materials in accordance with Section 01730.
	.2	One insulator of each type installed.
	.3	Three power fuse refills, non-expulsion type, of each type installed.
1.7 Delivery and Storage	.1	Ship foundation anchoring devices in advance of substation structure.

PART 2 - PRODUCTS

2.1 Materials	.1	Aluminum structural members: to CSA HASeries 1975.
	.2	Aluminum for bus bars and connections: to CSA HA.5-1975.
	.3	High tensile, hot dipped galvanized, bolts, nuts, washers: to CSA S16-1969.
	.4	Support insulators, station post type, coloured grey: to ANSI C29.9-1971.
2.2 Transformers	.1	Refer to Section 16160.
2.3 Lightning Arresters	.1	Refer to Section 16147.
2.4 Substation Fence	.1	Refer to Section 16152
2.5 Strain Insulators	.1	Refer to Section 16108
2.6 Substation Structure	.1	Substation structure, corrosion resistant, bolted construction to form lattice type columns and girders, for easy field assembly. Individual columns and girders supplied partially assembled. Metric modular concept, minimum number of different parts, interchangability, no need for field drilling or cutting.
	.2	Fabricate structure from aluminum alloy.
	.3	Structure to withstand line tension of 4.452 kN per conductor, total number of conductors 3, wind and ice loadings, effect of broken conductors, earthquake factors, safety factor of 2 of nominal yield point.

2.6 Substation Structure (Cont'd)

.4 Structure to withstand effects of electrical faults.

.5 Girder and column bracing made from formed angles notched to facilitate field assembly. Number of different braces kept to absolute minimum and fabricated in such a way that similarly identified components are completely interchangeable.

.6 Structure complete with deformed bar anchor bolts and individual welded base plate assemblies to eliminate anchor bolt alignment problems.

.7 Galvanized steel base plates, anchoring devices, strain U-bolts, strain insulator tower eyes.

.8 Structure, equipment and lightning arrester grounding conductors complete with clamps and additional 1.2 m conductor length beyond ground level for connection to station grounding system.

2.7 Bus and Connections

.1 Three phase high conductivity aluminum bus bars and connections suitably supported on insulators, including connectors.

.2 Flexible phase and ground connections to components.

.3 Identify phases of bus bar and connections by marking and/or by coloured paint.

.4 Support clamps for bus bars and connections.

2.8 Warning Signs

.1 Provide warning signs in accordance with Section 16010.

.2 Warning signs to caution against fuse changing, as indicated.

.3 Danger signs, warning against high voltage as indicated.

PART 3 - EXECUTION

3.1 Installation

.1 Contractor under this Section to provide a complete operational sub-station.

.2 Contractor under this Section to provide proof of previous experience in this type of work to satisfaction of Engineer.

.3 Provide complete sub-station including all concrete, re-inforcing, fencing, gravel base, structure, transformer, interconnection with duct bank, co-ordination with supply authority, permits and pay for inspection fees.

.4 Provide structural drawings of the sub-station structure and re-inforced concrete base certified by a Professional Engineer of the Province of Ontario prior to construction which shall be submitted as shop drawings.

.5 Set and secure substation structure in place rigid, plumb and square and as indicated.

.6 Make field connections.

.7 Connect equipment, lightning arrestors, structure to station ground system.

.8 Co-ordinate connection to supply, with power supply authority. Ensure phases identified.

.9 Provide concrete bases to suit manufacturer's recommendations.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Arrange for pre-service inspection, oil sample, insulation test, by Supply Authority.

.3 Perform tests with supply disconnected.

.4 Operate interrupter closing and tripping mechanism, verify correct functioning.

3.2 Tests (Cont'd)

.5 Simulate instrument transformer, transducer signal sources of protective relays, check relays for correct operation, calibration, settings.

.6 Check insulation of substation assembly with 1000 V megger with feeder cables and connections, disconnected.

.7 Conduct high potential tests on substation assembly to Engineer's written instructions.

.8 Verify phase rotation of each feeder.

.9 Check continuity of each feeder.

**********END**********

PART 3 - EXECUTION

3.1 Installation

.1 Contractor under this Section to provide a complete operational sub-station.

.2 Contractor under this Section to provide proof of previous experience in this type of work to satisfaction of Engineer.

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.4 Operate interrupter closing and tripping mechanism, verify correct functioning.

3.2 Tests (Cont'd)

.5 Simulate instrument transformer, transducer signal sources of protective relays, check relays for correct operation, calibration, settings.

.6 Check insulation of substation assembly with 1000 V megger with feeder cables and connections, disconnected.

.7 Conduct high potential tests on substation assembly to Engineer's written instructions.

.8 Verify phase rotation of each feeder.

.9 Check continuity of each feeder.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01340.

.2 Indicate:
- .1 Load break mechanism
- .2 Switching type
- .3 Mounting design
- .4 Gang operating mechanism
- .5 Load rating

1.2 Maintenance Materials

1. Provide maintenance materials in accordance with Section 01730.

.2 Spares:
- .1 Three (3) fuses

PART 2 - PRODUCTS

2.1 Materials

.1 Outdoor load break switches: to NEMA SG6-1974.

.2 Insulators: to EEMAC G1-1-1958.

2.2 Full Load Air Break Switches

.1 Full load air break type as follows:
- .1 Horizontal mounted, side break, rotating insulator, gang operated, single throw, 3 pole.
- .2 Rating 600 A, 46 kV.
- .3 Insulators: three per pole, standard station post type.
- .4 Contacts:
  - .1 Fixed contacts brazed silver nickel-alloy overlay.
  - .2 Switch blade contacts heavily silver clad.
- .5 Interrupter unit to permit opening and closing under rated full load currents consists of:
  - .1 Housing containing quick make, quick break mechanism actuated by levers for operating contacts.
  - .2 Housing bolted to fixed contact assembly of switch.
  - .3 Shunt contact bolted to switch blade actuates interrupter unit when blade is moved to open or closed position.

2.2 Full Load Air Break Switches (Cont'd)

.2 Switch operation:
.1 When blade starts to move from fully closed position shunt contact engages interrupter housing and bypasses load current through interrupter unit before blade contacts and fixed contacts have separated.
.2 After switch blade is clear of fixed contacts, blade actuates opening lever on outside of interrupter housing producing quick break of silver tungsten contact tips, establishing arc.
.3 Trailer and liner of interrupting unit yield deionizing gases which quickly extinguish arc, so there is no external arc or flame.

.3 Switch base: 5 mm formed channel galvanized steel drilled for universal mounting on pipe as indicated.

.4 Rotating insulator carried by dual tapered chrome plated roller bearings, totally sealed.

.5 Interphase mechanism assembly.
.1 Operated from center pole.
.2 Poles interconnected by articulated pipe assembly to allow for minor misalignment.

.6 Manual operating mechanism with:
.1 Two offset bearings.
.2 Pipe shaft.
.3 Pipe guides.
.4 Pipe couplings.
.5 Position indicator.
.6 Foot bearing.
.7 Operating handle with padlock.

2.3 Primary Fuses

.1 Disconnect vertical type.

.2 Voltage rating: 46 kV.

.3 Continuous current rating of power fuse mounting and holder 300 A.

.4 Three phase symmetrical short circuit ratings:
.1 2500 mVA at 46 kV.

.5 Silver clad copper contacts bifurcated to provide four point contact at each ferrule.

2.5 Primary Fuses (Cont'd)

.6 Refill unit consisting of:
.1 Solid material arc-extinguishing medium contained in filament wound glass-epoxy tube.

PART 3 - EXECUTION

3.1 Installation

.1 Locate and mount switches on structure as indicated.

.2 Connect switch terminals to transformer feeder and primary feeder as indicated.

.3 Locate, mount and connect fuses as indicated.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Energize and load feeders controlled by load break switches.

.3 Open and close load break switches at least ten times over period of 8 h to ensure proper mechanical and electrical performance of installation.

**********END**********

PART 1 - GENERAL

1.1 Product Data .1 Submit product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Materials .1 Arrester component parts to CSA C233-1972.

.2 Arrester characteristics:
- .1 Intermediate arrester.
- .2 System highest voltage: 46 kV.
- .3 Rated voltage of arrester: 39 kV.
- .4 BIL: 250 kV.
- .5 Outdoor type.
- .6 Indicating type.

PART 3 - EXECUTION

3.1 Installation .1 Mount arresters on structure and connect to station grounding system.

.2 Connect line terminals to phase conductors.

.3 From arrester ground terminal run No. 2/0 AWG copper ground wire down pole to ground rod.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Clearing and grubbing: Section 02102

.2 Site grading: Section 02210

.3 Substation fencing - electrical bonding grounding and lighting: Section 16153

1.2 Description of Systems

.1 Covers requirements for security fencing around outdoor electrical installations which for reasons of security and safety as well as for power systems integrity, must be inaccessible to unauthorized persons or to animals.

PART 2 - PRODUCTS

2.1 General

.1 Fence height 2.134 m plus 0.3 m of barbed wire overhang to DOT drawing 0000-H210-C010 as indicated.

2.2 Material Standards

.1 Chain link fabric: zinc coated to ASTM A392-74.

.2 Post and Rails: zinc coated to CSA B63-1966.

.3 Barbed wire: zinc coated to ASTM A121-73.

.4 Fittings: to CSA G164-1965(R1972).

2.3 Materials

.1 Line posts: tubular steel pipe, 60 mm od, scale free, hot dipped galvanized, 5.43 kg/m.

.2 Corner and gate posts: tubular steel pipe, 89 mm od, scale free, hot dipped galvanized, 11.28 kg/m.

.3 Gate post caps: without projections; to match overhang tops.

.4 Top rail, braces, gate frame and centre rail: tubular steel pipe, 43 mm od, scale free, hot dipped galvanized, 3.38 kg/m.

.5 Gates bracing: tubular steel pipe 3 mm od, scale free, hot dipped galvanized, 2.5 kg/m.

2.3 Materials (Cont'd)

.6 Connecting sleeves: malleable iron, hot dipped galvanized.

.7 Stretching bands, fixing bands and tension bars: malleable iron, hot dipped galvanized.

.8 Overhang tops: malleable iron hot dipped galvanized, with eye for holding top rail and 305 mm long projection at 45 degree angle.

.9 Fabric: chain link, 2" mesh of 3.8 mm dia. steel wire, hot dipped galvanized after fabrication. Weight of zinc not less than 490 g/m² of surface area.

.10 Reinforcing wire: 5 mm dia. steel wire, hot dipped galvanized.

.11 Tie wire: 3.8 mm dia. steel, hot dipped galvanized or aluminum alloy wire.

.12 Barbed wire: 2.64 mm dia. steel with 4 point 2.0 mm thick barbs 127 mm apart, electrolytically galvanized before fabrication or hot dipped galvanized after fabrication.

.13 Hinges, latches, drop bolt, centre rest (with 762 mm anchor) chained hook and padlocking accessories: malleable iron, hot dipped galvanized.

.14 Fittings and accessories including nuts, bolts etc. steel or malleable iron, hot dipped galvanized.

.15 Concrete: to Section 03300.

.16 Reinforcing bars: 6 mm dia. steel.

.17 Crushed stone: 10 mm nominal.

.18 Heavy duty ice-breaker padlock: with two (2) keys (for each gate).

2.4 Fabrication

.1 Gates: frame and centre rail electrically welded at all joints. All gates to have centre rail. Gates over 3.25 m² in area to be diagonally braced. Brace to extend from top corner on hinged side to bottom corner on free side, and be

2.4 Fabrication (Cont'd)

electrically welded at all joints. Fabric fastened to frame with stretching bands and tension bars. All gates fitted with malleable iron hinges, with latches to hold in closed position, and with accessories for padlocking. Double gates provided with malleable iron center rest and fitted with drop bolt for closed position and chained hook to hold gates in open position. Each gate topped with 3 rows of barbed wire set 75 mm apart to match gate posts. All gates hinged to have free swing through 180 degrees. Complete gate assembly hot dipped galvanized.

PART 3 - EXECUTION

3.1 Installation

.1 Install 2.134 m fence plus 0.3 m of barbed wire overhang as indicated.

.2 Setting of posts: pour concrete footings directly in ground to depth of 1.37 m. Set gate posts and corner posts in concrete footings at depth of 1.1 m, line posts at depth of 0.9 m as indicated.

.3 Setting of center rests: set malleable center rest for double gates in concrete footing poured directly in ground to depth of 1.37 m. Set centre rest anchoring stake in concrete footing at depth of 0.76 m.

.4 Concrete curb: construct 305 x 305 mm reinforced concrete curb around perimeter of the fence, with two only 6 mm dia. steel rods to provide reinforcing as indicated. Pour in ground to depth of 229 mm and protrude 75 mm above grade; place so that fence will be centered on curb. Pouring of concrete to be made simultaneously so that curb and footings form an integral mass. Crown top to shed water.

.5 Bracing of gate or corner post and the next post: place brace rail horizontally at center, and between gate or corner post and next post. Faster to posts by means of rail ends.

3.1 Installation (Cont'd)

.6 Fitting of caps and overhang tops: with exception of gate posts, fit each post with malleable iron, hot dipped galvanized or aluminum alloy top, with barbed wire supporting projection directed away from fenced area. Fit gate posts 280 mm higher than line and corner posts, with caps without projection to match overhang tops.

.7 Insertion of top rail: insert lengths of conduit forming top rail in eyes of overhang tops, connected at joints with sleeves that allow for contraction and expansion, and fasten to posts by means of rail ends and fixing bands.

.8 Fastening of chain link fabric: attach chain link fabric to corner and gate posts by means of stretching bands. Tie to top rail and fence posts every 460 mm with 3.8 mm dia. tie wire.

.9 Stringing of barbed wire: tightly string three rows of barbed wire, clip securely to overhang, and fasten neatly to gate posts.

.10 When work under Section 16153 is completed, level area inside fence and over surface with 75 mm layer of 10 mm crushed stone.

.11 Properly grade area surrounding fence so that gates can swing freely.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical substation fencing: Section 16152

1.2 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 16010.

1.3 Reference Standards

.1 Grounding: to CSA C22.3No.2-1975.

PART 2 - PRODUCTS

2.1 Materials

.1 Grounding and bonding equipment: to CSA C22.2No.41-1950(R1967).

.2 Grounding and bonding material to comprise:
.1 Grounding and bonding wire: one (1) conductor No. 2/0 AWG, annealed bare copper wire.
.2 Flexible grounding conductor: extra flexible No. 3/0 AWG, extra flexible copper conductor 425 strands.
.3 Ground rod 19 mm x 3 m long hot dipped galvanized.
.4 Ground wire connectors: 19 mm, malleable iron, hot dipped galvanized or bronze, with bronze set screw.
.5 Ground wire clamps: for 50 mm and 75 mm posts, malleable iron, hot dipped galvanized or bronze.

.3 Warning signs: to Section 16010.

.4 Exterior lighting: to Section 16900 as indicated.

PART 3 - EXECUTION

3.1 Installation

.1 Ground fence to grounding system as indicated, independent of station ground.

.2 Install warning signs.

.3 Install exterior lighting to Section 16900 as indicated.

3.2 Inspection and Testing

.1 Conduct inspection and electrical testing to Section 6010.

.2 Maximum resistance to ground to conform to CSA C22.1-1975.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Installation of anchor devices, setting templates: Section 16118
1.2 Reference Standards	.1	ANSI C57.93-1958-Guide for installation and maintenance of oil-immersed transformers.
1.3 Source Quality Control	.1	Submit type test certificates.
1.4 Shop Drawings	.1	Submit shop drawings in accordance with Section 01340.
	.2	Indicate: .1 Dimensioned positions of mounting devices. .2 Dimensioned positions of terminations. .3 Identified internal and external component layout on assembly drawing. .4 Insulating liquid capacity.
1.5 Maintenance Data	.1	Provide maintenance data for transformers for incorporation into maintenance manual specified in Section 01730.
	.2	Include insulating liquid maintenance data.
1.6 Maintenance Materials	.1	Provide maintenance materials in accordance with Section 01730.
1.7 Delivery and Storage	.1	Deliver and store in accordance with Section 01600.
	.2	Ship transformer complete with first fill of liquid.

PART 2 - PRODUCTS

2.1 Transformer Characteristics	.1	Transformers: to CAN3-C88-M79.
	.2	Liquid cooled, outdoor, power transformers type ONAN with provision for fan cooling.
	.3	Primary voltage: 44 kV, 60 Hz, grounded neutral delta connected, 3 phase, 3 wire.

2.1 Transformer Characteristics (Cont'd)	.4	Secondary voltage: 600 V, wye connected, 3 phase, 4 wire, grounded, neutral.
	.5	Capacity: 2000 kVA as indicated.
	.6	Basic impulse level: 250 kV.
	.7	Polarity: subtractive.
	.8	Impedance: not less than 5.5%, nor more than 6.0%.
2.2 Mounting	.1	Transformers suitable for outdoor substation.
2.3 Vibration Dampers	.1	Anti-vibration mountings to isolate not less than 90% of disturbing vibrations.
2.4 Voltage Taps	.1	Four 2.5% taps, 2-FCAN, 2-FCBN.
2.5 Tap Changer	.1	Externally operated off-load tap changer, with provision for padlocking on 3 phase units.
2.6 High Voltage Bushings	.1	Bushings: to EEMAC 1G1-1-1957.
2.7 Insulating Liquid	.1	Insulating liquid: transformer oil.
2.8 Throat Connections	.1	Extend primary and secondary terminals through a throat connection to cable connection box as indicated.
2.9 Accessories	.1	Top filter press connection.
	.2	Liquid Celsius temperature thermometer, maximum indicating type, dial size 100 mm with two sets contacts.
	.3	Liquid level gauge with two sets contacts.
	.4	Wiring and terminal box for protective devices.
	.5	Top non-flammable insulating liquid sampling device.
	.6	Anchor devices, setting templates means for bolting down.

2.9 Accessories (Cont'd)

.7 Bi-directional skid base.

.8 Wildlife proof shroud for each high voltage bushing.

.9 Vacuum gauge: dial size 100 mm.

.10 Factory install accessories.

.11 25 mm drain valve with plug.

2.10 Finish

.1 Finish tank exterior in accordance with Section 16010.

2.11 Equipment Identification

.1 Owner's equipment reference label to Section 16010, size 7.

PART 3 - EXECUTION

3.1 Installation

.1 Install transformer only after other work in area is completed.

.2 Ensure concrete pad is fully cured for 28 days before installation of transformer.

.3 Use spreader bars on slings when lifting transformers into place.

.4 Use skids under base when using rollers to move transformers.

.5 Protect bushings during installation.

.6 Set and secure transformer in place rigid, plumb, square.

.7 Ensure internal connections are mechanically tight.

.8 Make connections as indicated.

.9 Connect transformer ground terminal to system ground.

.10 Fill transformers when required and ensure care is taken to prevent contamination of liquid and components.

.11 Use only metal hose (never, under any circumstances, use rubber hose) when field filling transformer with oil.

3.1 Installation (Cont'd)

.12 Set taps to produce rated secondary voltage at no-load.

.13 Wire one set contacts on liquid temperature thermometer, liquid level gauge, gas detector relay, to sound alarm when unsafe condition reached.

**********END**********

PART 1 - GENERAL

1.1 Reference Standards

.1 Do grounding work to CSA C22.3 No. 2-1975 except where specified otherwise.

1.2 Related Work Specified Elsewhere

.1 Perimeter Ground Bus: Section 16121

.2 Grounding Secondary: Section 16291

.3 Lightning Protection: Section 16652

PART 2 - PRODUCTS

2.1 Materials

.1 Grounding and bonding equipment: to CSA C22.2 No. 41-1950(R1967).

.2 Rod electrodes: galvanized steel 19 mm dia. by 3 m long.

.3 Conductors: bare, stranded, tinned soft annealed copper wire, size No. 4/0 AWG and 2/0 AWG for ground bus, electrode interconnections, metal structures, transformers, switchgear, ground connections.

.4 Conductors: pvc insulated coloured green, stranded, tinned soft annealed copper wire, size No. 4 AWG for grounding cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers.

.5 Conductors: pvc insulated coloured green, stranded, tinned soft annealed copper wire No. 10 AWG for grounding meter and relay cases.

.6 Bolted removeable test links.

.7 Accessories: non-corroding, necessary for complete grounding system, type, size material as indicated, including:

.1 Grounding and bonding bushings
.2 Protective type clamps
.3 Bolted type conductor connectors
.4 Thermit welded type conductor connectors
.5 Bonding jumpers, straps
.6 Pressure wire connectors

PART 3 - EXECUTION

3.1 Grounding Installation

.1 Install continuous grounding system including, electrodes, conductors, connectors, accessories, as indicated and to requirements of local authority having jurisdiction.

.2 Install connectors to manufacturers instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to electrodes, structural steel work, using copper welding by thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

3.2 Electrode Installation

.1 Install ground rod electrodes. Make grounding connections to station equipment.

.2 Install ground rod electrodes at switchgear locations.

3.3 Equipment Grounding

.1 Install grounding connections as indicated to typical station equipment including: metallic water main, neutral. Non current carrying parts of: transformers, generators, motors, circuit breakers, current transformers, frames of gang-operated switches. Cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers. Meter and relay cases. Any exposed building metal.

.2 Ground hinged doors to main frame of electrical equipment enclosure with flexible jumper.

3.4 Neutral Grounding

.1 Connect transformer neutral and distribution neutral together using 1000 V insulated conductor to one side of ground test link, the other side of the test link being connected directly to perimeter ground.

3.4 Neutral Grounding (Cont'd)	.2	Interconnect electrodes at each grounding installation.
	.3	Ground transformer tank with continuous conductor from tank ground lug through connector on ground bus to primary neutral. Connect neutral bushing at transformer to primary neutral in same manner.
3.5 Grounding in Manholes	.1	Install ground rod with lug for grounding connection in each manhole so that top projects through bottom of manhole.
3.6 Cable Sheath Grounding	.1	Bond single conductor, metallic sheathed cables together at each termination.
	.2	Use No. 6 AWG flexible copper wire soldered, not clamped, to cable sheath.
	.3	Connect bonded cables to ground with No. 2/0 AWG copper conductor.
3.7 Tests	.1	Perform tests in accordance with Section 16010.
	.2	Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340.

.2 Indicate meter, instrument, outline dimensions, panel drilling dimensions and include cutout template.

PART 2 - PRODUCTS

2.1 Materials

.1 Meters: to CSA C17-1975.

.2 Meter mounting devices: to CSA C22.2 No. 115-1971.

.3 Analogue instruments: to ANSI C39.1-1972.

.4 Recording instruments: to ANSI C39.2-1964.

2.2 Meter

.1 Polyphase kilowatt demand indicating meter as indicated.

.2 Accuracy: 1%.

.3 'A' base, bottom connected, rectangular, flush switchboard, indoor.

.4 Ratings: as indicated.

.5 Register: instrument transformer operated, 0% - 100% range.

2.3 Test Terminal Blocks

.1 Test terminal blocks as required.

2.4 Analogue Indicating Instruments

.1 Analogue indicating instrument: 1% accuracy, switchboard mounting, semi-flush, case size 112 mm rectangular 90° scale, suppressed scale, calibrated 0 - 100, end zero, operated from current transformer.

.1 Ammeter, range full load.

.2 Voltmeter, range full voltage.

2.5 Instrument Selector Switches

.1 Voltmeter selector switch: rotary, multi-position, maintained contacts, panel mounting, round notched handle, rated to suit instrument nameplate marked as indicated to coincide with each rotary position.

2.5 Instrument Selector Switches (Cont'd)	.2	Four position voltmeter selector switches identified "A-B, B-C, C-A, off".
2.6 Recording Instruments	.1	Recording instrument: 1% accuracy switchboard mounting, direct acting marking device, continuous marking, strip chart, electric driver timing mechanism, chart speed 1, 5 mm/hr, scale calibrated 0 - 3000 kW, end zero, operated from current transformer on/off switch. .1 Wattmeter, range as indicated. .2 On/Off switch for each breaker position. .3 Two separate pens on two separate channels.
2.7 Shop Installation	.1	Install instruments on switchboard as indicated.
	.2	Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources, electrical supplies.

PART 3 - EXECUTION

3.1 Metering Installation	.1	Install meters and instruments as indicated.
	.2	Make connections in accordance with diagrams.
	.3	Install meters in location free from vibration and shock.
	.4	Ensure power factor corrective equipment connected on load side of meter.
	.5	Do not connect other instruments, relays, devices to metering circuits.
	.6	Connect meter and instrument transformer cabinets to ground.
	.7	Locate meters within 9 m of instrument transformers. Use 32 mm conduit for interconnections. Use separate conduit for each set of current transformer connections, exclusive for metering.

3.2 Tests

.1 Conduct tests in accordance with Section 16010 and to manufacturer's recommendations.

.2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.

.3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources, electrical supplies.

.4 Perform tests to obtain correct calibration.

.5 Do not dismantle meters and instruments.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340. Indicate dimensions and connection details.

PART 2 - PRODUCTS

2.1 Materials

.1 Instrument transformers to CSA C13-1970.

2.2 Potential Transformers

.1 Potential transformers: dry type for indoor use, with following characteristics:

.1 Nominal voltage class: as indicated.
.2 Rated frequency: 60 Hz.
.3 Basic impulse level: 10 kV.
.4 Voltage ratio: as indicated.
.5 Accuracy rating: 1%.

.2 Potential transformers equipped with fuse holder and fuses. Fuses to Section 16260 and as indicated.

2.3 Current Transformers

.1 Current transformers: dry type for indoor use with following characteristics:

.1 Nominal voltage class: as indicated.
.2 Rated frequency: 60 Hz.
.3 Basic impulse level: 10 kV.
.4 Metering accuracy rating: 1%.
.5 Relay accuracy rating: 1%.
.6 Rated primary and secondary current: as indicated.
.7 Continuous-current rating factor: 1.2.

.2 Positive action automatic short-circuiting device in the secondary terminals.

2.4 Mounting Brackets

.1 Potential transformers with channel type mounting brackets.

.2 Fabricate brackets and channels from electrogalvanized code gauge painted steel.

PART 3 - EXECUTION

3.1 Inspection .1 Inspect instrument transformers for damage and verify characteristics and record nameplate data.

3.2 Installation .1 Install instrument transformers as indicated and ensure accessibility. Make only those connections shown on wiring diagrams.

3.3 Identification .1 Where instrument transformers are installed in enclosure, provide identification plate on face of enclosure housing equipment indicating transformer ratio.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01340.

.2 Indicate:
.1 Floor anchoring method and foundation template.
.2 Dimensioned cable entry and exit locations.
.3 Position and size of bus.
.4 Overall length, height and depth of complete switchgear.
.5 Layout of internal and front panel mounted components.
.6 Nameplate wordings and letter sizes.

.3 Include time-current characteristic curves for air circuit breakers.

1.2 Maintenance Data

.1 Provide data for incorporation into maintenance manual specified in Sections 01730 and 16010.

.2 Maintenance data for complete switchgear assemblies including components.

1.3 Maintenance Materials

.1 One set spare parts as recommended by manufacturer.

.2 Fuses:
.1 3 fuses for each type.

1.4 Source Quality Control

.1 Refer to Section 16010.

.2 Engineer to witness final factory tests. Give witness minimum 7 days notice.

.3 Submit 4 copies of certified test results.

PART 2 - PRODUCTS

2.1 Materials

.1 Switchgear assembly: to CSA C22.2 No. 31-1977, EEMAC G8-2-1972, NEMA SG-5, CSA C22.1 Rule 26-006 Ontario Supplement.

.2 Steel for cubicles: to CSA G40.21-1976.

2.1 Materials (Cont'd)

.3 Insulators: to EEMAC G1-1-1958.

.4 Air circuit breakers: to CSA C22.2 No. 5-1963, and IEEE No. 20-1973.

.5 HRC Fuses: to CSA C22.2 No. 106-1953 (R1967).

.6 Meters: to CSA C17-1975.

.7 Meter mounting devices: to CSA 22.2 No. 115-1971.

.8 Analogue instruments: to ANSI C39.1-1972.

.9 Instrument transformers: to CSA C13-1970.

.10 Where requirements of this Specification exceed those of above mentioned standards, this Specification shall govern.

2.2 Rating

.1 Secondary switchgear: Sprinklerproof 600 V, 3200 A, 3 phase, 3 wire, 60 Hz, maximum short circuit current 50 kA (rms symmetrical).

2.3 Enclosure

.1 Enclosure:

.1 Main incoming sections to contain:

.1 Air circuit breaker sized as indicated.

.2 Ammeters.

.3 Voltmeter and selector switch.

.4 Recording Kilowattmeter.

.5 Potential and current transformers for supply authority metering.

.2 Distribution sections to contain:

.1 Air circuit breakers.

.2 Copper bus from main section to distribution sections including vertical bussing.

.3 Spaces for future units.

.2 Free standing concrete pad mounted, dead front, indoor, sprinklerproof enclosure CSA Enclosure including sides, top, doors, bottom enclosing plate, sills, horizontal and vertical barriers, lintels, supports, reinforcing members; formed, welded and braced into rigid

2.3 Enclosure (Cont'd)

self-supporting structure. Constructed from rolled flat steel sheets. Constructed to fit space allocated.

.3 Cubicle units to have adequate bracing, sufficient volume and ventilating openings to prevent distortion of unit during installation and normal operation and during operation under short circuit conditions, or when attempting closure onto fault.

.4 Ventilating louvres: vermin, insect, sprinkler proof.

.5 Remove burrs and sharp edges from steel work.

.6 Use non-corrosive bolts and hardware.

.7 Access from front and rear.

.8 Low voltage switchboard shall be of type, rating and arrangement shown. Rearrangement of components will not be permitted. Equipment shall be constructed to fit space allocated and shall be a free standing assembly mounted on a concrete pad.

.9 Where future breakers are indicated, bus, stationary element, control and metering wiring shall be supplied such that, at a future date, Owner need buy only drawout element and CT. Main bus and switchboard shall be drilled and plated and have provision for future extension of additional vertical cells at each end of switchboard.

.10 Construction features to be included shall be:

.1 Free standing, rigid, dead-front enclosure.

.2 Hinged and formed front and rear doors, louvred as required.

.3 Two channels across bottom of each section, to permit rolling or jacking of board.

.4 Two channels, to be grouted into housekeeping base, for levelling purposes, for full length of switchboard and future section.

2.3 Enclosure (Cont'd)

.5 Removable top plates.
.6 Phase collection and provision of necessary bolts, nuts and washers for bus duct connections.
.7 Plated hardware.
.8 Main bus work, 3 phase 3 wire extending through all sections, rated to match main breaker rating and braced to withstand stresses resulting from short circuit current of maximum system fault equal to interrupting rating of main breaker combination.
.9 Main buswork and other live parts in bus compartment fully insulated by covering throughout with PVC insulating material using heated metal and fluidized bed process or Raychem heat shrink sleeves. Bus joints shall be covered with molded snap-on covers.
.10 Provision of vertical fire retardant and non-hygroscopic barriers between vertical sections, from bottom to top of switchboard, and from front face to back of switchboard. Barriers to be sealed to prevent passage of ionized gases between vertical sections.
.11 Secondary bus work as required.
.12 Copper ground bus extending through all sections.
.13 Coloured phase designations for all phases to suit CSA, NEMA and Supply Authority Standards.
.14 Sprinklerproof construction of non-walk-in type including separate sheet metal roof overhanging front by maximum of 300 mm and sides and rear by 150 mm.

.11 Finish equipment as follows:
.1 Basic rust-inhibiting metal process.
.2 Exterior in Sherwin Williams blue-F65LQ114.
.3 Interior in white.

.12 Manufacturer to provide quart of touch-up paint or several pressurized spray cans to touch-up small areas marred during installation.

2.4 Busbars

.1 Three phase and full capacity neutral insulated busbars, continuous current rating 3200 A self-cooled, extending full width of multi-cubicle switchboard, suitably supported on insulators.

2.4 Busbars (Cont'd)

.2 Brace busbar system to withstand stresses resulting from specified short circuit currents.

.3 Silver surfaced joints, secured with noncorrosive bolts and Bellville washers, tightened with torque wrench to manufacturers' recommended load.

.4 Busbar connectors, when switchboard shipped in more than one section.

.5 Copper buswork required throughout.

2.5 Grounding

.1 Copper ground bus not smaller than 50 x 6 mm extending full width of multi-cubicle switchboard and situated at bottom.

.2 Lugs at each end for grounding cable.

.3 Bond non-current carrying metal parts, including switchgear framework, enclosure and bases to ground bus.

2.6 Air Circuit Breakers

.1 Air circuit breakers shall include the following:

.1 Drawout construction.

.2 Manual operation for breakers up to 1600 A frame size, electric operation for breakers 2000 A frame size and larger.

.3 Isolation of adjacent breaker compartments by steel panels.

.4 Isolation of front breaker section and rear bus section by steel panels.

.5 Breakers to have solid state selective trips.

.6 Integral ground fault protection on all breakers. Adjustable up to 1600 amps on main breaker and up to 1200 amps on branch breakers.

.7 Individual breakers shall be equipped with a visual indication of ground fault indication. The integral ground fault protection specified for each breaker shall include three co-ordinated time settings, with the minimum time setting to be 0.20 - 0.25 seconds. Two other, longer term, settings shall be included, identified as intermediate and long term. The associated current and time ratings shall be applied to the breakers as shown.

2.6 Air Circuit Breakers (Cont'd)

.8 Ability to remain closed during power outage on supply.
.9 Minimum interrupting rating of 50 kA (rms symmetrical).
.10 Cable terminations as required and as indicated on Drawings.
.11 Shunt trips for manually operated breakers.
.12 Capacitor trip device.
.13 Where fused breakers are shown, fuses shall be on line side of breaker.

2.7 Secondary Instruments

.1 Meters: to CSA C17-1975.

.2 Meter mounting devices: to CSA C22.2 No. 115-1971.

.3 Analogue instruments: to ANSI C39.1-1972.

.4 Voltmeters:
.1 Matching appearance and same manufacturer as ammeters.
.2 On load side of each main breaker.
.3 Semi-flush mounted, with HRC fuses on primary three potential transformers if required, secondary wiring and transfer switch.

.5 Ammeters on Main Breakers:
.1 Semi-flush mounted, three single thermal type with U/L selector switch and instantaneous ammeter. Sangamo type ADF.
.2 3 current transformers.

.6 Ammeters on Feeder Breakers:
.1 Semi-flush single thermal demand ammeter, current transformer of suitable ratio on centre phase of each feeder breaker, small wiring.

2.8 Utility Metering

.1 Switchboard manufacturer shall provide and connect Supply Authority's metering transformers in accordance with their requirements.

2.9 Miscellaneous

.1 Provide the following:
.1 Mimic bus single line diagram on front of switchboard. Bus to run through all breaker handles and to show every piece of equipment, using industry standard symbols for each device. Mimic

2.9 Miscellaneous (Cont'd)

bus to be red for 600 volt. Mimic bus shall be aluminum, fastened securely with screws or rivets.

.2 Power supplies of suitable capacity for operation of such items as electrically operated breakers and meters, using HRC fuses for protection of small wiring.

.3 Supply one counterbalanced hoist on wheels with swivelboom, winch and lockable wheels.

.4 Set of 6 spare fuses of each type used in switchboard.

.5 Rubber mats at switchboards shall be 1000 mm wide and 6 mm thick for full length of each board.

2.10 Co-ordination .1 Manufacturer shall review line and load side equipment connected to switchboard, as well as equipment enclosed, and provide trip devices to co-ordinate with line side and load side equipment. Allowance will not be made, after Contract award, to change trip devices to provide satisfactory co-ordination.

2.11 Shop Fabrication .1 Assemble and wire complete secondary switchgear.

.2 Energize switchgear and check phase rotation of each feeder.

.3 Check meters and phase selector switches.

2.12 Equipment Identification .1 Provide equipment identification in accordance with Section 16010.

.2 Nameplates:

.1 White plate, black letters, size 7.

.2 Complete switchgear - labelled "600 volts".

.3 Main cubicles - labelled "Main Breaker", "Supply Authority Metering".

.4 Distribution Units - labelled to indicate equipment fed.

.5 Metering instruments and switches.

.6 Submit list of nameplate wordings and obtain approval.

2.13 Factory Test Inspection

.1 Test shall be performed, after compleand tion of assembly in factory, in accordance with NEMA and EEMAC Specifications. These tests shall include hi-pot testing, operation of breakers, operation of relays, meters and switches.

.2 Each circuit breaker shall have a load applied sufficient to test the overcurrent devices on breaker and to prove that trip unit and breaker function satisfactorily. Completed switchboard shall be connected to power supply to operate electrically operated devices to prove that they are wired correctly, that contacts make and break and that devices perform satisfactorily before shipment of switchboard.

.3 Racking in and out of breakers and manual operation of equipment shall be tested to prove that items work freely.

.4 Certified copies of standard production tests are required.

2.14 Ground Fault Protection

.1 Each breaker shall have integral ground fault protection adjustable up to sizes as indicated subject to approval of co-ordination study:
.1 Main breaker to 2000 A.
.2 Feeder breaker to 1200 A.

.2 Individual breakers shall be equipped with a visual indication of a ground fault. The integral ground fault protection specified for each breaker shall include three co-ordinated time settings with the minimum time to be 0.20 - 0.25 seconds. Two other longer term settings shall be included identified as intermediate and long time.

PART 3 - EXECUTION

3.1 Installation

.1 Locate switchgear assembly as indicated and mount on concrete pad. Install anchor bolts.

.2 Grout two channels into floor, for levelling purposes, for full length of switchboard and future cell.

3.1 Installation (Cont'd)

.3 Touch up small areas marred in transit or during installation.

.4 Provide two (2) 38 mm empty conduits from metering transformer compartments to metering cabinet.

.5 Connect main secondary supplies.

.6 Connect load side of breakers to distribution feeders as indicated.

.7 Check factory made connections for mechanical security and electrical continuity.

.8 Run two grounding conductors 4/0 AWG bare copper each in 25 mm conduit from ground bus to perimeter ground bus.

.9 Provide a rubber mat at front and rear of each switchboard.

.10 When levelling each switchboard ensure that hinged doors have enough clearance above floor to open over rubber mat.

3.2 On-Site Testing

.1 Conduct an acceptance test in presence of and to satisfaction of Engineer, after completion of installation, but before switchboard is permanently put into service.

.2 Test shall include operation of breakers manually and electrically, racking in and out, and checking that meters and relays function properly. Correct defects at no additional cost to Owner. Replace defective equipment immediately with new factory equipment.

.3 In addition to above, include work associated with field testing, cleaning and calibration of relays and trip devices in Tender cost.

**********END**********

PART 2 - PRODUCTS

2.1 Equipment .1 Arrester component parts: to CSA C233-1972.

.2 Arrester characteristics:
.1 System voltage: 600 V.
.2 Rated voltage of arrester: 650 V.
.3 Indoor type.

PART 3 - EXECUTION

3.1 Installation .1 Install arresters as indicated and connect to secondary bus and ground bus.

**********END**********

PART 1 - GENERAL

1.1 Requirements .1 Submit necessary information, required by Supply Authority, to enable them to provide final requirements for metering. Metering shall be satisfactory to, and approved by, Supply Authority. Where requirements of this Specification exceed those of Supply Authority, this Specification shall govern.

PART 2 - PRODUCTS

2.1 Materials .1 Provide a sheet steel metering cabinet for Supply Authority metering equipment. Cabinet shall be minimum 2.5 mm complete with two doors, frames and hinges, sized as shown, and finished in Grey ASA 61. Metering cabinet shall be complete with steel sub-base or back plate to accommodate meters and test blocks.

PART 3 - EXECUTION

3.1 Installation .1 Install cabinet as indicated and mount plumb.

.2 Provide two 38 mm empty conduits from metering cabinet to a box in switchboard. Run 38 mm flexible conduits from box to Supply Authority metering transformers.

**********END**********

PART 1 - GENERAL

1.1 Requirements

.1 Prepare a graph of co-ordination curves, prior to manufacture of switchboards, on K & E No. 336E Time-Current characteristic graph paper. Time-current characteristics shall be plotted of the following:

.1 Supply Authority's relays or fuses protecting incoming service (Contractor under this Section shall obtain this information).

.2 Main and feeder protective devices at every voltage level used in distribution system.

.3 Protective devices associated with largest motor and/or refrigeration compressor.

.4 Protective devices associated with emergency power system showing generator fault levels.

.2 Preliminary submission of graph for comment will be accepted. Submit graph to Supply Authority for approval by them as providing satisfactory co-ordination. When curves have been approved by Supply Authority, they shall be submitted for Engineer's approval. After approval has been obtained, order protective devices and calibrate to conform with these curves.

.3 Each time-current characteristic curve sheet shall include:

.1 A single line diagram for the portion of the system involved.

.2 Transformer damage curves (where applicable).

.3 Cable damage curves (where applicable).

.4 Available fault levels for the portion of the system involved.

.5 Generator fault and damage curves (where applicable).

.4 Consult manufacturer of the refrigeration compressors and obtain his recommendations for settings on starters. Incorporate this information in co-ordination curves and submit the associated curves to Compressor Manufacturer and obtain his approval.

1.1 Requirements (Cont'd)

.5 Compressor manufacturer and Mechanical Division will determine and calibrate proper protection on motor starters and will ensure that it co-ordinates with protective devices on switchboard.

.6 Co-ordination curves, mentioned above, shall be prepared by Switchboard manufacturer as soon as possible after award of Contract.

.7 The co-ordination curves shall be prepared by the manufacturer or an independent testing organization. The proper settings of all protective relays and devices shall be determined and incorporated into the switchboard and protective devices. Include all associated costs in the Tender.

.8 Switchboard manufacturers shall examine Drawings and Specifications prior to award of Contract to ensure that relays and devices being supplied by them will co-ordinate satisfactorily to Supply Authority requirements. Payment will not be allowed, after award of Contract, for extra charges due to relay and trip device changes to provide adequate co-ordination as required by Supply Authority or as required to comply with recommended practices, due to oversight or negligence by Switchboard manufacturer.

**********END**********

PART 1 - GENERAL

1.1 Requirements

.1 Include cost of field testing, cleaning and calibrating relays and trip devices and cost of function testing of control devices prior to final energizing of switchboards, in Tender. Calibration of all these devices shall conform to requirements established by approved co-ordination curves. Test each breaker and record the test results on H. H. Angus Standard Sheet No. TS-100. Submit complete test and calibration data on these devices as evidence of meeting requirements. Replace fuses blown during testing procedure without cost to Owner. Retain services of Switchgear Manufacturer's equipment testing division for this work.

.2 If this service is not available from Switchgear Manufacturer, retain and pay for the services of one of the following for this work:

Westinghouse Apparatus Service Division,
55 Goldthorne Avenue
Toronto, Ontario

G. T. Wood
3210 Wharton Way
Mississauga, Ontario

K-Tek Electro-Services Limited
81 Howden Road
Scarborough, Ontario

Ferguson, Haronitis & Associates Ltd.
77 Progress Avenue
Scarborough, Ontario

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity, enclosure dimensions, nameplate wordings, nameplate details.

1.2 Plant Assembly

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

PART 2 - PRODUCTS

2.1 Lighting and Receptacle Panelboards

.1 Panelboards: to CSA C22. No. 29-1955.

.2 Panelboards to be product of one manufacturer.

.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.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Bus with full size neutral.

.7 Panels shall be constructed and finished in accordance with details specified in Section 16234 "Panel Trim".

.8 Panels shall be surface or flush-mounting type, as shown.

.9 Panels shall be dead front type in code gauge steel enclosures.

2.1 Lighting and Receptacle Panelboards (Cont'd)

.10 Each panel shall be complete with a directory which shall be mounted inside door in a metal frame with clear plastic cover.

.11 Panels shall have mains of voltage and capacity, and main and branch breakers and contactors, as shown on the "Lighting and Receptacle Panel Schedule". Spaces shall include necessary bus work such that Owners, at a later date, need buy only the breakers.

.12 Where panels exceed 42 circuits, use multi-section panel with main cross-over solid bus bars. Main bus capacity of each section shall be full size to match cross-over bus. Cross-over bus shall be concealed by panel trim. Separate covers are not acceptable.

.13 Breakers shall have bolted type connections. Two and three pole breakers shall be common trip type with a single handle, suitable for voltage applied and of same manufacture as single pole breakers.

.14 Panels for 120/208 volt, 3 phase, 4 wire systems shall be complete with full size breakers, having a symmetrical interrupting rating of at least 10,000 A.

.15 Where indicated breakers shall have ground fault interrupter.

.16 Contactors in panel mains shall be electrically operated, mechanically held and shall be rated to include incandescent, fluorescent and other loads as shown. Contactors shall be mounted within panel and shall be open type. Contactors shall be complete with fuse and fuse adaptor mounted and connected to line side of contactor and shall be connected to supply power to operating coil. Coil cleaning contacts shall be included in contactor where a contactor is controlled by a time switch.

.17 Contactors shall be as manufactured by: Ascolectric Ltd. - Bulletin 920 Series.

2.2 Power Panels

.1 Panels shall be constructed and finished in accordance with details specified in Section 16234 "Panel Trim".

.2 Power panels shall be surface or flush-mounting type as shown.

.3 Panelboards shall have mains of voltage and capacities, and main and branch breakers, as shown. Connections between main buses shall be made with solid bus bars to match when a panelboard comprises two or more sections.

.4 Panels shall be complete with branch breakers, spares and spaces as shown. "Spares" shall be complete breakers. "Spaces" shall be understood to include necessary bus work such that Owners, at a later date, need buy only breakers.

.5 Panels shall be sectionalized so that flush panels do not exceed 1850 mm and surface panels do not exceed 2300 mm in height, unless noted otherwise.

.6 Power panels shall be of same manufacture as lighting and receptacle panels.

.7 Breakers shall be of quick-make, quick-break, bolted connection molded case type with thermal magnetic trips and interrupting capacity indicated on Power Panel Schedule.

.8 Panelboards shall be factory assembled type CDP, unless otherwise specified.

.9 Circuit breakers shall have a symmetrical interrupting rating of 22,000 A minimum unless otherwise indicated.

2.3 Panelboard Assemblies

.1 Contactors in mains as indicated.

.2 Feed through lugs as indicated.

.3 Isolated ground bus, as indicated.

2.4 Breakers

.1 Breakers to Section 16240.

2.5 Equipment Identification

.1 Provide equipment identification in accordance with Section 16010.

.2 Nameplate for each panelboard size 4 engraved.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

PART 3 - EXECUTION

3.1 Installation

.1 Locate panelboards as indicated and mount securely, plumb true and square, to adjoining surfaces.

.2 Provide locking bars on non-switched circuits where panels are used for switching lighting circuits.

.3 Mount panelboards to height given in Section 16010 or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 Provide drip shields and gasketted doors on panels located in electrical rooms and for main services in ancillary buildings.

**********END**********

PART 1 - GENERAL

1.1 Application

.1 Provide panel trim for:
.1 Lighting and receptacle panelboards: Section 16230
.2 Power panels: Section 16230
.3 Terminal cabinets: Section 16585

PART 2 - PRODUCTS

2.1 Trim

.1 Panels shall be given a rust-resistant treatment to both tub and trim.

.2 Flush panels shall have concealed hinges and flush type combination lock latch. Locks shall be chrome plated. Doors shall open minimum 135°. Trims shall have fasteners concealed and shall be prime coated to receive room finish paint.

.3 Surface mounted panels located in electrical and mechanical rooms shall have manufacturer's standard trim complete with lock and latch and finished with Sherwin-Williams colours: Normal Power - F65LQ114 (blue), Emergency Power - F65EG9 (international orange). Surface mounted panels located elsewhere to be finished in grey.

.4 Provide hoods or shields to protect panels from sprinklers to comply with Code and Inspection requirements.

.5 Panel locks shall be common to one key throughout project, except that main fire alarm control panel shall be keyed differently. Locks shall be those used by Lighting Panel Manufacturer.

.6 Recessed panels shall have standard flush trims.

PART 3 - EXECUTION

3.1 Installation

.1 Co-ordinate panel finish with Room Finish Schedule.

.2 Deliver ten (10) duplicate keys for panel locks to Owner.

.3 Mount electrical panels, where possible, with top of trim at uniform height of 1900 mm or to match door heads or to suit tile layout.

**********END**********

PART 3 - EXECUTION

3.1 Installation

.1 Provide three 25 mm empty conduits from top and also from bottom of lighting, receptacle, telephone, signal and communication panels and terminal cabinets recessed in walls.

.2 Provide three 50 mm empty conduits from top and bottom of recessed power and distribution panels.

.3 Cap ends of conduits in accessible locations in ceiling spaces above and below panels, to allow for future wiring.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340.

.2 Include time-current characteristic curves for breakers with ampacity of 225 A and over.

PART 2 - PRODUCTS

2.1 Breakers General

.1 Moulded case circuit breakers: to CSA C22.2 No. 5-1963.

.2 Bolt-on moulded case circuit breaker, quickmake, quick-break type, for manual and automatic operation.

.3 Common-trip breakers with single handle for multipole applications.

.4 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-10 times current rating.

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 under overload conditions and instantaneous magnetic tripping for short circuit protection.

2.3 Optional Features

.1 Incorporate optional features as follows and as indicated:
- .1 shunt trip.
- .2 under-voltage release.
- .3 on-off locking device.

PART 3 - EXECUTION

3.1 Installation

.1 Install circuit breakers as indicated.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Breakers: Section 16240

.2 Fused Switch: Section 16255

.3 Control Transformer: Section 16480

1.2 Product Data

.1 Submit product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Contactors

.1 Contactors: to CSA C22.2 No. 14-1973 and EEMAC No. 1CS-1970.

.2 Mechanically held controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.

.3 Breaker combination contactor as indicated.

.4 Complete with two normally open and two normally closed auxiliary contacts unless indicated otherwise.

.5 Mount in CSA Enclosure (1) unless otherwise indicated.

.6 Include following options in cover:
.1 Red indicating lamp.
.2 Stop-Start pushbutton.
.3 Hand-Off-Auto selector switch.
.4 On-Off selector switch.

.7 Control transformer in contactor enclosure.

2.2 Equipment Identification

.1 Size 4 nameplate in accordance with Section 16010 indicating name of load controlled.

PART 3 - EXECUTION

3.1 Installation

.1 Install contactors and connect auxiliary control devices as indicated.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Equipment

.1 Enclosed manual air break switches in non-hazardous locations: to CSA C22.2No.4-1974.

.2 Fuseholder assemblies to CSA C22.2No.39-1972.

.3 Fusible and non-fusible disconnect switch in CSA Enclosure 3.

.4 Provision for padlocking in on-off switch position.

.5 Mechanically interlocked door to prevent opening when handle in ON position.

.6 Fuses as indicated in accordance with Section 16260.

.7 Fuseholders in each switch suitable for type of fuse as indicated. Provide adaptors where necessary.

.8 Quick-make, quick-break action.

.9 ON-OFF switch position indication on switch enclosure cover.

.10 Switches shall be finished as follows based on Sherwin-Williams colours: Normal Power - F65LQ114 (blue) and Emegency Power - F65EG9 (international orange).

2.2 Equipment Identification

.1 Indicate name of load controlled on size 4 nameplate to Section 16010.

PART 3 - EXECUTION

3.1 Installation

.1 Install disconnect switches complete with fuses as indicated.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings and Product Data

.1 Submit fuse melting and clearing time-current characteristics for each fuse type and size.

1.2 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

.2 Three spare fuses of each type and size installed above 600 A.

.3 Six spare fuses of each type and size installed up to and including 600 A.

1.3 Delivery and Storage

.1 Ship fuses in original containters.

.2 Do not ship fuses installed in equipment.

.3 Store fuses in original containers in storage cabinet, moisture free location.

PART 2 - PRODUCTS

2.1 Fuses General

.1 HRC Form I, Class J fuses: to CSA C22.2No.106-1953(R1967) to have interrupting capability of 200,000 A symmetrical, and be fast acting type.

.2 Fuses: product of one manufacturer.

2.2 Fuse Storage Cabinet

.1 Fuse storage cabinet, manufactured from 2.0 mm thick aluminum 750 mm high, 600 mm wide, 300 mm deep, hinged, lockable front access door, finished in accordance with Section 16010.

.2 Provide separate compartment with nameplate for each size and type of fuse used throughout project. Provide more than one cabinet if necessary.

2.3 Manufacturers

.1 Acceptable Fuse Manufacturer: English Electric.

PART 3 - EXECUTION

3.1 Installation

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices. Use fuse adaptors where necessary.

.3 Ensure correct fuses fitted to assigned electrical circuit.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340.

.2 Submit nameplate wordings.

PART 2 - PRODUCTS

2.1 Materials

.1 Dry type transformers: to CSA C22.2No.47-1977, CSA C9-M1977.

.2 Use transformers of one manufacturer throughout project.

2.2 Transformers

.1 Transformers shall have voltage and kVA rating indicated.

.2 Transformer shall be self-contained, free standing units suitable for floor or wall mounting. Where shown to be wall-mounted, necessary mounting hardware shall be included. They shall be of ventilated or epoxy potted type. They shall be rated "weatherproof", CSA enclosure Type 3.

.3 kVA capacity indicated shall be based on Class 200 System.

.4 Transformers shall be ANN.

.5 Transformers shall have provisions for incoming and outgoing conductors as indicated.

.6 Transformers shall be equipped with grounding provision specified in Table 3 of CSA Standard.

.7 Unless shown otherwise, impedance of transformers shall be as per Table 7 of CSA Standard.

.8 Transformer noise level shall be as per Table 9 of CSA Standard.

.9 Transformers rated 300 kVA and larger shall have a noise level 3 dB below that shown on Table 9 of CSA Standard.

2.2 Transformers (Cont'd)

.10 Transformers shall have BIL rating as follows:

600 V Class - 10 kV

.11 Include vibration isolation pads (to give minimum 6 mm static deflection) for each unit.

.12 Three phase transformers shall have delta connected primary and 120/208 volt WYE secondary unless otherwise noted.

.13 Transformer enclosure shall be in compliance with CSA C22.1 Rule 26-006 Ontario Supplement.

.14 Transformer enclosure shall have primary metal treatment and shall be finished with 2 coats of finishing paint.

.15 Finishing paint shall be Sherwin-Williams colours as follows: Normal Power - F65LQ114 (blue) and Emergency Power - F65 EG9 (international orange) for transformers located in electrical and mechanical rooms. Transformers in other locations to be grey.

PART 3 - EXECUTION

3.1 Mounting

.1 Mount dry type transformers up to 75 kVA as indicated.

.2 Mount dry type transformers above 75 kVA on floor.

.3 Ensure adequate clearance around transformer for ventilation.

.4 Install transformers in level upright position.

.5 Remove shipping supports only after transformer is installed and just before putting into service.

.6 Loosen isolation pad bolts until no compression is visible.

3.2 Connections	.1	Make only those connections shown on wiring diagram.
	.2	Energize transformers immediately after installation is completed, where practicable.
3.3 Equipment Identification	.1	Nameplate in accordance with Section 16010.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Grounding - Primary Perimeter Ground Bus — Section 16185 Section 16121

PART 2 - PRODUCTS

2.1 Materials

.1 Grounding equipment to: CSA C22.2No.41 1950(R1967).

.2 Copper grounding conductors to: ASA G7.1-1964.

2.2 Equipment

.1 Clamps for grounding of conductors, to electrically conductive underground water pipr.

.2 Rod electrodes, galvanized steel, 19 mm dia. by 3 m long.

.3 Insulated grounding conductors to Section 16301.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not limited to:
.1 Grounding and bonding bushings.
.2 Protective type clamps.
.3 Bolted type conductor connectors.
.4 Thermit welded type conductor connectors.
.5 Bonding jumpers, straps.
.6 Pressure wire connectors.

PART 3 - EXECUTION

3.1 Installation General

.1 Install complete permanent, continuous, system and circuit equipment grounding systems including electrodes, conductors, connectors, accessories, as indicated, to conform to requirements of Owner, and local authority having jurisdiction over installation. Where EMT is used, run green insulated ground wire in conduit.

.2 Install connectors to manufacturers instruction.

3.1 Installation General (Cont'd)

.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 Install green insulated bonding wire through flexible conduit.

.7 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.8 Install separate green insulated ground conductor, to outdoor lighting standards.

.9 Connect building structural steel and metal siding to ground by welding copper to steel as indicated.

.10 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections except for perimeter ground bus.

.11 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.12 Install grounding conductors, outside Electric Rooms and Electrical Closets, in conduit and conceal where possible. Make Connections to water mains, neutral and equipment with brass, copper or bronze bolts and connectors or weld using Cadweld or Thermoweld processes.

.13 Provide grounding conductors, sized as per Code, and connect to grounding bus or water main wherever non-metallic raceways are installed.

.14 Clean exposed copper to a bright surface and finish with two coats of clear insulating varnish.

3.2 Manholes	.1	Install ground rod in each manhole so that top projects through bottom of manhole, provided with lug to which grounding connection can be made.
3.3 Electrodes	.1	Make ground connections to continuously conductive underground water pipe on street side of water meter.
	.2	Install water meter shunt.
	.3	Install electrodes and make grounding connections as indicated.
	.4	Bond separate, multiple electrodes together.
	.5	Use copper conductors for connections to electrodes.
3.4 System and Circuit Grounding	.1	Install system and circuit grounding connections to neutral of primary and secondary system as indicated.
3.5 Equipment Grounding	.1	Install grounding connections to equipment included in, but not limited to following list. Service equipment, transformers, switchgear, duct systems, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, power panels, outdoor lighting.
3.6 Communication Systems	.1	Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows: .1 Telephones: grounding system in accordance with telephone company's requirements. .2 Sound, fire alarm, intercommunication systems as indicated, or required.
3.7 Tests	.1	Perform tests in accordance with Section 16010.
	.2	Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.
	.3	Perform tests before energizing electrical system.

**********END**********

PART 2 - PRODUCTS

2.1 Materials

.1 Conductors: stranded for 10 AWG and larger.

.2 Copper conductors sized as indicated with 1000 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 and/or RWU90: to CSA C22.2 No. 38-1977. Use RWU90 for wiring installed underground.

.3 Armoured cable, type AC90, may be used for connection between recessed lighting fixture and the fixture outlet box in ceiling space.

.4 Wiring in channel back of fluorescent fixtures shall be 600 volt type GTF or TEW.

.5 Lighting and power wiring shall be copper, minimum No. 12 gauge. Size wires for 2% maximum voltage drop to farthest outlet on a loaded circuit.

.6 Home runs to lighting and receptacle panels which exceed 25 m in length, shall be minimum No. 10 gauge.

.7 Conductors shall be colour coded. Conductors No. 10 gauge and smaller shall have colour impregnated into insulation at time of manufacture. Conductors size No. 8 gauge and larger may be colour coded with adhesive colour coding tape but only black insulated conductors shall be employed in this case, except for neutrals which shall be white wherever possible.

.8 Colour coding shall be as follows:

Phase "A" - Red	Ground - Green
Phase "B" - Black	Neutral - White
Phase "C" - Blue	Control - Orange

PART 3 - EXECUTION

3.1 Installation

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 16320.

3.1 Installation (Cont'd)

.2 In cabletroughs in accordance with Section 16335.

.3 In underground ducts in accordance with Section 16106.

.4 In surface and lighting fixture raceways in accordance with Section 16350.

.5 In wireways and auxiliary gutters in accordance with Section 16355.

.6 Neatly train circuit wiring in cabinets, panels, pull boxes and junction boxes and hold with nylon cable ties.

.7 Splice wire, up to and including No. 6 gauge, with nylon insulated expandable spring type connectors. Splice larger conductors using split-bolt or compression type connections wrapped with PVC tape.

.8 Where colour coding tape is utilized, it shall be applied for a minimum of 50 mm at terminations, junction and pull boxes and condulet fittings. Do not paint conductors under any condition. Colour coding shall also apply to bussing in panels and bus duct.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Electrical - general provisions: Section 16010

PART 2 - PRODUCTS

2.1 Materials

.1 Teck cable to: CSA C22.2 No. 131-1965 and CSA C22.2 No. 131S1-1973.

.2 Teck cable to be constituted as follows:
- .1 Grounding conductor copper.
- .2 Circuit conductors copper sized as indicated.

.3 Insulation to be:
- .1 Chemically cross-linked thermosetting polyethylene rated type RW90, 1000 V.

.4 Jacket-thermosetting rubber compound.

.5 Armour flat galvanized steel.

.6 Overall covering thermosetting polyvinyl chloride material.

2.2 Connectors

.1 Watertight, approved for teck cable.

PART 3 - EXECUTION

3.1 Installation

.1 Install cables as indicated.

.2 Group cables wherever possible on channels.

.3 Install cable in trenches in accordance with Section 16106.

.4 Lay cable in cabletroughs in accordance with Section 16335.

.5 Terminate cables in accordance with Section 16315.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Fastenings and supports: Section 01600

PART 2 - PRODUCT

2.1 Support Channels

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted suspended set in poured concrete walls and ceilings as indicated.

PART 3 - EXECUTION

3.1 Installation

.1 Secure equipment to poured concrete with expandable inserts.

.2 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.3 Fasten exposed conduit or cables to building construction or support system using straps.
.1 One-hole malleable iron or 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.
.3 Beam clamps to secure conduit to exposed steel work.

.4 Suspended support systems:
.1 Support individual conduit runs with 6 mm dia threaded rods, galvanized after threading, and spring clips.
.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical. Rods to be galvanized after fabrication.

.5 For surface mounting of two or more conduits use channels.

.6 Provide galvanized after fabrication metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

3.1 Installation (Cont'd)

.7 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.8 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.9 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.

.10 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.11 Supply and erect special structural work required for the installation of electrical equipment. Provide anchor bolts and other fastenings unless noted otherwise. Mount equipment required to be suspended above floor level, where details are not shown, on a frame or platform bracketted from the wall or suspended from the ceiling. Carry supports to either the ceiling or the floor, or both as required, at locations where, because wall thickness is inadequate, it is not permitted to use such brackets.

.12 Electrical panels, switches or other electrical equipment shall be complete with suitable bases or mounting brackets. Install angle or channel iron supports to bear the equipment where it is shown on or in structural tile walls, or walls are inadequate to bear the equipment.

.13 Provide channel iron or other metal supports where necessary, to adequately support lighting fixtures. Do not use wood.

.14 Locate raceway hangers only at joint between precast slabs, where raceways are supported from any precast slab construction, and attach hanger rods to steel plates on top of slab. Attach additional horizontal steel members to

3.1 Installation (Cont'd)

rods similar to those specified above, where raceways or equipment must be located between joints of precast slabs, and fasten hangers to the horizontal steel member. Examine Architectural and Structural Drawings to determine in which areas precast flooring occurs.

.15 Support hangers, in general, from inserts in concrete construction or from building structural steel beams, using beam clamps. Provide additional angle or channel steel members, required between beams for supporting conduits, cables and bus ducts.

.16 Provide any additional supports required from existing concrete construction for any piping or equipment, by drilling same and installing expansion bolt cinch anchors.

.17 Do not use explosive drive pins in any section of Work without obtaining prior approval.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Wire and Cable: Section 16301

.2 Outlet Boxes: Section 16375

PART 2 - PRODUCTS

2.1 Materials

.1 Pressure type nylon insulated expandable spring wire connectors: with current carrying parts of copper, copper alloy sized to fit copper conductors as required.

.2 Fixture type nylon insulated expandable spring splicing connectors: with fixture type current carrying parts of copper, copper alloy sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2-1961 to consist of:
.1 Connector body and stud clamp for conductors
.2 Clamp
.3 Stud clamp bolts
.4 Bolts for copper conductors
.5 Sized for conductors as indicated

.4 Clamps or connectors for armoured cable, mineral insulated cable, flexible conduit as required.

PART 3 - EXECUTION

3.1 Installation

.1 Remove insulation carefully from ends of conductors and:
.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65-1956(R1965).
.2 Install fixture type connectors and tighten. Replace insulating cap.
.3 Install bushing stud connectors in accordance with EEMAC 1Y-2-1961.
.4 Install crimp type connectors.
.5 Install box connectors.

**********END**********

PART 1 - GENERAL

1.1 Location of Conduit

.1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

PART 2 - PRODUCTS

2.1 Conduits

.1 Rigid galvanized steel and aluminum threaded conduit: size as indicated.

.2 Epoxy coated conduit: with zinc coating and corrosion resistant epoxy finish, size as indicated.

.3 Electrical metallic tubing EMT, with couplings, size as indicated.

.4 Rigid pvc conduit: size as indicated.

.5 Flexible metal conduit and liquid-tight flexible metal conduit: size as indicated.

2.2 Conduit Fastenings

.1 One hole malleable iron and steel straps to secure surface conduits up to size 50 mm and 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.

.4 6 mm diameter galvanized after fabrication threaded rods to support suspended channels.

2.3 Conduit Fittings

.1 Fittings for raceways: to CSA C22.2No.18-1972.

.2 Fittings manufactured for use with conduit specified.

.3 Factory 90° bends are required for 25 mm and larger conduits.

2.4 Expansion Fittings for Rigid Conduit

.1 Weatherproof expansion fittings with internal bonding assembly suitable for linear expansion as indicated.

2.4 Expansion Fittings for Rigid Conduit (Cont'd)

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions as indicated.

PART 3 - EXECUTION

3.1 Installation

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in unfinished areas.

.3 Use rigid galvanized steel threaded conduit except where specified otherwise.

.4 Use epoxy coated conduit underground, except where otherwise indicated.

.5 Install wiring in conduit unless otherwise specified.

.6 Use thin wall conduit, up to and including 50 mm conduit size, for branch circuit and signal wiring in ceilings, furred spaces, and in hollow walls and partitions. Use rigid galvanized steel conduit for wiring in poured concrete, where exposed, and for conduit 65 mm or larger.

.7 Aluminum conduit may be used, in lieu of rigid steel conduit, in clean and dry locations, but shall not be used in poured concrete, or for signal and intercommunication systems wiring.

.8 Conduit manufacturer's touchup enamel shall be used to repair all scratches and gouges on epoxy-coated conduit.

.9 Use flexible metal conduit for connection to recessed fixtures without a prewired outlet box.

.10 Use liquidtight flexible metal conduit for connection to motors.

.11 Use condulets with suitable covers where conduits are exposed. Each conduit fitting shall be of a type suitable to

3.1 Installation (Cont'd)

its particular use and of a type which will allow installation of future conduits without blocking covers of existing condulets.

.12 Install junction boxes or cable anchor boxes wherever necessary for proper pulling or anchoring of cables. Install so as to be accessible after building is completed and set to come within finished lines of building.

.13 Terminate rigid conduit entering boxes or enclosure with nylon insulated steel threaded bushings.

.14 Terminate EMT entering boxes or enclosures with nylon insulated steel concrete tight connectors.

.15 Terminate flexible conduit entering boxes or enclosures with nylon insulated steel connectors.

.16 Install wall entrance seals where conduits pass through exterior walls below grade.

.17 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.18 Install polypropylene fish cord in empty conduits, tied at each outlet.

.19 Where conduits become blocked, remove and replace blocked section.

.20 Dry conduits out before installing wire.

.21 Where EMT is used, run green insulated ground wire in conduit in accordance with Section 16291.

3.2 Surface Conduits

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on channels.

3.2 Surface Conduits (Cont'd)	.4	Do not pass conduits through structural members except with Engineer's prior authority.
	.5	Do not locate conduits closer than 75 mm where parallel to steam or hot water lines with a minimum of 25 mm at cross-overs.
3.3 Concealed Conduits	.1	Do not install horizontal runs in masonry walls.
	.2	Do not install conduits in terrazzo or concrete toppings.
3.4 Conduits in Poured Concrete	.1	Locate to suit reinforcing steel. Install in centre one third of slab.
	.2	Protect conduits from damage where they stub out of concrete.
	.3	Install sleeves where conduits pass through slab or wall.
	.4	Where conduits pass through waterproof membrane provide oversized sleeve before membrane is installed. Use cold mastic between sleeve and conduit.
	.5	Encase conduits completely in concrete.
3.5 Conduits in Poured Slabs on Grade	.1	Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope.
3.6 Conduits Underground	.1	Slope conduits to provide drainage.
	.2	Waterproof joints (PVC excepted) with a heavy coat of bituminous paint.

**********END**********

PART 1 - GENERAL

1.1 Description .1 System consists of a suspended, ceiling grid and accessories which accommodates ceiling tiles, lighting, sprinklers and ventilation.

PART 2 - PRODUCTS

2.1 Materials .1 The system will be provided under Section 13500.

PART 3 - EXECUTION

3.1 Installation .1 System components will be installed under Section 13500, ready for power feed connections by Division 16.

.2 Provide 120 volt power feeds as indicated and connect to luminaires and service poles.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data for cabinets in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Splitters

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs, Connection bars to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400 A.

.4 Finish splitter as follows based on Sherwin-Williams colours: Normal Power - F65LQ114 (blue) and Emergency Power - F65EG9 (international orange)

2.2 Junction and Pull Boxes

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.3 Terminal Cabinets

.1 Type C: sheet steel, hinged door handle, lock and catch, for surface mounting.

.2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, for flush mounting.

.3 Comply with Section 16234 Panel Trim.

.4 Cabinets to have screw type indexed terminals.

.5 Inside of door to have metal frame and clear plastic cover for directory.

PART 3 - EXECUTION

3.1 Installation

.1 Install splitters as indicated and mount plumb, true and square to the building lines.

3.1 Installation (Cont'd)

.2 Mount terminal cabinets with top not higher than 2 m above finished floor.

.3 Use terminal cabinets for terminating telephone and communication systems wiring.

.4 Provide pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 Identification

.1 Install nameplates indicating system name voltage and source of power in accordance with Section 16010.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Box connectors:	Section 16315

PART 2 - PRODUCT

2.1 Outlet and Conduit Boxes General	.1	Size boxes in accordance with CSA C22.1-1978, Section 12-3042.
	.2	102 mm square or larger outlet boxes as required for devices.
	.3	Gang boxes where wiring devices are grouped.
	.4	Blank cover plates for boxes without wiring devices.
	.5	Combination boxes with barriers where outlets for more than one system are grouped.
	.6	Masonry boxes in masonry walls.
	.7	Weatherproof type FS outside building.
2.2 Sheet Steel Outlet Boxes	.1	Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 and 50 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.
	.2	Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
	.3	102 mm square or octagonal outlet boxes for lighting fixture outlets.
	.4	102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster or tile walls.
2.3 Masonry Boxes	.1	Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.
2.4 Concrete Boxes	.1	Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 Fittings - General

.1 Bushings and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of foreign materials.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

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 construction material.

.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. Reducing washers not allowed.

.5 Provide a suitable outlet box for each light, switch, receptacle or other outlet, approved for the particular area in which it is to be installed.

.6 Locate outlet boxes, mounted in hung ceiling space, so they do not obstruct or interfere with the removal of lay-in ceiling tiles.

.7 Offset outlet boxes, shown back to back in partitions, horizontally to minimize noise transmission between adjacent rooms.

.8 Use gang boxes at locations where more than one device is to be mounted. Use combination boxes with suitable barriers where outlets for more than one system are shown.

3.1 Installation (Cont'd)	.9	Use tile wall covers where 100 mm square outlet boxes are installed in exposed concrete or cinder block in finished areas.

**********END**********

PART 1 - GENERAL

1.1 Related Work .1 Low voltage remote control: Section 16935

1.2 Product Data .1 Submit product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Local Switches .1 Local switches shall be 20 ampere, silent, A.C. type and C.S.A. listed.

.2 Catalogue numbers listed below have been used for convenience only to indicate quality standards.

Type	Approved Catalogue Numbers
	Hubbell (120 Volt)
Single Pole	1221
Double Pole	1222
Three-Way	1223
Four-Way	1224

.3 Combination switches shall have neon pilot light and jewel on stainless steel plates.

.4 Switches controlling lights on 120 volt emergency circuits shall be silent mercury type with lighted handles. Catalogue numbers listed below have been used for convenience only to indicate quality standards:

Type	Approved Catalogue Numbers		
	Smith & Stone	Bryant	P & S
Single Pole	1-4701-3	4701GL1	3008-GL
Three-Way	1-4703-3	4703GL1	3010-GL

.5 Local switches and receptacles shall be of the same manufacturer throughout except where a specified item is not made by that manufacturer.

2.2 Receptacles .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:

.1 Urea molded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Break-off links for use as split receptacles.

2.2 Receptacles (Cont'd)

.4 Eight back wired entrances, four side wiring screws.
.5 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
.1 Urea molded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Receptacles on Normal Power shall be "brown" and on Emergency Power "red".

2.3 Special Wiring Devices

.1 Special wiring devices:
.1 Photovoltaic sensor shall be single throw, single pole, 120 volt, 15 amp type, complete with weatherproof tamperproof cast enclosure for surface mounting, as manufactured by: Tork - Model 2100.

2.4 Cover Plates

.1 Cover plates for wiring devices.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.4 Stainless steel, Type 302 brushed, 1 mm thick cover plates for wiring devices mounted in a flush-mounted outlet box.

.5 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.6 Weatherproof lift spring-loaded cast cover plates, complete with gaskets for duplex receptacles outside building, as manufactured by: Crouse Hinds No. WLRD-1.

PART 3 EXECUTION

3.1 Installation

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height specified in Section 16010 or as indicated.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height specified in Section 16010 or as indicated.

.3 Cover plates:

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

.4 Mount photovoltaic sensors facing north.

**********END**********

PART 1 - GENERAL

1.1 Product Data .1 Submit product data in accordance with 01340.

PART 2 - PRODUCTS

2.1 Explosionproof Receptacles .1 Receptacles to be duplex type, CSA listed 20 A, 120 volts unless otherwise indicated 3 wire, 3 pole (with ground) with the following features:

.1 arctite receptacles
.2 delayed action circuit breaking type
.3 spring return door
.4 factory sealed assembly
.5 pressure type wiring terminals
.6 neoprene gaskets
.7 twist lock receptacle to plug to close circuit
.8 explosionproof threaded joints
.9 angle type fitting

.2 Receptacles to be suitable for hazardous locations, Class I Group C and D applications.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Receptacles on Normal Power shall be colour coded "brown" and on Emergency Power "red".

2.2 Coverplates .1 Coverplates to be an integral part of receptacle.

PART 3 - EXECUTION

3.1 Installation .1 Receptacles:

.1 Install receptacles in locations shown.
.2 Mount receptacles at height specified in Section 16010 or as indicated.

**********END**********

PART 1 - GENERAL

1.1 Product Data .1 Submit product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Power Receptacles .1 Single receptacles, 600 volt CSA listed, 3 wire, 4 pole (with ground) with the following features:
.1 weatherproof
.2 arctite
.3 angle adapter
.4 suitable for extra flexible wire
.5 self closing spring door
.6 threaded nuts to provide positive plug retention
.7 suitable matching plug for each receptacle
.8 large wire wells

.2 Receptacles of one manufacturer throughout.

.3 Receptacles shall be as follows:
100 A - Crouse Hinds #AREA10485
200 A - Crouse Hinds #20422
400 A - Crouse Hinds #AR4042

.4 Receptacles to include suitable backboxes, covers, adapters for a complete installation.

PART 3 - EXECUTION

3.1 Installation .1 Receptacle:
.1 Install receptacles in locations shown.

**********END**********

PART 1 - GENERAL

1.1 Product Data .1 Submit product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Materials .1 Single recoil extension units, CSA listed, 250 volts, 3 wire (with ground) with suitable trouble light or duplex receptacle as shown and with the following features:

.1 industrial heavy duty
.2 heavy gauge cable drum and housing
.3 copper graphite contact points
.4 floating brush holder
.5 instant automatic positive lock
.6 rotating external control
.7 extension cord to be #16 AWG 300 volt, yellow SJO cord, cord length 10 m
.8 adjustable stop
.9 self-contained springs which do not require lubrication
.10 declutching feature to eliminate breakage on rewind
.11 swivel bracket
.12 wall mounting unless otherwise indicated
.13 steel construction remote controlled ratchet lock

.2 Trouble light bracket to include the following:

.1 on/off switch
.2 enclosed metal lamp guard
.3 100 W incandescent lamp
.4 rubber base

.3 Duplex receptacle bracket to include the following:

.1 Enclosed metal box, rubber adapter and suitable coverplate.
.2 2 pole, 3 wire with ground CSA configuration 5-15R, 15 ampere, 120 volt.

.4 Trouble light and duplex receptacle recoil units to be of one manufacturer throughout.

PART 3 - EXECUTION

3.1 Installation

.1 Install recoil lamps and receptacles where shown.

.2 Provide direct connection to each unit or provide a duplex receptacle for each unit as required by manufacturer.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Installation of anchor devices, setting templates: Section 03300

.2 Concrete pad: Section 03300

.3 Automatic load transfer equipment: Section 16440

1.2 Description of System

.1 Generator set consists of:
- .1 Diesel engine
- .2 Alternator
- .3 Alternator control panel
- .4 Battery charger and battery
- .5 Structural steel mounting base.

.2 Set designed to operate as emergency standby.

1.3 Operation of Emergency Power System

.1 If any one or all phases of normal supply to one or all of automatic transfer switch should fail, a contact in switch shall close after a delay and initiate automatic starting of the diesel-generator unit.

.2 Certain lighting loads, elevator and pumps, supplied through transfer switches, shall be automatically reconnected to emergency power supply by operation of automatic transfer switches after generator reaches rated voltage and speed, so that these items will continue to operate as required.

.3 Automatic transfer switch shall transfer its load back to normal source when normal power service is restored, and elevators will restart and return to normal operation.

1.4 Shop Drawings

.1 Submit Shop Drawings in accordance with Section 01340.

.2 Include:
- .1 Engine: make and model, with performance curves.
- .2 Alternator: make and model.
- .3 Voltage regulator: make, model and type.
- .4 Battery: make, type and capacity.
- .5 Battery charger: make, type and model.
- .6 Alternator control panel: make and type of meters and controls.
- .7 Governor type and model.

1.4 Shop Drawings (Cont'd)

.8 Cooling air requirements in m^3/s.
.9 British standard rating of engine.
.10 Flow diagrams for:
  .1 Diesel fuel
  .2 Lubricating oil
  .3 Cooling air.
.11 Dimensioned drawing showing complete generating set mounted on steel base, including vibration isolators, exhaust system, drip trays, and total weight.
.12 Dimensions and structural specifications of engine-generator foundation.
.13 Continuous full load output of set at 0.8 pf lagging.
.14 Description of set operation including:
  .1 Automatic starting and transfer to load and back to normal power, including time in seconds from start of cranking until unit reaches rated voltage and frequency.
  .2 Manual starting.
  .3 Automatic shut down on:
    .1 Overcranking
    .2 Overspeed
    .3 High engine temp
    .4 Low lube oil pressure
    .5 Short circuit
    .6 Alternator overvoltage
    .7 Lube oil high temperature.
  .4 Manual remote emergency stop.
.15 Evaluation of Canadian content.

1.5 Preliminary Data

.1 Prior to final purchase of Diesel-generator set submit the following information, contained in a binder, for approval:
.1 Preliminary dimensioned outline of unit.
.2 Confirmation of Diesel exhaust pipe diameter.
.3 Brake horsepower versus rated speed curves.
.4 Diesel fuel consumption and cooling water data.
.5 Performance curves for local conditions and multipliers for ambient temperatures.
.6 Generator damage curves.
.7 Generator decrement curves showing current delivered for specified faults.

1.5 Preliminary Data (Cont'd)

.8 Generator decrement curves plotted against generator main breaker curve.
.9 Efficiency of generator.
.10 List of components.

1.6 Operation and Maintenance Data

.1 Provide data for incorporation into maintenance manual specified in Sections 01730 and 16010.

.2 Operation and Maintenance Manual to include instructions for particular unit supplied and not general description of units manufactured by supplier and:
.1 Operation and maintenance instructions for engine, alternator, control panel, automatic transfer switch, battery charger, battery, fuel system, exhaust system and accessories, to permit effective operation, maintenance and repair.
.2 Technical data:
.1 Illustrated parts lists with parts catalogue numbers.
.2 Schematic diagram of electrical controls.
.3 Flow diagrams for:
.1 Fuel system
.2 Lubricating oil
.3 Cooling system.
.4 Certified copy of factory test results.

1.7 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

.2 Include:
.1 6 fuel filter replacement elements.
.2 6 lube oil filter replacement elements.
.3 6 air cleaner filter elements.
.4 2 sets of fuses for control panel.
.5 Special tools for unit servicing.

1.8 Source Quality Control

.1 Factory test generator set including engine, alternator, control panels and accessories in presence of Engineer.

.2 Notify Engineer seven days minimum in advance of date of factory test.

.3 Test procedure:
.1 Prepare blank forms and check sheet with spaces to record data. At top of first sheet record:

1.8 Source Quality Control (Cont'd)

.1 Date
.2 Generator set serial no.
.3 Engine, make, model, serial no.
.4 Alternator, make, model, serial no.
.5 Voltage regulator, make and model.
.6 Rating of generator set, kW, kVA, V, A, r/min, Hz.

.2 Mark check sheet and record data on forms in duplicate as test proceeds.

.3 Witness's signature on completed forms to indicate concurrence in results of test.

.4 Tests:

.1 With 100% rated load, operate set for four hours, taking readings at 30 min intervals, and record following:

.1 Time of reading
.2 Running time
.3 Ambient temp in °C
.4 Lube oil pressure in kPa
.5 Lube oil temp in °C
.6 Engine coolant temp in °C
.7 Exhaust stack temp in °C
.8 Alternator voltage, phase 1, 2 and 3.
.9 Alternator current, phase 1, 2 and 3.
.10 Power in kW
.11 Frequency in Hz
.12 Power factor
.13 Battery charger current in A
.14 Battery voltage
.15 Alternator stator temp in °C.

.2 At end of four hour run without shutting down or making additional adjustments, increase load to 110% rated value, and take readings every 15 minutes for 1 hour.

.3 After completion of five hour run, demonstrate following shut down devices and alarms:

.1 Overcranking
.2 Overspeed
.3 High engine temp
.4 Low lube oil pressure
.5 Short circuit
.6 Alternator overvoltage
.7 Low battery voltage, or no battery charge.
.8 Manual remote emergency stop.

1.8 Source Quality Control (Cont'd)

.4 Next install continuous strip chart recorders to record frequency and voltage variations during load switching procedures, with chart speed of 1.3 mm/s. Each load change delayed until steady state conditions exist. Switching increments to include:

.1 No load to full load to no load.
.2 No load to 70% load to no load.
.3 No load to 20% load to no load.
.4 20% load to 40% load to no load.
.5 40% load to 60% load to no load.
.6 60% load to 80% load to no load.

.5 Demonstrate:

.1 Automatic starting of set and automatic transfer of load on failure of normal power.
.2 Automatic retransfer on resumption of normal power.
.3 That battery charger reverts to high rate charge after cranking.

.6 Demonstrate low oil pressure and high engine temperature shutdowns by removing sensors and installing to show excessive oil pressure and high temperature at devices without subjecting engine to these excesses.

.7 Fuel consumption for duration of 5 hour test shall be recorded on form.

1.9 Guarantee

.1 Provide a written guarantee, signed and issued in the name of Her Majesty, the Queen in right of Canada, stating that the generating set is guaranteed against defects in material and workmanship for a period of 5 years, or 1500 operating hours, which ever occurs first, from the date of the Final Certificate of Completion.

PART 2 - PRODUCTS

2.1 Diesel-Generator Set

.1 Alternator and exciter, diesel set, instruments, meters and switches shall be C.S.A. approved.

2.1 Diesel-Generator Set (Cont'd)

.2 Diesel-generator performance and accessories shall conform to C.S.A. Standard C282 Z32.4.

.3 Finish shall be Sherwin-Williams International Orange - F65EG9.

2.2 Engine

.1 Diesel engine: to British Standard Specification BS649-1958.

.2 Prime mover: full diesel synchronous speed 1800 r/min., maximum.

.3 Capacity:

.1 Total output of engine in hp (brake) = British standard rating as defined in BS649-1958 expressed in hp (brake), minus the sum of the following:

.1 Power to drive cooling fan

.2 Power loss for site conditions

.2 Site conditions; derate for:

.1 Ambient temp 40°C

.2 Relative humidity 60%

.3 Generator rating in kW x 1.34 divided by generator efficiency this formula gives minimum net B.H.P.

.4 Engine shall be sized to ensure that generator can deliver rated voltage and frequency within 10 seconds after signal to start has been given by automatic transfer switch.

.5 BHP, plus allowance for engine driven accessories, shall not exceed 85% of maximum BHP of engine at generator RPM as substantiated by engine manufacturer's regularly published BHP curves. Engine rating conditions shall be 38°C ambient, 330 m above sea level. Engine manufacturer shall either show horsepower curves at these conditions or at other conditions together with derating factors including data on losses to engine driven accessories.

.4 Cooling System:

.1 Liquid cooled: heavy duty industrial radiator mounted on generating set base with engine driven pusher type fan to direct air through radiator from engine side. Thermostatically controlled, with ethylene glycol anti-freeze non-sludging above -46°C.

.2 To maintain manufacturer's recommended engine temperature range at 10% continuous overload in ambient temp of 38°C.

2.2 Engine (Cont'd)

.3 Block heater: thermostatically controlled liquid coolant heater connected to normal power to allow engine to start in room ambient 0°C. Heater shall be rated 120 volts.
.4 Radiator shall be complete with a flange for duct connection.
.5 Engine cooling system shall include built-in centrifugal type water circulating pump and thermostat to maintain proper jacket water temperature under each load condition.
.6 Radiator duct connection will be provided under Mechanical Division.

.5 Fuel:
.1 Type A fuel oil to CGSB 3-GP-6c.

.6 Fuel system: solid injection, mechanical fuel transfer pump with hand primer, fuel filters and air cleaner, fuel rack solenoid energized when engine running.

.7 Governor:
.1 Governor shall be capable of isochronous operation, no load to full load and capable, under any steady state condition, of maintaining engine speed within ± 1%.
.2 Governor shall be as manufactured by: Woodward-Type PSG.

.8 Engine shall be provided with full pressure lubrication with gear driven pump, pressure regulator, replaceable element filter with by-pass valve, supplying filtered lubricating oil under pressure to main bearings, crank pin bearings, piston pins, timing gears, camshaft bearings, valve rocker mechanism, governor and turbo-chargers. Readily accessible drain valves with suitable piping shall be provided for convenient draining of complete lubricating oil system. A water-cooled lubricated oil cooler shall be included.

.9 Starting System:
.1 Electric starting system minimum 24 volt shall include starting motor, charging dynamo, cutout, regulator and batteries, capable of providing six consecutive normal starts without recharging. Fully automatic battery

2.2 Engine (Cont'd)

charger with monitor circuit to prevent overcharging and capable of recharging batteries in 30 minutes following one normal start, shall be complete with battery rack, jumpers, cables and hydrometer.

.2 When battery voltage falls below a level suitable for starting, a contact on a secondary relay shall close to enable a signal to be sent to the Control Console.

.3 On failure of normal power supply on one or all of automatic transfer switches, a control on any transfer switch shall operate, after a delay, to cause diesel-engine to be started. Transfer switches shall operate when diesel-alternator reaches rated voltage and speed and transfer load to diesel-alternator. Upon return of normal power supply, transfer switch shall transfer load back after a time delay. Diesel-generator shall continue to operate until shut down manually.

.10 Safety and Alarm Devices:

.1 Two sets of temperature and pressure switches shall be included for coolant system and lube oil system. One set of temperature and pressure switches shall be set at a value, other than shut-down conditions, to operate an alarm and annunciator lights to indicate that engine is approaching a dangerous operating condition and is presently operating at critical limits. A second set shall provide instant shut-down action. Settings of these switches shall be as recommended by Engine manufacturer. Overspeed shall cause instant shut-down.

.2 The anticipatory switches shall have spare contacts wired in parallel, which will be connected to the Control Console.

.11 The following gauges shall be supplied and shall be flexibly mounted on engine:

.1 Coolant in and out temperature gauges.

.2 Engine water temperature gauge

.3 Lube oil pressure gauge

.4 Dynamo charging ammeter

.5 Tachometer

2.2 Engine (Cont'd)

.6 Hourmeter
.7 Exhaust temperature thermometer
.8 Lube oil temperature gauge.

.12 Miscellaneous:
.1 Engine package shall be equipped to accept gravity feed from fuel storage system.
.2 Flexible fuel lines shall be supplied by diesel manufacturer and shall be as manufactured by: Aeroquip.

.13 Guards to protect personnel from hot and moving parts.

.14 Drip tray.

2.3 Alternator

.1 Alternator: to CSA C22.2 No. 100-1974 and NEMA MG1-1978.

.2 Drip proof.

.3 Diesel-driven alternator shall be complete with necessary controls and accessories, to comprise a fully automatic standby generating plant capable of producing power in event of failure of normal supply. Generator shall be capable of operating on system voltage indicated, 80% power factor and maximum 1800 rpm.

.4 Generator shall be of rotating field type with brushless exciter and shall be capable of maintaining 400% of full load current for 10 seconds at terminals of generator, without damage to generator, for the following fault conditions:
.1 3 phase symmetrical fault
.2 Phase to phase fault
.3 Phase to ground fault.

.5 Generator shall be equipped to accept a solid ground connection.

.6 Generator shall be complete with automatic voltage regulator and exciter, acting on each phase and capable of controlling voltage within ± 2% of rated voltage, no load to full load, during steady state conditions.

2.3 Alternator (Cont'd)

.7 Unit shall be capable of producing 250 kW of power at 80% power factor at output terminals of generator for 24 hours, continuously.

2.4 Control Panel

.1 Totally enclosed, free standing CSA sprinklerproof enclosure.

.2 Panel door with formed edges and lockable handle with 2 keys.

.3 Flexible conductors between door and fixed panel.

.4 Voltmeter, flush mounting, CGE AO-91 long scale type, with 3 phase and phase-to-neutral selector switch, 3 position.

.5 Ammeter, flush mounting CGE AO-91 long scale type, with 3 phase selector switch, with direct reading scale marked to show generator full load current.

.6 Frequency meter, flush mounted, pointer type, scale 58-62 Hz.

.7 3 pole drawout circuit breaker, with static trips as shown on drawings with selective trip setting as recommended by generator supplier.

.8 Automatic start/manual shutdown relay system including "Auto", "Off" and "Manual" selector switch and indicating lights.

.9 Individual red indicating lights and alarm bell for safety conditions.

.10 Pre-shutdown red warning light for high coolant temperature.

.11 Demand wattmeter to indicate load on unit.

.12 Terminals, to provide remote indication of safety conditions.

.13 Blue light to indicate that alternator set is running.

2.4 Control Panel (Cont'd)

.14 Green lights to indicate that each automatic transfer switch has operated.

.15 Voltage adjusting rheostat.

.16 Colour coded wiring, and necessary instrument transformers, nameplates, bus and terminal blocks.

.17 A set of normally open/normally closed contacts, electrically isolated, activated by running engine for connection to room ventilation system.

.18 Engine start button.

.19 Engine emergency stop button plus provision for remote emergency stop button.

.20 Low battery voltage, or no battery voltage continuously monitored even when engine not running. Auto reset alarm.

.21 Finish shall be Sherwin-Williams International Orange - F65EG9.

2.5 Structural Steel Mounting Base

.1 Complete generating set mounted on structural steel base of sufficient strength and rigidity to protect assembly from stress or strain during transportation, installation and under operating conditions on suitable level surface.

.2 Assembly fitted with vibration isolators.

.1 Spring type isolators with adjustable side snubbers, and with sound pads.

.2 Vibration isolators to have minimum 12 mm static deflection.

2.6 Exhaust System

.1 Heavy duty, residential type, horizontally mounted exhaust silencer flanged couplings, as indicated.

.2 Suitable length of heavy duty flexible exhaust hose with flanged couplings as indicated.

.3 Fittings and accessories as required.

.4 Expansion joints: stainless steel, corrugated, of suitable length, to absorb both vertical and horizontal expansion.

2.6 Exhaust System (Cont'd)	.5	Flexible hose connections shall have sufficient length to handle the movement specified and to handle expansion between anchors in the piping plus not less than 25% safety factor, from 0°C. ambient temperature to corresponding exhaust gas temperature.
	.6	Flexible hose shall be as manufactured by: Flexonics Corp. of Canada Ltd. - RF-45 Series 400 S.S.
	.7	Muffler shall be as manufactured by: The Maxim Silencer Co., Vibron Ltd.
	.8	Flanges shall be steel, slip-on. Exhaust pipe shall be sized by supplier of diesel unit.
	.9	If diesel has two outlet exhaust connections, supply inverted 'Y' type pipe fittings for transition from two to one exhaust.
	.10	Deliver flexible hose (expansion joint), cross-over pipe, flanges, muffler and gaskets for Mechanical Division for installation and obtain receipt.
2.7 Fuel System	.1	Provide fuel lines including flexible fuel lines for 1.0 m from engine and connect to valves supplied by Mechanical Division 15.
	.2	Remainder of fuel system will be by Mechanical Division 15.
2.8 Finishes	.1	Apply finishes in accordance with Section 16010.
	.2	Alternator control cubicle: inside finish white, exterior to match engine and alternator.
	.3	Supply 0.25 L of international orange touch-up enamel.
2.9 Equipment Identification	.1	Provide equipment identification in accordance with Section 16010.
	.2	Control panel: .1 Size 4 nameplates for controls such as alternator breakers and program selector switch. .2 Size 3 nameplates for meters, alarms, indicating lights and minor controls.

2.10 Fabrication .1 Shop assemble diesel-generator unit including:
- .1 Base
- .2 Engine and radiator
- .3 Alternator
- .4 Control panel
- .5 Battery and charger.

2.11 Manufacturers .1 The diesel-generator plant shall be supplied by one supplier, who shall be a reputable company regularly engaged in producing and servicing this type of equipment. The diesel-generator plant supplier shall provide all necessary appurtenances, including all items and services specified, so that the installed plant is a complete and fully automatic plant for the production of power in the event of failure of the normal power supply. The diesel-generator plant supplier shall have been franchised for the proposed engine for at least the last five years. An existing, fully equipped parts and service facility must be available within 200 miles of the site.

2.12 Acceptance Test (Final On-Site Testing) .1 A competent diesel-generator expert shall be supplied for two working days, at a time convenient to Owners, to instruct Owners' staff in maintenance and operation, and shall be present during on-site acceptance test.

.2 Engine manufacturer shall provide an electric resistor artificial load of approximately 120% of full rated load for use during six hours test.

PART 3 - EXECUTION

3.1 Installation .1 Locate diesel generating unit and install as indicated. Provide minimum 150 mm thick concrete inertia pad and to suit manufacturer's recommendations.

.2 Complete wiring and interconnections as indicated.

.3 Start generating set and test to ensure correct performance of components.

.4 Install complete starting system including batteries, jumpers and cables.

.5 Provide flexible fuel and electrical connections to diesel-generator.

3.1 Installation (Cont'd)

.6 Mount diesel-generator package on structural steel base with suitable adjustable steel spring vibration isolators with sound pads mounted between steel base and concrete inertia pad. Touch-up areas marred in transit.

.7 Provide interconnecting wiring between diesel-generator and control panel.

.8 Provide remote indication of safety conditions.

.9 Ground generator frame to perimeter ground system.

.10 Conduct an acceptance test after preliminary runs and tests have been made. Conduct this test on site after completion of installation. This acceptance test shall not be of less than six hours duration with full rated load.

.11 Provide 100 mm high concrete pad under control panel.

3.2 Testing

.1 Perform tests in accordance with Section 16010.

.2 Notify Engineer at least 10 working days in advance of test date.

.3 Demonstrate:
.1 Unit start, transfer to load, retransfer to normal power, unit shut down, on "Automatic" control.
.2 Unit start and shut down on "Manual" control.
.3 Unit start and transfer on "Test" control.
.4 Unit start on "Engine start" control.
.5 Operation of automatic alarms and shut down devices.

.4 Run unit on full rated load for minimum period of 6 hours to show load carrying ability, stability of voltage and frequency, and satisfactory performance of dampers in ventilating system to provide adequate engine cooling.

.5 At end of test run check battery voltage to demonstrate battery charger has returned battery to fully charged state.

3.2 Testing (Cont'd)

.6 Install and connect artificial load supplied by engine supplier temporarily and use it during six hour test.

.7 After completion of above test, perform tests to demonstrate overload protection, low oil pressure protection and over-speed protection. Demonstrate functioning of safety devices.

**********END**********

PART 1 - GENERAL

1.1 Design Criteria

.1 Automatic load transfer equipment to:
.1 Monitor voltage of normal power supply.
.2 Initiate cranking of standby generator unit on normal power failure.
.3 Transfer load from normal supply to standby unit when standby unit reaches rated speed and voltage.
.4 Transfer load from standby unit to normal power supply when normal power restored.

1.2 Shop Drawings

.1 Submit Shop Drawings in accordance with Section 01340.

.2 Include:
.1 Make, model and type.
.2 Description of equipment operation including:
.1 Automatic starting and transfer to standby unit and back to normal power.
.2 Test control.
.3 Manual control.

.3 Evaluation of Canadian content.

1.3 Operation and Maintenance Data

.1 Provide data for incorporation into maintenance manual specified in Sections 01730 and 16010.

.2 Detailed instructions to permit effective operation, maintenance and repair.

.3 Technical data:
.1 Schematic diagram of components, controls and relays.
.2 Illustrated parts lists with parts catalogue numbers.
.3 Certified copy of factory test results.

1.4 Source Quality Control

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested.

.2 Tests:
.1 Operate equipment both mechanically and electrically to ensure proper performance.
.2 Check test switch, in 2 positions (Test, Auto) and record results.
.3 Check voltage sensing and time delay relay settings.

1.5 Verification

.1 Completed installation shall be checked and tested by transfer switch manufacturer who shall issue a report to the Engineer stating that transfer switches are installed and operating in accordance with Drawings, Specifications and Manufacturer's recommendations.

.2 Arrange and pay for the verification by the manufacturer.

.3 Obtain approval of this report.

PART 2 - PRODUCTS

2.1 Materials

.1 Meters: to CSA C17-1975.

.2 Instrument transformers: to CSA C13-1970.

.3 Transfer switches to CSA C22 and to be Type "A" as specified in the standard.

2.2 Transfer Switches

.1 Automatic transfer switches sized as shown shall be 3 pole, double throw of voltage and rating shown. They shall include the following accessories:

.1 Type 1B - 3 second time delay
.2 Type 2A - Adjustable time delay on retransfer to normal, set at 5 minutes.
.3 Type 2B - Adjustable time delay on transfer to emergency, set at 40 seconds.
.4 Type 5 - Maintained contact type test switch
.5 Type 7 - Auxiliary contact to close when normal power fails
.6 Type 9B - Pilot light to indicate transfer switch is in emergency position
.7 Type 14A - Auxiliary contact on main shaft (closed on normal)
.8 Type 14B - Auxiliary switch on main switch (closed on emergency)
.9 Type 27 - In phase monitor
.10 Type 28 - Overlapping neutral contacts
.11 Type 35 - Externally-mounted quick-make quick-break operating handle.

.2 Transfer switches to have two-way by-pass feature with manual double throw.

.3 Transfer switches shall be rated continuous duty at capacity specified, and shall be electrically operated, mechani-

2.2 Transfer Switches (Cont'd)

cally held, operating from a single coil mechanism momentarily energized. Switches shall be inherently interlocked mechanically and electrically, and failure of any coil or disarrangement of any part shall not permit a neutral position. Main contacts shall be protected by separate arcing contact with blowout coils and arc chutes.

.4 Operation of switch shall be such that when any phase of normal power supply at transfer switch drops below 70% of normal voltage for 3 seconds, a relay on that transfer switch shall operate to cause Diesel-engine to be started. When Diesel-alternator reaches rated voltage and frequency, the transfer switch shall operate to transfer load to Diesel-alternator. When normal power supply is restored and voltage on all phases is 90% or more for 5 minutes, switch shall transfer load back to normal power supply.

.5 Each switch shall have a maintained contact test toggle switch which shall simulate a power failure and cause Diesel to start and load to transfer. When the test switch is manually reset, the load shall transfer back to Hydro after time delay on Acc. 2A has expired. Test switch shall be mounted on outside of door and equipped with a guard to prevent accidental actuation.

.6 A pilot light shall be located on door of each transfer switch to indicate that switch is in "EMERGENCY" feed position.

.7 Automatic transfer switches shall be enclosed in oversized EEMAC 3 enclosure to accommodate the number of cables, bus ducts entering switch. Phase collection shall take place within enclosure.

.8 Sensing and control relays shall be continuous duty, industrial control quality, with wiping action contacts rated 10 amp. minimum.

.9 Transfer switch shall be capable of withstanding fault current of 44,000 Amp symmetrical for 20 Hz without damage to switch.

2.2 Transfer Switches (Cont'd)

.10 Control voltage between transfer switch and Diesel controls shall be compatible for interconnection of control wiring or an appropriate relay shall be installed by manufacturer of automatic transfer switch.

.11 Overall finish of each unit shall be equal to Sherwin-Williams International Orange - F65EG9; interiors shall be white.

2.3 Equipment Identification

.1 Provide equipment identification in accordance with Section 16010.

.2 Control panel:
.1 For selector switch size 4 nameplate.
.2 For indicating lights, minor controls, size 3 nameplates.

2.4 Manufacturers

.1 Acceptable manufacturer for transfer equipment: Ascolectric Ltd. Bulletin 962 Form "E".

2.5 Fabrication

.1 Shop assemble transfer equipment including:
.1 Mounting base and enclosure.
.2 Transfer switch and operating mechanism.
.3 Control transformers and relays.
.4 Accessories.

PART 3 - EXECUTION

3.1 Installation

.1 Locate, install and connect transfer equipment as indicated.

.2 Check relays and solid state monitors and adjust as required.

.3 Install and connect remote alarms as indicated.

.4 Provide interconnecting wiring between automatic transfer switch and Diesel-generator control panel.

.6 Ground automatic transfer switches as required, to perimeter ground bus.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Energize transfer equipment from normal power supply.

.3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position.

.4 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 10 min, then close main power to supply disconnect. Load should transfer back to normal power supply.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings .1 Submit shop drawings in accordance with Section 01340.

.2 Include schematic, wiring, interconnection diagrams.

PART 2 - PRODUCTS

2.1 Pushbuttons .1 Illuminated, heavy duty. Operator recessed type. Green with 1-NO and 1-NC contacts rated to suit contactor controlled ac labels as indicated. Stop pushbuttons coloured red, mushroom type labelled "emergency stop". Provide transparent guard to prevent accidental operation.

PART 3 EXECUTION

3.1 Installation .1 Install pushbutton stations as indicated and interconnect as indicated.

3.2 Tests .1 Perform tests in accordance with Section 16010.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at a time and check out operation of section.

.3 Upon completion of sectional test, undertake group testing.

.4 Check out complete system for operational sequencing.

.5 Provide one copy of test results.

**********END**********

PART 1 - GENERAL

1.1 Description of System

.1 Incoming telephone service facilities from property line to main terminal in concrete encased underground duct.

1.2 Co-ordination with Telephone Authority

.1 Co-ordinate with telephone authority to ensure availability of service, and suitability of duct bank termination.

PART 2 - PRODUCTS

2.1 Materials

.1 Plywood backboards in accordance with Section 06100.

.2 Duct banks in accordance with Section 16105.

.3 Grounding in accordance with Section 16291.

.4 Telephone raceway system in accordance with Section 16510.

PART 3 - EXECUTION

3.1 Installation

.1 Install telephone service facilities as indicated.

.2 Install 19 mm thick plywood backboard in each telephone room.

.3 Install grounding facilities and make connections.

.4 Connect Owners ducts to those of telephone company.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Incoming telephone service Section 16509

1.2 System Description

.1 Complete empty telephone raceways system consists of outlet boxes, cover plates, terminal cabinets, conduits, cabletroughs, pull boxes, sleeves, fish cords, concrete encased ducts.

PART 2 - PRODUCTS

2.1 Material

.1 Conduits: to Section 16320.

.2 Underground duct banks: to Section 16105.

.3 Junction boxes, cabinets to Section 16365.

.4 Outlet boxes, conduit boxes and fittings: to Section 16375.

.5 Fish cord: polypropylene type.

.6 Wall outlets in offices and similar areas shall be Type GCB-2 boxes with 2-gang plaster ring. Other outlets shall be 120 mm square boxes with single gang plaster ring.

.7 Cover plates shall be two piece split through cable hole type on plaster rings so that they are flush with finished plaster walls. Plates shall have 20 mm bushed holes. Plates shall be stainless steel as specified.

Pg. 2.2 Addendum #1
* 2.2 Weatherproof Telephone Receptacles.

PART 3 - EXECUTION

3.1 Installation

.1 Install empty raceway system, including fish cord, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, miscellaneous and positioning material to constitute complete system.

.2 Vertically mount outlet boxes, unless noted otherwise, 300 mm to centre above floor, or 150 mm above counter top where shown at counters or benches. In mechanical equipment area, mount at 1350 mm.

3.1 Installation (Cont'd)

.3 Verify exact position of outlets to suit furniture layout.

.4 Fish conduit, clear blockages and outlets and clean out pull boxes at completion of installation. Leave conduit free of water or excess moisture. Install pull cord continuously from outlet to outlet, through conduit and fasten at each box.

.5 Conduit bends shall have a bending radius of not less than ten times conduit diameter. Ream out conduit and identify ends with green paint.

.6 Install additional steel pull boxes in such a manner that, throughout entire system, there shall be not more than two 90 degree or equivalent bends or more than 30 m in each run, so that wire or cables may be pulled in or withdrawn with reasonable ease. Minimum space requirements in pull boxes having one conduit each in opposite ends of the box, shall be as follows:

Maximum Size of Conduit in millimetres	Size of Box in millimetres			For each Additional Conduit Increase Width
	Width	Length	Depth	
20	100	300	75	50 mm
25	100	400	75	50 mm
32	150	500	75	75 mm
32	200	700	100	100 mm
50	200	900	100	125 mm

.7 Minimum space requirements in pull boxes for 90 degree pulls, shall be as follows:

Maximum Size of Conduit In millimetres	Size of Box in Millimetres			For each Additional Conduit Increase Width
	Width	Length	Depth	
20	150	300	100	50 mm
25	200	400	150	75 mm
32	250	450	200	75 mm
38	300	600	250	100 mm
50	350	750	300	125 mm

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**********END**********

PART 1 - GENERAL

1.1 Description of System

.1 Public address loudspeaker system to incorporate:
- .1 Voice paging.

.2 Operations:
- .1 Paging:
  - .1 Selective area page to areas as indicated.
  - .2 Emergency page to all areas.

1.2 Care, Operation and Start-up

.1 Provide instructions in accordance with Section 16010.

.2 Manufacturer's factory service engineer to instruct:
- .1 Maintenance personnel in the maintenance of system.
- .2 Operating personnel in the use of system.

1.3 Product Data and Shop Drawings

.1 Submit product data and shop drawings in accordance with Section 01340.

.2 Include, riser diagram, block diagram of complete public address system.

.3 Submit public address system design criteria for approval.

1.4 Maintenance and Operation Data

.1 Provide data for incorporation into maintenance manual specified in Sections 01730 and 16010.

.2 Include description of system operation.

.3 Include parts list, using component identification numbers standard to electronics industry.

1.5 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

PART 2 - PRODUCTS

2.1 Materials

.1 Electronic equipment to CSA C22.1 No. 1-1971.

.2 Building wires as indicated: to Section 16301.

.3 Conduits to Section 16320.

2.1 Materials (Cont'd)

.4 Communication conductors as indicated to Section 16590.

2.2 System Criteria

.1 Public address system to operate on 120 V nominal, 60 Hz input voltage.

.2 Continuous duty cycle.

.3 Modular system design.

.4 Components to be solid state, and suitable for rack mounting.

.5 Maximum operating temperature 65°C.

.6 Fan cooling of components.

2.3 Equipment Rack

.1 Rack, to accommodate system components, enclosed type, steel construction with internal mounting rails, wire and cable entrances with smooth edges protected by rubber edging, four adjustable rack levelling feet.

.2 Metal outlet raceway with colour coded outlets wired to 120 V, 60 Hz supply controlled by key type locking switch.

.3 Louvres and ventilation apertures in sides, top, back of rack for convection ventilation.

.4 Racks to contain but not necessarily limited to following components.

.1 Monitor panel.
.2 Relay assembly.
.3 Page selection panel.
.4 Timer.
.5 Power amplifiers.
.6 Power supplies.
.7 Installation and service connections to various panels by plug-in type terminal blocks with barriers and screw type terminals.
.8 Telephone paging input interface.

2.4 Monitor Panel

.1 Monitor panel to contain VU meter, selector, 150 mm monitor speaker and volume control to provide audible and visual monitoring of sound programmes.

.1 VU meter to have black scale for normal conditions, and red scale for overload conditions.

2.5 Microphone

.1 Microphone: close talking, noise cancellation, low impedance, dynamic type, complete with cradle, built-in preamplifier:
.1 Frequency response: 50 - 15,000 Hz.
.2 Output level: approximately -55 dB.
.3 Sensitivity: -149 dB.
.4 Output impedance, balanced to ground, 150 ohms.
.5 Housing, metal, desk.
.6 Push-to-talk switch.
.7 Magnetic dust shield.

2.6 Programme Mixer

.1 Inputs:
.1 6 continuously variable microphone volume controls.
.2 1 continuously variable master gain control.
.3 1 bass tone control with centre position flat and 10 dB boost to 10 dB cut either side.
.4 1 treble tone control switch with centre position flat and 10 dB boost 10 dB cut either side.

.2 Printed circuit board components to be dipped in protective compound for long life and protection against humidity.

.3 Solid state programme mixer. Mixer to operate on 12 to 24 V DC.

.4 Output volts: 1 V rms at less than 1% distortion.

.5 Frequency response: 30 - 10,000 Hz ±1 dB at full output.

.6 Gain: 20 dB.

.7 Hum and noise level: -65 dB minimum at full output.

2.7 Compressor Limiter Amplifier

.1 'Power On' lamp.

.2 Controls:
.1 Output level, screwdriver adjustable.
.2 Compression, variable control and power on-off switch.
.3 Power, on-off switch.

.3 Visual monitoring:
.1 VU meter for compression and output levels, master zero and scale adjust.

2.7 Compressor Limiter Amplifier (Cont'd)	.4	Gain 26 dB.
	.5	Frequency response: 1.5 dB between 50 and 16,000 Hz.
	.6	Output: 1.2 V.
	.7	Harmonic distortion: less than 2% at 30 dB of compression at 50 to 16,000 Hz.
	.8	Hum level: 70 dB below rated output.
	.9	Maximum compression: 30 dB.
	.10	Attack time: 10 ms.
	.11	Recovery time: adjustable between 1 and 2 s.
	.12	External DC requirements 12 - 18 V DC at 160 mA.
2.8 Driver Panels	.1	Frequency response: 30 - 20,000 Hz ±1 dB.
	.2	Controls: .1 Variable master gain control. .2 Bass tone control. .3 Treble tone control.
2.9 Power Booster Amplifier	.1	Overload and output short circuit protection not dependent on relays or switches.
	.2	Solid state plug-in relay for remote control of input signal and external busy lights.
	.3	Power output: 3 x 400 W stated in rms power at 2% harmonic distortion over frequency range 25 to 18,000 Hz ±1 dB. One 400 W amplifier - provided as a spare.
	.4	Frequency response: 15 to 25,000 Hz ±1 dB at specified power of 3 x 400 W.
	.5	Signal and noise level: 80 dB below rated output.
	.6	Maximum gain: 75 dB.
	.7	Outputs: 70 V balanced or unbalanced line.
	.8	Peak power 1200 W.

2.9 Power Booster Amplifier (Cont'd)

.9 Damping factor, modulation distortion, over 20.

.10 Intermodulation distortion, below 1%.

.11 Controls and indicators:
- .1 Volume control screwdriver adjustable.
- .2 AC power switch.
- .3 Fused primary slow blow fuse.
- .4 'On' indicator light.

.12 In the event of an amplifier failure, automatic sensing and transfer to spare amplifier to engage.

2.10 Power Supply

.1 Power supply unit, well filtered, regulated, constant voltage under load.
- .1 Output: 70 V DC.
- .2 Input: 120 V, 60 Hz, nominal.
- .3 Power consumption: 1200 W.
- .4 Fuse: replaceable.
- .5 Rectifier, silicon full wave bridge.
- .6 Filter, choke and dual condensers.
- .7 Hook-up (+) (-) terminal strip with terminal screws.
- .8 Line cord, 2 m, 3 conductor with specially constructed strain relief.

2.11 Additional Features

.1 Leased wire background music source.

.2 Tone signal generator for time and alarm signals.

.3 Interface with closed circuit television.

.4 Bridging control to provide facilities between local sound source and sound control rack.
- .1 Three pole, three position, non-shorting type switch with positions marked '1', 'Off', '2', to allow programmes to originate, remain in or terminate.
- .2 Volume control to provide local volume regulations of programme received from console.
- .3 Programme control relay.

.5 Notch filters for acoustic treatment.

.6 Interface with public telephone switchboard.

2.12 Speakers

.1 Cone type.

.2 Ceiling mounting.

.3 Finish colour flat polar white.

.4 Indoor enclosure.

.5 Mass: .822 kg.

.6 Acoustic Treatment: tar base.

.7 Faceplate and backbox: rectangular.

.8 Connections type wire.

.9 Magent: ceramic, mass 170 g.

.10 Line transformer: 70 V primary with tapped secondary for volume adjustment and line multitap line matching transformer.

.11 Hertz range: 50 - 8000 Hz.

.12 Dispersion: 90°.

.13 Impedance: 1300 ohms at 4 W.

.14 Power input to voice coil: 11 W continuous at 22 W peak.

.15 Power input to driver: 11 W continuous at 22 W peak.

.16 Axial sensitivity: 94 dB at 1.2 m with 1 W input.

2.13 Interior Horns

.1 Sectoral horn type.

.2 Ceiling or wall mounting as shown.

.3 Finish colour beige.

.4 Indoor. Explosion proof enclosure in Paint Shop.

.5 Mass: 2.9 kg.

.6 Surface with swivel mounting bracket.

.7 onnections type screw.

.8 Magnet: ceramic, mass 740 g.

2.13 Interior Horns (Cont'd)

.9 Line transformer: 70 V primary with tapped secondary for volume adjustment and multi-tap line matching transformer.

.10 Hertz range: 220 - 14500 Hz.

.11 Dispersion: 120° horizontal, 60° vertical.

.12 Impedance: 166 ohms at 30 W.

.13 Power input to voice coil: 30 W continuous at 60 W peak.

.14 Power input to driver: 30 W continuous at 60 W peak.

.15 Axial sensitivity: 108 dB at 1.2 m with 1 W input.

3.14 Outdoor Horns

.1 Sectoral horn type.

.2 Pole mounting.

.3 Finish colour Coast Guard Red to match Architect's colour chip.

.4 Outdoor, weatherproof enclosure.

.5 Mass: 3.7 kg.

.6 Swivel type mounting bracket.

.7 Connnections type screw.

.8 Magnet: ceramic, mass 482 g.

.9 Line transformer: 70 V primary with tapped secondary for volume adjustment multi-tap line metaching transformer.

.10 Hertz range: 300 Hz. - 15000 Hz.

.11 Dispersion: 120° horizontal, 40° vertical.

.12 Impedance: 83 ohms at 60 W.

.13 Power input to voice coil: 60 W continuous at 120 W peak.

.14 Power input to driver: 60 W continuous at 120 W peak.

2.14 Outdoor Horns (Cont'd)

.15 Axial sensitivity: 102.5 dB at 1.2 m with 1 W input.

PART 3 - EXECUTION

3.1 Installation

.1 Install equipment to manufacturer's instructions.

.2 Speaker and microphone wiring to be in separate conduits.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Conduct intelligibility test.

**********END**********

PART 3 - EXECUTION

3.1 Installation

.1 Check out wiring on signal systems before final connections to equipment are made. Install signal and intercommunication wiring in conduit in accordance with the following:

.1 Low and line level wires may be combined with D.C. wiring in same conduit provided low level line is shielded, but install A.C. lines in separate conduits.

.2 Install low and high level wires in separate conduits.

.3 High level wires may be combined with A.C. or D.C. wiring without shielding.

.4 Line and high level wires may be combined in the same conduit provided line level wires are shielded.

.2 Interpretation or designation of the low, line and high level wires shall be the responsibility of Equipment Manufacturer. Correct any cross-talk, feed-back or other audible interferences, which occur on any of sound systems, without expense to Owner.

3.2 Testing

.1 Completely test out systems and, before they are turned over to Owner, demonstrate them to Owner's representative until such time as he is fully conversant with the operation of the systems.

.2 Six months after installation has been accepted by Owner, arrange a time convenient to Owner to do necessary re-aligning, and replace defective components to make equipment operate perfectly.

**********END**********

PART 2 - PRODUCTS

2.1 Materials

.1 Radio interference suppressors.

.2 Conduit: size as indicated, to Section 16320.

.3 Outlet boxes, conduit boxes and fittings: to Section 16375.

.4 Coaxial cable: to Section 16590.

.5 Terminals and connectors: to Section 16592.

PART 3 - EXECUTION

3.1 Installation

.1 Install coaxial cable in conduit system as indicated.

.2 Connect coaxial cable to cablevision system as indicated.

.3 At each TV outlet, install coaxial cable termination as indicated.

Pg. 2.3 Addendum #1 * .9 * .5

**********END**********

PART 1 - GENERAL

1.1 Application .1 Terminal cabinets shall be used for terminating telephone and communication system wiring.

1.2 Identification .1 Provide a typed directory showing the following information:
.1 Nature, actual quantities, and room number of device or devices connected to each terminal, as well as signal circuit number where applicable.

.2 Provide a nameplate in accordance with Section 16010, Electrical General Provisions.

PART 2 - PRODUCTS

2.1 Materials .1 Cabinets shall comply with Section 16234, "Panel Trim".

.2 Terminal cabinets shall be sized as shown.

.3 Flush cabinets shall be Type 'F', surface mounted cabinets shall be Type 'C'.

.4 Cabinets shall be fabricated of code gauge steel.

.5 Cabinets shall have screw-type indexed terminals.

.6 Inside of door shall have metal frame with clear plastic cover for directory.

.7 Panels shall be complete with 20 mm painted plywood backboard.

PART 3 - EXECUTION

3.1 Installation .1 Locate cabinets as indicated and mount securely.

.2 Terminate wiring on terminals.

**********END**********

PART 2 - PRODUCTS

2.1 Polyethylene Insulated Cables

.1 Conductors 16 AWG soft copper made into cables as follows:
.1 Number of pairs as required by system manufacturer, plus 20% spares
.2 Polyethylene, electric grade insulation.
.3 Non-hygroscopic colored binders.
.4 Sheath:
.1 Inner polyethylene jacket, corrugated aluminum tape not overlapped, and soldered, with covering of thermoplastic compound and jacket of polyethylene.
.5 Protective covering:
.1 Double wire armour of two layers of asphaltic compound and coal tar anthracene oil impregnated jute, two layers of heavy galvanized steel armour wire separated by layer of asphaltic compound and overall covering of two successive layers of asphaltic compound and coal tar anthracene oil impregnated jute. Conductor size to be 14 AWG.

2.2 Coaxial Cables for Television Cable Systems

*.1 Foam-dielectric coaxial cable designed for distribution cable in CATB system: centre conductor No. 10 AWG solid copper, insulation of foam (expanded) polyethylene and outer conductor of aluminum with covering of viscous flooding compound and medium density polyethylene sheath is suitable for burial in ducts.

Pg. 2.3 Addendum #1.

.2 Interior wiring coaxial cable: centre conductor No. 20 AWG solid copper, insulation of solid polyethylene, outer conductor No. 34 AWG tinned copper outer braid and jacket of translucent polyethylene, designed as general purpose highly flexible coaxial cable.

Pg. 2.3 Addendum #1.

* 2.3 Telephone Wire

PART 3 - EXECUTION

3.1 Installation

.1 Install armoured cables in ducts as indicated using wire rope sockets to protect outer sheath.

.2 Install main feeder, trunk coaxial cable in ducts as indicated.

3.1 Installation (Cont'd) .3 Install interior wiring coaxial cable in conduit, as indicated, from terminal block to outlets.

Pg. 23 & .4
Addendum #1.

**********END**********

PART 2 - PRODUCTS

2.1 Coaxial Cable Terminal

.1 Outer connector nut, inside threaded, sliding over body of terminal.

.2 Terminal body, inside threaded, designed to screw onto outer sheath of cable.

PART 3 - EXECUTION

3.1 Installation

.1 Install coaxial cable terminals to manufacturer's instructions.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Sprinkler systems: Section 15510

.2 Standpipe and hose systems: Section 15530

.3 Fire Pump Controller: Section 15501

1.2 Description of System

.1 System includes:

.1 Control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.

.2 Trouble signal devices.

.3 Power supply facilities.

.4 Manual alarm stations.

.5 Automatic alarm initiating devices.

.6 Audible signal devices.

.7 End-of-line devices.

.8 Annunciators.

.9 Ancillary devices.

.10 Provisions for connections to a Central Station for supervised service.

.2 Operation of any alarm initiating device to:

.1 Cause audible signal devices to sound continuously throughout building and complex.

.2 Transmit signal to Central Station via telephone lines.

.3 Cause zone of alarm device to be indicated on control panel and remote annunciators.

.4 Cause ventilation fans to be shut down.

.3 Operation of any trouble signal initiating device such as supervised valves, sprinkler system pressure indicators and system electrical fault to:

.1 Cause audible trouble signal buzzers to sound continuously at the annunciator and main control panel locations.

.2 Cause zone of fire alarm device to be indicated on control panel and remote annunciators.

Pg. 2:3 & .4
Addendum #1.

1.3 Requirements of Regulatory Agencies

.1 System:
.1 Subject to FCC approval.
.2 Subject to FCC inspection for final acceptance.
.3 To FCC Standard DFC No. 410(M)-1979.

1.4 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

.2 Include:
.1 Layout of equipment.
.2 Zoning.
.3 Complete wiring diagram, including schematics of modules.
.4 Riser diagram suitable for glazing.

1.5 Operation and Maintenance Data

.1 Provide data for incorporation into maintenance manual specified in Sections 01730 and 16010.

.2 Operation and Maintenance Manual to include:
.1 Operation and maintenance instructions for complete fire alarm system to permit effective operation and maintenance.
.2 Technical data - illustrated parts lists with parts catalogue numbers.
.3 Copy of approved shop drawings.

1.6 Maintenance Materials

.1 Provide maintenance materials in accordance with Section 01730.

.2 Include:
.1 Ten (10) spare glass rods for manual pullbox stations.
.2 Five (5) spare lamps for alarm indicating devices.
.3 Ten (10) spare lamps for annunciator panels.

1.7 Maintenance

.1 Provide one year's free maintenance with two inspections by manufacturer during the year. Inspection tests to conform to ULC-S536. Submit inspection reports to Owner.

PART 2 - PRODUCTS

2.1 Materials

.1 All components shall be ULC listed and labelled.

2.1 Materials (Cont'd)

.2 Power supply: to ULC S524.

.3 Audible signal devices: to ULC-S525.

.4 Control unit: to ULC-S527.

.5 Manual fire alarm stations: to ULC-S528.

.6 Thermal detectors: to ULC-S530.

.7 Smoke detectors: to ULC-S529.

2.2 Control Panel

.1 Class B.

.2 Single stage operation.

.3 Zoned.

.4 Non-coded.

.5 Enclosure: CSA Enclosure 2.

.6 Supervised, modular design with plug-in modules:

.1 Alarm receiver with trouble lamp, supervised alarm lamp, provision for remote supervised annunciation, for Class B initiating circuit, to serve manual stations, heat detectors, smoke detectors, signal silence-manual, fire department connection.

.7 Components:

.1 Non-coded alarm receiver panel with trouble lamp and supervised alarm lamp for Class B shunt non-interfering initiating circuit.

.2 Single stage alarm pulse rate panels:

.1 Single stroke control type for output to signal control panel at 120 strokes per minute.

.3 Audible signal control panel with 20 E spare control circuits complete with terminals for wiring and plug-in modules for DC signals up to 3.0 A load with trouble light with Class B connections.

.4 Common control and power units:

.1 Panel containing trouble signal and switch, reset, ground indicator, and remote lamp failure indicator plus receptacle for signal silence option.

2.2 Control Panel (Cont'd)

.2 Master power supply panel to provide 24 V DC to system from 120 V AC, 60 Hz input.

.3 Alarm signal silencing plug-in module with pushbutton switch and indicator to silence signals manually. If new alarm occurs after signals have been silenced, signal to sound again.

.4 Fire department connections:

.1 Plug-in module for connection over telephone lines to fire department and disconnect switch complete with indicators for disconnection, box tripped and trouble.

.5 Auxiliary device with 5.0 A, 120 V AC contacts to release door holders. Provide separate bypass switch to permit system testing. Operation of bypass switch to initiate trouble signal.

.6 Auxiliary device with 5.0 A, 120 V AC contacts to initiate fan shut down. Provide separate bypass switch to permit system testing. Operation of bypass switch to initiate trouble signal.

.7 Lamp test pushbutton control

2.3 Power Supply

.1 120 V AC, 60 Hz input, 24 V DC output from rectifier to operate alarm and signal circuits, with standby power of nickel-cadmium batteries sized to provide supervisory and trouble signal current for 24 h plus general alarm current for minimum of 5 min.

2.4 Manual Alarm Stations

.1 Manual alarm stations: pull lever, break glass, wall mounted semi-flush type, non-coded single pole normally open contact for single stage.

2.5 Automatic Alarm Initiating Devices

.1 Heat detectors, fixed temperature, non-restorable, rated 57°C. 88°C. as indicated. Visual indication of operation by a drop in the centre disc or an illuminated L.E.D.

.2 Smoke detector: ionization type, surface mounted and air duct type with sampling tubes.

.1 Plug-in type.

.2 Adjustable sensitivity.

2.5 Automatic Alarm Initiating Devices (Cont'd)

.3 Base assembly with integral red alarm lamp, and terminals for remote relay alarm lamp as indicated.

2.6 Audible Signal Devices

.1 Bells: surface single stroke 24 V DC, 150 or 250 mm as indicated.

2.7 End-of-line Devices

.1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visual alarm at main control panel and remotely as indicated.

2.8 Annunciator Panels

.1 Annunciator panels for remote mounting, as indicated.

.1 Number of LEDs as per drawings.

.2 Remote panel: wired in multiple with annunciator at main control panel and with other remote annunciator panels as indicated.

.3 Supervised, including trouble signal for lamp failure or open circuit.

.4 Mounted in common frame with buildings and site graphic display to identify location of zones. Graphic display to be independent and detachable for revision from LEDs.

.5 Graphic display dimensions to be approximately 600 mm x 600 mm. Overall dimensions not to exceed 750 mm x 750 mm.

2.9 Ancillary Devices

.1 Automatic pressure supervisory switch for sprinkler systems.

.2 Sprinkler flow switches and supervised valves.

Pg. 2.4 Addendum #1

.3 Remote relays for fan shut down.

X 2.10 Exterior Fire Alarm Zone Receptacles

PART 3 - EXECUTION

3.1 Installation

.1 Install systems: to ULC-S524.

.2 Install main control panel as indicated and connect to AC power supply, AC standby power.

3.1 Installation (Cont'd)

.3 Locate and install manual alarm stations as indicated, and connect to alarm circuit wiring.

.4 Locate and install thermal and smoke detectors as indicated and connect to alarm circuit wiring.

.5 Connect alarm circuits to main control panel.

.6 Locate and install signal bells as indicated and connect to signalling circuits.

.7 Connect signalling circuits to main control panel.

.8 Install end-of-line devices in control panel at end of alarm and signalling circuits as required.

.9 Install annunciator panel in control panel and remote annunciator panels as indicated and connect to annunciator circuit wiring.

.10 Sprinkler system: wire supervisory pressure switches, flow switches and sprinkler supervisory valves as indicated and connect to control panel.

Pg. 2 of Addendum #1 & #11

3.2 Tests

.1 Perform tests in accordance with Section 16010 and ULC-S536.

.2 Fire alarm system:

.1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors, sprinkler system, transmit alarm to control panel and actuate first stage alarm.

.2 Check annunciator panels to ensure zones are shown correctly.

.3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of trouble signals.

**********END**********

PART 1 - GENERAL

1.1 Certification .1 On completion of the inspection the Manufacturers shall supply a certificate, together with detailed inspection record sheets showing location of each device and certifying the test results per unit, confirming that the system is installed, supervised and operates in accordance with "System Verification", Section 16602.

1.2 Inspection .1 The manufacturers of the fire alarm system shall make a complete inspection of all components installed for the systems, such as manual stations, heat detectors, sprinkler connections and annunciators and smoke detectors to ensure the following:

.1 That the systems are complete and in accordance with Specifications.

.2 That the systems are connected according to U.L.C. requirements.

.3 That the systems are connected in accordance with Manufacturer's recommendations.

.4 That the regulations concerning the supervision of components have been adhered to (e.g. stations, detectors, sprinkler components) and are properly wired and supervised.

.5 That any subsequent changes necessary to conform to the above will be carried out with technical advice supplied by the manufacturer.

.6 That any necessary permit to operate the smoke detectors has been applied for and obtained for the Owners.

.7 That all thermal detectors and manual pull stations have been operated and are in good working order.

.8 That annunciator correctly pinpoints the origin of any fire alarm.

.9 That actual smoke concentrations of sufficient density, have been applied to each smoke detector to cause the detector to be set off and that the sensitivity of each smoke detector has been set.

1.3 Related Work Specified Elsewhere .1 Fire Alarm System Section 16601

PART 3 - EXECUTION

3.1 Testing and Adjusting

.1 Include provision of adequate qualified staff to manufacturer to carry out inspection work.

.2 Provide any necessary equipment, test apparatus, ladders and scaffolding as required.

.3 Adjust system and components as required to ensure complete system operation.

.4 Include associated costs in Tender price.

.5 Submit certificate to the Engineer.

.6 At the "takeover" inspection the certificate issued by the equipment manufacturer should be available to the representative of the Fire Commissioner of Canada. Final test to be witnessed by a representative of the Fire Commissioner of Canada.

**********END**********

PART 1 - GENERAL

1.1 Related Work	.1	Wiring	Section 16301
	.2	Conduit	Section 16320
1.2 Description of System	.1	System to consist of central monitor unit indicating position of watchperson at any tour station with central monitor unit.	
1.3 Shop Drawings	.1	Submit shop drawings in accordance with Section 01340.	

PART 2 - PRODUCTS

2.1 General	.1	System to operate from 24 V DC.
	.2	All parts of system to be capable of withstanding 1250 V rsm for one minute between current carrying parts and enclosures.
2.2 Monitor Unit	.1	Monitor unit: containing stations as per drawings, indicating lamps and nameplates, one red delinquency lamp, start and stop pushbuttons, telephone handset and calling key, telephone buzzer, delinquency bell and silencing switch. Provide unit for flush mounting on wall.
2.3 Control Unit	.1	Control unit for surface mounting containing necessary relays, sequence and timing units, rectifiers and terminals.
2.4 Telephone Handset	.1	Telephone handset with shockproof rubber casing and push-plug for insertion in tour station jacks.
2.5 Tour Station	.1	Numbered tour station with telephone jack and key-operated switch for flush mounting finished in brushed stainless steel.
2.6 System's Sequence of Operation	.1	System to provide constant supervision of watchperson by requiring him to operate stations of tour in selected sequence and pass from one station to next in less than allotted time.

2.6 System's Sequence of Operation (Cont'd)

.2 System to operate as follows: watchperson to press "start button" on monitor unit at start of tour, lighting a green start lamp and setting timer in action.

.3 At Station No. 1, watchperson to insert key in station, turn and withdraw key extinguishing green start lamp, and light No. 1 white lamp on central monitor unit. This operation to reset timer for move to Station No. 2.

.4 Watchperson to repeat procedure of Station No. 2 extinguishing No. 1 on monitor unit and light No. 2 lamp.

.5 In case watchperson exceeds time allotted for station-to-station travel, a red "delinquency" lamp to light and a bell to ring at central monitor unit, lamp of last station operated to remain "On", and silencing switch to silence delinquency bell. Bell to ring again after delinquency is cleared indicating switch to be reset.

.6 Should watchperson operate station not in set sequence, delinquency alarm to sound when time limit to travel to correct station is exceeded.

.7 Watchperson able to call monitor unit from any station, inserting phone plug on his handset in jack on station. Insertion of jack in station to sound buzzer on monitor unit indicating call, lifting monitor unit handset to silence buzzer.

.8 Call switch on monitor unit to light call lamp on each tour station to notify watchperson to call supervisor.

.9 At completion of tour, watchperson presses "Stop" button on monitor unit, extinguishing lamp for last station of tour, resetting system for next tour.

PART 3 - EXECUTION

3.1 General

.1 Install security tour system equipment as indicated and to manufacturer's instructions.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Upon completion, test security tour system in the presence of Engineer to assure complete system performs as indicated, and is clear and free from defects.

**********END**********

PART 1 - GENERAL

1.1 Related Work

.1 Wiring — Section 16301

.2 Conduit — Section 16320

1.2 Description of System

.1 System to consist of alarm control panel, intrusion switches located at doors to be supervised.

1.3 Shop Drawings

.1 Submit shop drawings in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Control Panel

.1 Control panel: surface mounted with supervised zone capacity, as per Drawings, modular design. "Power On" light, "Reset" key switch, "Acknowledge Button", common "Trouble Light, Buzzer and Silencing Switch". Separate alarm lamp, trouble lamp and deactivating key switch for each zone and necessary modules, and relays as required for operation as indicated. Power supply from 120 V AC emergency power circuit with rectifier to supply 24 V DC to operate complete system. Standby power of nickel cadmium batteries sized to provide supervisory and trouble signal current for 24 h. Capable of differentiating between open line condition and alarm. Panel to display "trouble" conditions when fault occurs in wiring.

2.2 Magnetic Door Switches

.1 Door switches suitable for surface and flush mounting on door as required.

2.3 Terminal Cabinets

.1 Terminal cabinets to Section 16365 with required terminals to Section 16592 to accommodate conductors required. Provide locks on terminal cabinets.

2.4 End-of-Line Resistors

.1 Mount end-of-line resistors to control supervisory current in each circuit, in control panel.

2.5 Local Alarm

.1 Buzzer for local alarm at each door location and mount in single gang box adjacent to door.

2.6 Annunciator

.1 Annunciator panel for remote mounting as indicated.

.1 Number of LEDs.

.2 Remote panel wired in multiple with annunciator at main control panel.

.3 "Power On" light, "Reset" key switch, "Acknowledge" button, common "Trouble Light and Silencing Switch". Separate alarm lamp, trouble lamp and deactivating key switch for each zone.

.4 Mounted in common frame with buildings and site graphic display to identify location of zones. Graphic display to be independent and detachable for revisions from LEDs. All doors to be displayed on annunciator.

.5 To be suitable for mounting on control desk as per drawings.

.6 Graphic display dimensions to be approximately 600 mm x 600 mm and to suit space available as per Drawings.

2.7 System Operation

.1 System operation: when supervised door is opened, zone indicating lamp flashes and operates audible alarm at control and annunciator panels. When "Acknowledge" button is operated, audible signal is silenced and flashing light changes to steady glow.

.2 System restored to normal when door is closed and "Reset" key switch on control panel operated.

.3 Buzzer located at each door to give pulsating signal when door opened. Upon acknowledgement from control or annunciator panel signal to change to continuous note. Buzzer at door location to be silenced only after door reclosed and "Reset" key switch operated. Closing of door alone not to affect signal once it has started to sound.

.4 When deactivating switch is operated, supervised door on that zone opened without causing alarm. Zone trouble lamp illuminated when zone is deactivated but audible trouble signal not to sound.

.5 Fault in wiring of one zone to cause audible signal to sound even if zone in deactivated position.

PART 3 - EXECUTION

3.1 Installation

.1 Install complete door supervision system as indicated.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Test system components in presence of Engineer to ensure correct operation of system. On completion of tests, provide certificate listing components tested.

**********END**********

PART 1 - GENERAL

1.1 Description

.1 A complete system of conduit and junction boxes shall be installed as shown on the drawings.

PART 3 - EXECUTION

3.1 Installation

.1 Junction boxes as sized on the drawings shall be installed in locations shown.

.2 Empty conduits shall be located in ceiling spaces and in walls where practical.

.3 Fish conduit, clear blockages and outlet and clean out pull boxes at completion of installation. Leave conduit free of water or excess moisture. Install No. 12 gauge galvanized soft iron pull wire, or 3 mm nylon pull cord continuously from outlet to outlet, through conduit and fasten at each box.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340.

.2 Product data to include:
- .1 Suspension of heating element
- .2 Physical size
- .3 Thermostat control if integral
- .4 Finish
- .5 kW rating
- .6 Cabinet thickness
- .7 Cabinet surface temperature

PART 2 - PRODUCTS

2.1 Materials

.1 Heaters: to CSA C22.2 No. 46-1971.

.2 Heaters: wattage density as indicated with connection box. Element through-type fitted with convector vanes and resistor wire enclosed in mineral insulation sheath.

.3 Element: locked to cabinet and supported at additional points throughout length to allow for linear expansion.

.4 Heaters shall be of type, rating and characteristics indicated and shall be capable of operating on supply voltage available.

.5 Heater enclosure shall be fabricated of cold rolled steel with the following minimum thicknesses:
- .1 Front - 1.2 mm
- .2 Rear - 1.0 mm
- .3 Sides - 1.6 mm

.6 Enclosure shall be treated with a rust inhibiting etching process and finished in beige.

.7 Enclosures shall be rigidly constructed and contain suitable grilles for air discharge. Discharge shall occur via top, unless noted otherwise. Intake shall occur from the bottom.

2.1 Materials (Cont'd)

.8 Where several heaters are shown adjacent to one another, a continuous convector cover with all necessary hardware, blank sections and covers shall give the appearance of one continuous cover.

.9 A suitable raceway shall be provided to facilitate wiring of all heaters in such a group.

.10 Heating elements shall be of the wattages noted. Element in each unit shall be rated for operation on voltage noted.

.11 Wiring for elements shall be terminated on easily accessible terminal blocks, adequately sized to accept wire size used.

.12 Heaters shall be equipped with temperature limiting safety control, designed to prevent unit from overheating.

.13 Blank cabinet sections, outside and inside corners complete with wireway in all sections including splice plates, to match heater cabinets in all respects for continuous baseboard effect as indicated.

.14 Explosionproof heaters and thermostats required where shown on Drawings.

2.2 Controls

.1 Built-in thermostats shall be of the one voltage type, screwdriver adjustable through the enclosure.

.2 Thermostats shall be suitable for operation on voltage shown.

.3 Wall mounted thermostats to Section 16770.

.4 Integral thermostats (unless otherwise shown) 2 pole to control load as indicated.

PART 3 - EXECUTION

3.1 Installation

.1 Install baseboard convector heaters, blank sections and controls as indicated.

3.1 Installation (Cont'd)

.2 When wireway is used, remove knock-outs and insert insulating bushing between each unit.

.3 Install grounding wire to maintain ground integrity between heating, blank, and auxiliary sections.

.4 Make power and control connections.

.5 Connect heaters to wall mounted thermostats where shown.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Ensure that heaters and controls operate correctly.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340.

.2 Product data to include:
- .1 Mounting methods
- .2 Physical size
- .3 Layout and diagrams of unit heaters
- .4 kW rating
- .5 Cabinet thickness
- .6 Finish

1.2 Operation and Maintenance Data

.1 Provide data for incorporation into maintenance manual specified in Section 01730 and 16010.

PART 2 - PRODUCTS

2.1 Materials

.1 Heaters: to CSA C22.2 No. 46-1971.

.2 Unit heater: horizontal blower complete with adjustable louvres finished in sahara sand.

.3 Fan motor permanently lubricated ball bearing type with resilient mount. Built-in fan overload protection.

.4 Unit heaters shall be of type, rating and characteristics indicated.

.5 The heaters shall be capable of operating from the supply voltage available.

.6 Unit heaters shall be complete with integral contactor, 120 V control transformer and built-in high heat limit protection and thermostat. They shall be complete with all necessary mounting brackets and appurtenances for wall or ceiling mounting.

.7 Unit heaters shall be of the rating indicated capable of operation on one phase supply.

PART 3 - EXECUTION

3.1 Installation

.1 Suspend from ceiling or mount on wall as indicated.

3.1 Installation (Cont'd)

.2 Make interconnection between heaters and controls as indicated.

.3 Make power connection.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Test cut-out protection when air movement is obstructed.

.3 Test fan delay switch to assure dissipation of heat after element shut down.

.4 Test unit cut-off when fan motor overload protection has operated.

.5 Ensure that heaters and controls operate correctly.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340.

.2 Product data to include:
- .1 Element replacement data
- .2 Mounting methods
- .3 Auxiliary Controls
- .4 Finish
- .5 kW rating
- .6 Cabinet thickness
- .7 Cabinet surface temperatures

PART 2 - PRODUCTS

2.1 Materials

.1 Heaters: to CSA C22.2 No. 46-1971.

.2 Enclosure shall be fabricated of cold rolled steel with the following minimum thickness:
- .1 Front - 1.6 mm
- .2 Rear - 1.0 mm
- .3 Top - 1.6 mm
- .4 Sides - 1.6 mm

.3 Enclosure shall be treated with rust-inhibiting etching process and finished in beige.

.4 Enclosure shall be rigidly constructed and contain suitable grilles for air intake and discharge on the front. Grille design shall preclude accidental contact with heater element.

.5 Unless noted to be flush-mounted, units shall be designed for floor mounting.

.6 Heating elements shall be of the wattages noted. Elements shall be capable of operating on voltages noted.

.7 Wiring shall be terminated in easily accessible terminal blocks, adequately sized to accept wires used.

.8 Heaters shall be equipped with temperature limiting safety control, designed to prevent unit from overheating.

.9 Cabinet convectors shall be complete with built-in thermostats, screwdriver adjustable through the front of the enclosure.

.10 Thermostats shall be built-in and suitable for operation on voltage noted.

PART 3 - EXECUTION

3.1 Installation

.1 Install cabinet convectors as indicated.

.2 Make power and control connection.

.3 Ensure free flow of convection air current.

.4 Install cabinet convector in accordance with manufacturer's recommendations. Suitable anchors shall be used to fasten unit to walls or floor as required.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Ensure that heaters and controls are operating correctly.

**********END**********

PART 1 - GENERAL

1.1 Product Data

.1 Submit product data in accordance with Section 01340.

.2 Product data to include:
- .1 Fan accessibility
- .2 Fastening of cabinet
- .3 Physical size
- .4 Thermostat, transformer, controls
- .5 Finish
- .6 kW rating
- .7 Cabinet thickness
- .8 Cabinet surface temperatures.

PART 2 - PRODUCTS

2.1 Materials

.1 Forced air console units: to CSA C22.2 No. 46-1971, for mounting as indicated.

.2 Enclosure shall be fabricated of minimum 1.2 mm cold rolled steel, treated with a rust inhibiting etching process and finished in beige.

.3 Heating elements shall be of the wattages noted and shall be protected by temperature limiting safety control.

.4 Units shall be equipped with line voltage, screwdriver adjustable thermostat accessible through enclosure.

.5 Heaters shall be flush-mounted type unless otherwise noted.

PART 3 - EXECUTION

3.1 Installation

.1 Install units where indicated.

.2 Make power and control connections.

3.2 Tests

.1 Perform tests in accordance with Section 16010.

.2 Ensure that heaters and controls are operating correctly.

**********END**********

PART 1 - GENERAL

1.1 Product Data .1 Submit product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Thermostat (Line Voltage, Heating) .1 Line voltage wall mounted electric heating thermostat with:
.1 Full load rating: 30 A at 208 V.
.2 Temperature setting range: 10°C. to 25°C.
.3 Double pole.
.4 Thermometer range: 10°C. to 25°C.
.5 Scale markings: Off-5-10-15-20-25°C.

PART 3 - EXECUTION

3.1 Installation .1 Install control devices as indicated.

.2 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior wall.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01340.

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Engineer.

PART 2 - PRODUCTS

2.1 Materials

.1 Incandescent and electric-discharge fixtures: to CSA C22.2 No. 9-1968.

.2 Socket screw-shell lampholders: to CSA C22.2 No. 43-1965.

.3 Electric discharge lampholders: to CSA C22.2 No. 74-1969.

.4 Plastic lenses and diffusers: ULC labelled.

2.2 Lenses

.1 Lenses for incandescent and fluorescent luminaires are made and supplied by KSH Industries Ltd., Holophane, and Corning. The more common lenses are listed in this Section. Photometric performance of luminaires depends on design of lens, reflector configuration and reflection factor, number of lamps and their positioning relative to lens and reflector.

.2 Fluorescent acrylic lens:
.1 Acrylic lenses shall have a recessed prismatic pattern of 5 mm square based female cones running 45° to the parallel and perpendicular axis to the panel.
.2 Panels shall be strain-free and uniform in production. There shall be no fade-outs or streaks to detract from job performance.
.3 Lenses shall be a low brightness, sparkling crystal panel that provides maximum efficiency and good brightness control in the direct glare zone.

2.3 Finishes

.1 Baked enamel finish:
.1 Conditioning of metal before painting:
.1 For corrosion resistance

2.3 Finishes (Cont'd)

conversion coating to CGSB 31-GP-103M.

.2 For paint base, conversion coating to CGSB 31-GP-105M, CGSB 31-GP-106a.

.2 Metal surfaces of luminaire housing and reflectors finished with high gloss baked enamel to give smooth, uniform appearance, free from imperfections, pinholes, or defects.

.3 Reflector and other inside surfaces finished as follows:

.1 White, minimum reflection factor 85%.

.2 Color fastness: Yellowness factor not above 0.02 and after 250 h exposure in Atlas fade-ometer not to exceed 0.05.

.3 Film thickness, not less than 30 micrometres average, and in no areas less than 25 micrometres.

.4 Gloss not less than 80 units as measured with Gardner 60° gloss meter.

.5 Flexibility: withstand bending over 12 mm mandrel without showing signs of cracking or flaking under 10 x magnification.

.6 Adhesion: 24 mm square lattice made of 3 mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and pulled. Adhesion satisfactory if no coating removed.

.2 Alzak finish:

.1 Aluminum sheet fabricated from special aluminum alloys and chemically brightened, subsequently anodically treated to specifications established by Alcoa, to produce:

.1 Finish for mild commercial service, minimum density of coating 0.8 mg/cm² minimum reflectivity 83% for specular and 75% for diffuse.

PART 3 - EXECUTION

3.1 Installation

.1 Locate and install luminaires as indicated.

.2 Locate hangers on tile centres or intersections. Mount recessed incan-

3.1 Installation (Cont'd)

descents, troffers and surface mounted luminaires in or on full tiles.

.3 Verify quantity of luminaires before placing orders.

.4 Verify ceiling types with the latest revised Architectural Drawings and order luminaires to suit the correct ceiling.

.5 Check lighting luminaires and mountings for their electrical and physical characteristics in relation to conditions due to building construction and mechanical equipment. Make necessary adjustments to fixtures or hanging arrangement without expense to Owners. Give notification at time of shop drawings and before construction if decision on necessary changes is required.

.6 Co-operate with other trades to ensure proper installation of lighting luminaires.

.7 Carefully align luminaires, shown in continuous lines or rows, so that rows appear as straight lines.

.8 Mount luminaires perfectly level or plumb. Luminaires shall fit tightly to ceiling without showing a space or light leak between frame and ceiling.

.9 Take down any improperly installed luminaires and re-install without expense to Owner.

.10 Standard octaganal boxes may be supplied where conduits feeding luminaires in finished areas are exposed on ceiling if hanger canopies entirely cover outlet boxes and are neatly notched for conduit. Otherwise, provide cast condulet outlet boxes with a diameter larger than canopies.

.11 Attach boxes or hickies directly to poured concrete with 6 mm minimum diameter bolts and lead expansion anchors where fixtures are suspended directly from concrete slabs. Use 8 mm minimum bolts through precast slabs,

3.1 Installation (Cont'd)

welded to 100 mm x 100 mm minimum, 3.5 mm plate above slabs.

.12 Do not mount luminaires above pipes, ducts or equipment. In event of unavoidably tight locations, provide hangers to clear obstructions. Check layouts of other trades on job and plan co-operatively. Luminaires in any room shall hang at one height. Obtain approval before any changes are made to layouts shown.

.13 Provide continuous 12 mm x 38 mm channel above the ceiling, where luminaires are suspended or mounted on furred ceilings. Fasten fixtures to channel with two 6 mm minimum diameter studs with minimum 1.220 m on centre.

.14 Luminaires mounted in or on ceilings shall be supported independently of ceiling.

.15 Industrial luminaires where suspended shall be 12 mm conduit hangers and ARB ball aligners. Length and location shall clear equipment, ducts and pipes. Flexibar may be used for mounting of luminaires in mechanical areas and electrical rooms.

**********END**********

PART 1 - GENERAL

1.1 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01340.

.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified for approval by Engineer.

.3 Where air handling luminaires are used, coordinate with Division 15.

1.2 Spare Lamps

.1 Provide spare lamps as follows:
.1 5% of each type of lamp.

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1.3 Guarantee

*.1 Replace:
.1 Incandescent and tungsten halogen lamps burning out within 3 months of takeover.
.2 Fluorescent and HID lamps burning out within 12 months of takeover.
.3 Ballasts that fail or exceed their original noise level rating within 12 months of takeover.

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PART 2 - PRODUCTS

2.1 Materials

.1 Incandescent and electric discharge fixtures: to CSA C22.2No.9-1968.

.2 Socket screw-shell lampholders: to CSA C22.2No.43-1965.

.3 Electric discharge lampholders: to CSA C22.2No.74-1969.

.4 Incandescent lamps: to CSA C10-1951 and CSA C22.2No.84-1974.

.5 Tungsten halogen lamps: to CSA C22.2No.84-1974.

.6 HID lamps: to ANSI C78 series.

.7 Fluorescent lamps: to ANSI C78 series.

.8 Ballasts: to CSA C22.2No.74-1969.

2.2 Luminaire Details .1 Provide luminaires as indicated.

TYPE	DESCRIPTION	LAMP
Fluorescent		
'A'	Office luminaire supplied under Division 13 but wired and lamped under Division 16. Refer to Drawing for details. Voltage: 120 Volt	1-F40 Watt Metric RS
'A1'	Office luminaire supplied under Division 13 but wired and lamped under Division 16. Refer to Drawing for Details. Voltage: 120 Volt	2-F40 Watt Metric RS
'B'	Recessed 300mm x 1200mm fluorescent luminaire with pattern 12 virgin acrylic lens, 3.2 mm thick securely fastened in a hinged aluminum frame. Luminaire shall be suitable for a 'T'-bar ceiling. Refer to Drawings for details. Voltage: 120 volt	2-F40 Watt Metric RS
'B1'	Recessed 300mm x 1200mm fluorescent luminaire with pattern 12 virgin acrylic lens, 3.2 mm thick securely fastened in a hinged aluminum frame. Luminaire shall be suitable for a 'T'-bar ceiling. Refer to Drawings for details. Voltage: 120 volt	1-F40 Watt Metric RS

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'C'	Single lamp 1200 mm fluorescent striplight mounted in coves. Position to Engineer's satisfaction. Refer to Drawings for details. Voltage: 120 volt	1-F40 Watt Metric RS
'C1'	Single lamp 900 mm fluorescent striplight mounted in coves. Position to Engineer's satisfaction. Refer to Drawings for details. Voltage: 120 volt Note: Also provide with luminaire Type 'C' and 'C1' a 12.5 mm x 12.5 mm x 12 mm square white aluminum interleaf louvre with 45° cut-off for the entire cove. Support for louvre supplied under another Division.	1-30 Watt RS
'D'	Recessed 300mm x 1200mm fluorescent luminaire with pattern 12 virgin acrylic lens, 3.2 mm thick securely fastened in a hinged aluminum frame. Luminaire shall be suitable for a dry-wall ceiling. Refer to Drawings for details. Voltage: 120 volt	2-F40 Watt Metric RS

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'F'	Recessed 600mm x 1200mm fluorescent luminaire with pattern 12 virgin acrylic lens, 3.2 mm thick securely fastened in a hinged aluminum frame. Luminaire shall be suitable for a 'T'-bar ceiling. Refer to Drawings for details. Voltage: 120 volt	4-F40 Watt Metric RS
'G'	Single lamp 1200 mm fluorescent striplight mounted in coves. Position to Engineer's satisfaction. Refer to Drawings for details. Voltage: 120 volt	1-F40 Watt Metric RS
'G1'	Single lamp 900 mm fluorescent striplight mounted in coves. Position to Engineer's satisfaction. Refer to Drawings for details. Voltage: 120 volt	1-30 Watt RS
'H'	Single lamp 1200 mm fluorescent strip light mounted in coves. Position to Engineer's satisfaction. Refer to Drawings for details. Voltage: 120 volt	1-F40 Watt Metric RS

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'H1'	Single lamp 900 mm fluorescent strip light mounted in coves. Position to Engineer's satisfaction. Refer to Drawings for details. Voltage: 120 volt Note: Luminaire types 'H' and 'H1' to have dimming ballasts.	1-30 Watt RS
'J'	Suspended industrial 300 mm x 1200 mm fluorescent luminaire with slotted baked white enamel reflector, spring loaded turret type lampholders and two rigid conduit stems with ball aligners. Luminaires to be located to clear electrical and mechanical equipment. Refer to Drawings for details. Voltage: 120 volt	2-F40 Watt Metric RS
'K'	Suspended 275mm x 2400mm fluorescent luminaire with high impact acrylic lens, square based indented prisms on the bottom of the lens, longitudinal prisms on the side complete with retaining clips to support the lens during relamping. The body of the luminaire shall be made of die-formed steel and shall be finished in white. Refer to Drawings for details. Voltage: 120 volt	4-F40 Watt Metric RS

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'K1'	Suspended 275mm x 1200mm fluorescent luminaire with high impact acrylic lens, square based indented prisms on the bottom of the lens, longitudinal prisms on the side complete with retaining clips to support the lens during relamping. The body of the luminaire shall be made of die-formed steel and shall be finished in white. Refer to Drawings for details. Voltage: 120 volt	2-F40 Watt Metric RS
'L'	Surface mounted 300 mm x 1200 mm fluorescent luminaire with pattern 12 virgin acrylic lens, 3.2 mm thick securely fastened in a hinged aluminum frame. Body of luminaire shall be finished in white. Refer to Drawings for details. Voltage: 120 volt	2-F40 Watt Metric RS
'L1'	Surface mounted 300 mm x 1200 mm fluorescent luminaire with pattern 12 virgin acrylic lens, 3.2 mm thick securely fastened in a hinged aluminum frame. Body of luminaire shall be finished in white and mounted on a channel. Refer to Drawings for details. Voltage: 120 volt	2-F40 Watt Metric RS

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'M'	Under counter 1200 mm fluorescent luminaire with ribbed white plastic diffuser. Body of luminaire shall be finished in white and suitable for continuous mounting. Refer to Drawings for details. Voltage: 120 volt	1-F40 Watt Metric RS
'N'	Recessed 1200mm x 1200mm fluorescent luminaire with opal diffuser, securely fastened in a lockable regressed aluminum frame. Luminaire shall be suitable for a drywall ceiling. Refer to Drawings for details. Voltage: 120 volt	6-F40 Watt Metric RS
'P'	Two lamp 1200 mm fluorescent striplight mounted in coves. Position to Engineer's satisfaction Refer to Drawings for details. Voltage: 120 volt	2-F40 Watt Metric RS

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'P1'	Two lamp 900 mm fluorescent striplight mounted in coves. Position to Engineer's satisfaction. Refer to Drawings for details. Voltage: 120 volt Note: Also provide with luminaire Types 'P' and 'P1' a 12.5 mm x 12.5 mm x 12. mm square white aluminum interleaf louvre with 45° cut-off for the entire cove. Support for louvre supplied under another Division.	2-30 Watt RS
'R'	Industrial 300 mm x 2400 mm fluorescent luminaire with slotted baked white enamel reflector, spring loaded turret type lampholders mounted on a channel. Refer to Drawings for details. Voltage: 120 volt	4-F40 Watt Metric RS
'S'	Surface mounted 190 mm x 1200 mm weatherproof fluorescent luminaire with moulded fibreglass body, acrylic diffuser securely fastened with latch hinges on either side. Luminaire shall come complete with seal-tight connection. Refer to Drawings for details. Voltage: 120 volt	2-F40 Watt Metric RS

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'T'	Suspended industrial 300 mm x 1200 mm fluorescent luminaire with slotted BWE reflector, spring loaded turret type lamp holders, 0° ballast and two rigid conduit stems with ball aligners. Refer to Drawings for details Voltage: 120 volt	2-F40Watt Metric RS
'U'	Recessed 300mm x 1200mm fluorescent luminaire with pattern 12 virgin acrylic lens, 3.2 mm thick securely fastened in a hinged aluminum frame. Luminaire shall have a dimming ballast and be suitable for a drywall ceiling. Refer to Drawings for details Voltage: 120 volt	2-F40 Watt Metric RS
H.I.D./Incandescent		
'AA'	Suspended gasketted enclosed metal halide luminaire with integral constant wattage ballast and injection moulded ultra-violet stabilized acrylic reflector, latched and hinged, with fluted sides to provide low brightness and a square distribution pattern. The spun aluminum reflector shall be finished in BWE and have a reflectance factor of 87%. The entire luminaire including ballast shall be finished in white and guaranteed not to peel. Mount luminaire flush with underside of steel joists complete with safety chain. Refer to Drawings for details. Voltage: 120 volt	1-400 Watt Clear Metal Halide (40,000 Lumen)

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'AA1'	Suspended gasketted enclosed metal halide luminaire with integral constant wattage ballast and injection moulded ultra-violet stabilized acrylic reflector, latched and hinged, with fluted sides to provide low brightness and a square distribution pattern. The spun aluminum reflector shall be finished in BWE and have a reflectance factor of 87%. The entire luminaire, including ballast, shall be finished in white and guaranteed not to peel. Mount luminaire flush with underside of steel joists, complete with safety chain. Refer to Drawings for details. Provide auxiliary system that will give instant incandescent light continuously from the moment the current energizes (or re-energizes after voltage interruption) until the metal halide lamp reaches 70% or more of its light output. Voltage: 120 volt	1-400 Watt Clear Metal Halide and 1-150 Watt Quartz (40,000 Lumen)

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'BB'	Suspended industrial luminaire with spun aluminum slotted specular reflector, integral aluminum ballast, housing and six slotted focusing tube to allow easy reflector installation and positioning. A positive keyed stop and two safety screws shall ensure correct reflector engagement. The inside of the reflector shall have a black rim ring to reduce brightness.	1-250 Watt Clear Metal Halide

Candela Data

Lumens - 20500
Test Distance - 7.62 metres

Angle (Deg)	Mean CP
0	8607
5	8730
15	9035
25	7448
35	4920
45	3168
55	915
65	252
75	83
85	36
90	21
	12

Mount luminaire flush with underside of steel joists complete with safety chain.

Refer to Drawings for details.

Voltage: 120 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'BB1'	Suspended industrial luminaire with spun aluminum slotted diffused reflector, integral aluminum ballast, housing and six slotted focusing tubes to allow easy reflector installation and positioning. A positive keyed stop and two safety screws shall ensure correct reflector engagement. The inside of the reflector shall have a black rim ring to reduce brightness.	1-250 Watt Clear Metal Halide and 1-150 Watt Quartz

Candela Data — Lumens - 20,500
Test Distance - 7.62 metres

Angle (Deg)	Mean CP
0	8607
5	8730
15	9035
25	7448
35	4920
45	3168
55	915
65	252
75	83
85	36
90	21
	12

Mount luminaire flush with underside of steel joists complete with safety chain.

Refer to Drawings for details.

Provide auxiliary system that will give instant incandescent light continuously from the moment the current energizes (or re-energizes after voltage interruption) until the metal halide lamp reaches 70% or more of its light output.

Voltage: 120 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'CC'	Suspended industrial luminaire with spun aluminum slotted diffused reflector, integral aluminum ballast, housing and six slotted focusing tube to allow easy reflector installation and positioning. A positive keyed stop and two safety screws shall ensure correct reflector engagement. The inside of the reflector shall have a black rim ring to reduce brightness.	1-400 Watt Clear Metal Halide

Candela Data Lumens - 34000
Test Distance - 7.62 metres

Angle (Deg)	Mean CP
0	14346
5	14550
15	15059
25	12413
35	8201
45	5280
55	1526
65	420
75	138
85	60
90	21

Mount luminaire flush with underside of steel joists complete with safety chain.

Refer to Drawings for details.

Voltage: 120 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'CC1'	Suspended industrial luminaire with spun aluminum slotted diffused reflector, integral aluminum ballast, housing and six slotted focusing tube to allow easy reflector installation and positioning. A positive keyed stop and two safety screws shall ensure correct reflector engagement. The inside of the reflector shall have a black rim ring to reduce brightness.	1-400 Watt Clear Metal Halide and 1-150 Watt Quartz

Candela Data Lumens - 34000
Test Distance - 7.62 metres

Angle (Deg)	Mean CP
0	14346
5	14550
15	15059
25	12413
35	8201
45	5280
55	1526
65	420
75	138
85	60
90	21

Mount luminaire flush with underside of steel joists complete with safety chain.

Refer to Drawings for details.

Provide auxiliary system that will give instant incandescent light continuously from the moment the current energizes (or re-energizes after voltage interruption) until the metal halide lamp reaches 70% or more of its light output.

Voltage: 120 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'DD'	Wall mounted industrial luminaire with spun aluminum slotted diffused reflector, integral aluminum ballast, housing and six slotted focusing tube to allow easy reflector installation and positioning. A positive keyed stop and two safety screws shall ensure correct reflector engagement. The inside of the reflector shall have a black rim ring to reduce brightness.	1-400 Watt Clear Metal Halide

Candela Data

Lumens - 34000
Test Distance - 7.62 metres

Angle (Deg)	Mean CP
0	14346
5	14550
15	15059
25	12413
35	8201
45	5280
55	1526
65	420
75	138
85	60
90	21

Mount luminaire at the same height as Type 'CC'.

Refer to Drawings for details.

Voltage: 120 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'DD1'	Wall mounted industrial luminaire with spun aluminum slotted diffused reflector, integral aluminum ballast, housing and six slotted focusing tube to allow easy reflector installation and positioning. A positive keyed stop and two safety screws shall ensure correct reflector engagement. The inside of the reflector shall have a black rim ring to reduce brightness.	1-175 Watt Clear Metal Halide

Candela Data — Lumens - 14000
Test Distance - 7.62 metres

Angle (Deg)	Mean CP
0	5882
5	5965
15	6174
25	5089
35	3362
45	2165
55	626
65	172
75	56
85	25
90	8

Mount luminaire at the same height as Type 'FF'.

Refer to Drawings for details.

Voltage: 120 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'FF'	Suspended industrial luminaire with spun aluminum slotted diffused reflector, integral aluminum ballast, housing and six slotted focusing tube to allow easy reflector installation and positioning. A positive keyed stop and two safety screws shall ensure correct reflector engagement. The inside of the reflector shall have a black rim ring to reduce brightness.	1-175 Watt Clear Metal Halide

Candela Data — Lumens - 14000
Test Distance - 7.62 metres

Angle (Deg)	Mean CP
0	5882
5	5965
15	6174
25	5089
35	3362
45	2165
55	626
65	172
75	56
85	25
90	8

Mount luminaire flush with underside of steel joists complete with safety chain.

Refer to Drawings for details.

Voltage: 120 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'FF1'	Suspended industrial luminaire with spun aluminum slotted diffused reflector, integral aluminum ballast, housing and six slotted focusing tube to allow easy reflector installation and positioning. A positive keyed stop and two safety screws shall ensure correct reflector engagement. The inside of the reflector shall have a black rim ring to reduce brightness.	1-175 Watt Clear Metal Halide and 1-100 Watt Quartz

Candela Data — Lumens - 14000
Test Distance - 7.62 metres

Angle (Deg)	Mean CP
0	5882
5	5965
15	6174
25	5089
35	3362
45	2165
55	626
65	172
75	56
85	25
90	8

Mount luminaire flush with underside of steel joists complete with safety chain.

Refer to Drawings for details.

Provide auxiliary system that will give instant incandescent light continuously from the moment the current energizes (or re-energizes after voltage interruption) until the metal nalide lamp reaches 70% or more of its light output.

Voltage: 120 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'GG'	Surface mounted weather-tight and bug-tight sharp cut-off luminaire with an Alzak optical reflector assembly adjustable from 70° through 86° above nadir. The housing shall be made of aluminum with a heavy duty cast aluminum door and vandal resistant, injection moulded, polycarbonate lens that is UV stabilized. The ballast shall be an integral part of the housing with the luminaire finished in white and guaranteed not to peel. Mount luminaire approximately 4.57 metres above finished grade. Verify mounting heights with Division 13. Refer to Drawing for details. Voltage: 120 volt	1-150 Watt High Pressure Sodium (Clear)
'GG1'	Surface mounted weather-tight and bug-tight sharp cut-off luminaire with an Alzak optical reflector assembly adjustable from 70° through 86° above nadir. The housing shall be made of aluminum with a heavy duty cast aluminum door and vandal resistant, injection moulded, polycarbonate lens that is UV stabilized. The ballast shall be an integral part of the housing with the luminaire finished in white and guaranteed not to peel. Mount luminaire approximately 4.57 metres above finished grade. Verify mounting heights with Division 13. Refer to Drawing for details. Voltage: 120 volt	1-400 Watt High Pressure Sodium (Clear)

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'HH'	Pole mounted quad luminaire with extruded square aluminum housings each secured by means of an internal aluminum ring to a corrosion resistant tubular steel brace within the distributing reflector with the steel brace mounted rigidly to the neck casting. All supporting hardware shall be concealed and shall apply no pressure to the clear polycarbonate enclosure. The flush top plate shall be removable with the upper segment of the collecting Alzak reflector providing access to the lamp. The reflector shall have a cut-off of 76° from vertical. Colour of luminaire to be red to match Architect's colour chip and guaranteed not to peel.	4-400 Watt High Pressure Sodium (Clear)

Photometric Performance

1. Intensity at peak shall be no less than 0.20 cd/lumen.

2. Intensity at any angle from 77° to 90° (above vertical) shall be no greater than 0.02 cd/lumen.

3. The peak angle shall be no lower than 67° above vertical.

The pole shall be a square tapered 10.16 cm steel pole mounted on a concrete base. The height of the pole without the luminaire shall be 12.19 metres. The luminaire shall be internally fastened to the pole providing a hardware free appearance. The pole shall be welded to a square base,

2.2 Luminaire
Details (Cont'd)

TYPE	DESCRIPTION	LAMP
	furnished with grounding lug, anchor bolt assembly, template and base cover. Colour of pole shall be red to match Architect's colour chip. Colour finish of luminaire and pole to match exactly and guaranteed not to peel. P.18 Addendum No. 1 * Concrete base supplied under Division 3. Refer to Drawings for details. Voltage: 208 volt	
'HH1'	Pole mounted double luminaire with extruded square aluminum housings each secured by means of an internal aluminum ring to a corrosion resistant tubular steel brace within the distributing reflector with the steel brace mounted rigidly to the neck casting. All supporting hardware shall be concealed and shall apply no pressure to the clear polycarbonate enclosure. The flush top plate shall be removable with the upper segmant of the collecting Alzak reflector providing access to the lamp. The reflector shall have a cut-off of 76° from vertical. Colour of luminaire to be red to match Architect's colour chip and guaranteed not to peel.	2-400 Watt High Pressure Sodium (Clear)

2.2 Luminaire Details (Cont'd)

TYPE DESCRIPTION LAMP

Photometric Performance

1. Intensity at peak shall be no less than 0.20 cd/lumen.

2. Intensity at any angle from 77° to 90° (above vertical) shall be no greater than 0.02 cd/lumen.

3. The peak angle shall be no lower than 67° above vertical.

The pole shall be a square tapered 10.16 cm steel pole mounted on a concrete base. The height of the pole without the luminaire shall be 12.19 metres. The luminaire shall be internally fastened to the pole providing a hardware free appearance. The pole shall be welded to a square base, furnished with grounding lug, anchor bolt assembly, template and base cover.

Colour of pole shall be red to match Architect's colour chip. Colour finish of luminaire and pole to match exactly and guaranteed not to peel.

Pg. 18 Addendum #1

Concrete base supplied under Division 3.

Refer to Drawings for details.

Voltage: 208 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'JJ'	Pole mounted single luminaire with extruded square aluminum housing secured by means of an internal aluminum ring to a corrosion resistant tubular steel brace within the distributing reflector with the steel brace mounted rigidly to the neck casting. All supporting hardware shall be concealed and shall apply no pressure to the clear polycarbonate enclosure. The flush top plate shall be removable with the upper segment of the collecting Alzak reflector providing access to the lamp. The reflector shall have a cut-off of 76° from vertical. Colour of luminaire to be red to match Architect's colour chip and guaranteed not to peel.	1-400 Watt High Pressure Sodium (Clear)

Photometric Performance

1. Intensity at peak shall be no less than 0.20 cd/lumen.

2. Intensity at any angle from 77° to 90° (above vertical) shall be no greater than 0.02 cd/lumen.

3. The peak angle shall be no lower than 67° above vertical.

4. Provide asymmetric distribution.

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
	The pole shall be a square tapered 10.16 cm steel pole mounted on a concrete base. The height of the pole without the luminaire shall be 9.14 metres. The luminaire shall be internally fastened to the pole providing a hardware free appearance. The pole shall be welded to a square base, furnished with grounding lug, anchor bolt assembly, template and base cover. Colour of pole shall be red to match Architect's colour chip. Colour finish of luminaire and pole to match exactly and guaranteed not to peel. Pg. 18 * Addendum #1. Concrete base supplied under this Division 3. Refer to Drawing for details. Voltage: 208 volt	
'JJ1'	Pole mounted single luminaire with extruded square aluminum housing secured by means of an internal aluminum ring to a corrosion resistant tubular steel brace within the distributing reflector with the steel brace mounted rigidly to the neck casting. All supporting hardware shall be concealed and shall apply no pressure to the clear polycarbonate enclosure. The flush top plate shall be removable with the upper segment of the collecting Alzak reflector providing access to the lamp. The reflector shall have a cut-off of 76° from vertical.	1-400 Watt High Pressure Sodium (Clear)

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
	Colour of luminaire to be red to match Architect's colour chip and guaranteed not to peel.	

Photometric Performance

1. Intensity at peak shall be no less than 0.20 cd/lumen.

2. Intensity at any angle from 77° to 90° (above vertical) shall be no greater than 0.02 cd/lumen.

3. The peak angle shall be no lower than 67° above vertical.

The pole shall be a square tapered 10.16 cm steel pole mounted on a concrete base. The height of the pole without the luminaire shall be 9.14 metres. The luminaire shall be internally fastened to the pole providing a hardware free appearance. The pole shall be welded to a square base, furnished with grounding lug, anchor bolt assembly, template and base cover.

Colour of pole shall be red to match Architect's colour chip. Colour finish of luminaire and pole to match exactly and guaranteed not to peel.

Pg. 18 * Addendum #1.

Concrete base supplied under this Division.

Refer to Drawing for details.

Voltage: 208 volt

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'KK'	square recessed ellipsoidal 219 mm low brightness downlight with black baffle and integral ballast. Visual cut-off to lamp shall be 45° and suitable for a linear metal ceiling or drywall ceiling.The trim ring shall be painted to match ceiling colour. Spacing to mounting height ratio - 1.07 Refer to Drawings for details. Voltage: 120 volt	1-100 Watt A-23 Mercury
'KK1	Square recessed ellipsoidal 219 mm low brightness downlight with black baffle and integral ballast. Visual cut-off to lamp shall be 45° and suitable for a linear metal ceiling or drywall ceiling. The trim ring shall be painted to match ceiling colour. Spacing to mounting height ratio - 1.07. The quartz lamp will give instant incandescent light continuously from the moment the current energizes (or re-energizes after voltage interruption) until the mercury lamp reaches 70% or more of its light output. Refer to Drawing for details Voltage 120 volt	1-100 Watt A-23 Mercury 1-70 Watt lamp Quartz

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'LL'	Recessed 311 mm round reflector downlight with specular clear Alzak reflector with black grooved baffle and integral ballast. Visual cut-off to lamp shall be 45° with the trim ring in white. Spacing to mounting height ratio - 1.03. Refer to Drawing for details. Voltage: 120 volt	1-175 Watt Metal Halide E-28
'MM'	Recessed incandescent shower light with one piece cast aluminum faceplate, 3 mm minimum wall thickness of corrosion resistant alloy, and regressed flat fresnel lens. Luminaire shall be suitable for a drywall ceiling. Refer to Drawing for details. Voltage: 120 volt	1-150 Watt A-23
'NN'	Round recessed 212 mm wallwash and downlight combination, with dual Alzak reflectors, integral ballast and suitable for a linear metal ceiling or drywall ceiling. Luminaire shall have a heat dissipating socket enclosure and medium base porcelain socket with nickel plated screw shell. Trim ring to be painted to match ceiling colour. Refer to Drawing for details. Voltage: 120 volt	1-100 Watt Mercury A-23

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'PP'	Round recessed 203 mm wallwash and downlight combination with dual Alzak reflectors and suitable for a 'T'-bar ceiling. Luminaire shall have a heat dissipating socket enclosure and adjustable medium base porcelain socket. Trim ring shall be finished in white. Refer to Drawings for details. Voltage: 120 volt	1-200 Watt A-23
'RR'	Round recessed 206 mm downlight with black milligroove baffle and suitable for a 'T'-bar ceiling. Luminaire shall have a heat dissipating socket enclosure and medium base porcelain socket. Trim ring shall be finished in white. Refer to Drawings for details. Voltage: 120 volt	1-200 Watt A-23
'SS'	Recessed incandescent round downlight with anodized aluminum reflector and heavy crystal glass ring nested in a hydroformed black aperture cone. Luminaire shall be suitable for a drywall ceiling. Refer to Drawings for details. Voltage: 120 volt	1-60 Watt A-19

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'TT'	Single circuit flush mounted heavy duty light track in 1200 mm and 2400 mm lengths as shown on Drawing. Track shall be finished in matte white and shall come complete with all mounting accessories.	-
	Incandescent compact track luminaire with side-by-side arrangement of adjustable lamp holder and transformer. The luminaire shall have a snap-in socket to assure ease in lamping. Luminaire to be finished in white.	1-50 Watt Par 36 12 Volt (Screw Terminal Base)
	Refer to Drawings for details.	
	Voltage: 120 volt	
'VV'	Recessed 198mm x 117mm x 76mm deep fluorescent step light with recessed housing and die-cast hinged ribbed face plate. Finish of step light to stainless steel to match finish of stair.	1-PL9
	Provide finished sample of faceplate to Architect before manufacturing.	
	Refer to Drawings for details.	
	Voltage: 120 volt	
'WW'	Recessed incandescent luminaire with black grooved baffle, heat dissipating socket and suitable for a drywall ceiling. Provide a top reflector to take advantage of using 'A' lamps.	1-150 Watt A-23 I.F.
	Refer to Drawings for details.	
	Voltage: 120 volt	

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'YY'	Base mounted adjustable small quartz light made of rugged cast housing that is anodized complete with fins for good heat dissipation. The primary and auxiliary reflectors shall be made of aluminum with a curved thermal and shock-resistant tempered glass protecting the reflectors. Refer to Drawings for details. Voltage: 120 Volt Note: Aim Type 'YY' luminaires to the satisfaction of the Engineer.	1-300 Watt T4Q CL
'ZZ'	Desk mounted fluorescent task light finished in white complete with weighted base, chrome 19" stem complete with 10'-0" white cord and male receptacle. Voltage: 120 Volt	1-14 Watt
'AAA'	Explosion proof suspended luminaire, Class 1, Division 2, with die cast aluminum housing, integral ballast, impact resistant glass globe and guard. The luminaire shall have a chemically coupled, glass fortified polypropylene lensfor corrosive atmospheres and shall be totally gasketted. Mount luminaire flush with underside of steel joists. Refer to Drawings for details. Voltage: 120 Volt	1-250 Watt Metal Halide

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'AAA1'	Explosion proof suspended luminaire, Class 1, Division 2, with die cast aluminum housing, integral ballast, impact resistant glass globe and guard. The luminaire shall have a chemically coupled, glass fortified polypropylene lens for corrosive atmospheres and shall be totally gasketted. Mount luminaire flush with underside of steel joists. Provide auxiliary system that will give instant incandescent light continuously from the moment the current energizes (or re-energizes after voltage interruption) until the metal halide lamp reaches 70% or more of its light output. Refer to Drawings for details. Voltage: 120 volt	1-250 Watt Metal Halide and 1-150 Watt Quartz
'BBB'	Explosion proof incandescent luminaire with heavy duty housing, glass, heat and impact resistant globe, Class I, Groups C, D. Refer to Drawings for details. Voltage: 120 volt	1-100 Watt A-21

2.2 Luminaire Details (Cont'd)

TYPE	DESCRIPTION	LAMP
'CCC'	Heavy duty industrial dock light with die cast aluminum housing gasketted clear glass lens, and guard. Arm reach shall be 900 mm with two arms. Unit shall come complete with On-Off bat handle switch. Colour of luminaire shall be safety-yellow. Refer to Drawings for details. Voltage: 120 volt	1-150 Watt Par 38 Spot
'DDD'	Wall mounted incandescent luminaire made of die cast aluminum and injection moulded polycarbonate diffuser and tamper proof stainless steel screws. Refer to Drawings for details. Voltage: 120 volt	1-100 Watt A-19
'FFF'	Pad mounted square bollard made of extruded aluminum 91 cm thick. The reflector system shall be specular clear dual Alzak to provide efficient "assymmetrical distribution". The window section shall be made of one piece injection molded polycarbonate and shall be completely gasketted top and bottom. The ballast shall be mounted on a removable carriage within the post.	1-70 Watt High Pressure Sodium

2.2 Luminaire Details (Cont'd)	TYPE	DESCRIPTION	LAMP
		Post and top cap sections shall be made of extruded aluminum, securely fastened internally by high strength tie rods. Finish shall be red to match Architect's colour chip and guaranteed not to peel. Voltage 120 volt Refer to Drawings for details. Moldcast "Pericline 32320-12-RED-LEX-ASY"	
	'GGG'	Round recessed 210 mm downlight with black milligroove baffle suitable for a drywall ceiling. Luminaire shall have a heat dissipating socket enclosure and medium base porcelain socket. Trim ring shall be finished in white. Refer to Drawings for details. Voltage: 120 volt	1-300 Watt R40 SPOT

2.3 Lamps .1 Provide lamps as indicated.

2.4 Ballasts and Accessories .1 Provide ballasts and accessories as indicated.

PART 3 - EXECUTION

3.1 Installation .1 Locate luminaires as indicated.

3.2 Wiring	.1	Connect luminaires to lighting circuits as indicated.
3.3 Lamps	.1	Adjust lamp light centre position to produce specified beam distribution for luminaire type GG and GG1.
3.4 Tests	.1	Perform tests in accordance with Section 16010.
	.2	Check luminaires and replace defective lamps, ballasts and accessories.
	.3	Emergency lighting system to be tested in accordance with DFC 501-1975.

**********END**********

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

.1 Lighting general description: Section 16801

1.2 Product Data

.1 Submit product data in accordance with Section 01340.

PART 2 - PRODUCTS

2.1 Materials

.1 Housings: cast anidozed extruded aluminum frame, satin aluminum finish and:

.2 Back plates: cast aluminum alloy die formed cold rolled steel.

.3 Total of two (2) PL7 lamps, 120 V, 10,000 h lamps per luminaire.

.4 Designed for 10,000 h of continuous operation without relamping.

.5 150 mm, 70 mm high x 13 mm wide letters red on separate die-cast aluminum face plates, reading EXIT and SORTIE.

.6 White glass downlight in bottom of each unit.

.7 Faceplates to remain captive for relamping.

2.2 Design

.1 Provide separate exit lights, one indicating EXIT and the other SORTIE for each luminaire type.

.2 Refer to drawing for details.

Type	Description
"X1"	Wall mounted single face
"X2"	Pendant mounted - double face complete with directional arrows
"X3"	Pendant mounted - single face
"X4"	Pendant mounted - single face complete with directional arrows
"X5"	Ceiling mounted - single face
"X6"	Wall mounted - single face complete with directional arrows

2.2 Design (Cont'd)

Type	Description
"X7"	Ceiling mounted - single face complete with directional arrows
"X8"	Ceiling mounted - double face complete with directional arrows.
"X9"	"Explosion Proof" - exit lights suitable for hazardous locations.

PART 3 - EXECUTION

3.1 Installation

.1 Install exit lights as indicated, to requirements of NBC-1980.

.2 Connect luminaires to emergency exit light circuits as indicated.

.3 Ensure that emergency exit light circuit breaker is locked in closed position.

**********END**********

PART 1 - GENERAL

1.1 Spare Lamps .1 Provide spare lamps as follows:
.1 5% of each type of lamp.

1.2 Guarantee .1 Replace:
.1 Incandescent and tungsten halogen lamps burning out within 3 months of takeover.
.2 Fluorescent and HID lamps burning out within 12 months of takeover.

PART 2 - PRODUCTS

2.1 Materials .1 Incandescent lamps to: CSA C10-1951 and CSA C22.2 No. 84-1974.

.2 Tungsten halogen lamps to: CSA C22.2 No. 84-1974.

.3 Fluorescent lamps to: ANSI C78 - fluorescent lamps - 1972.

.4 HID lamps to: ANSI C78-1972.

2.2 Incandescent .1 Standard incandescent:
.1 Bulb shape A to 15G W, PS from 150 to 300 W, medium base, inside frosted 1000 h life, minimum initial lumens:
60 W - 870
100 W - 1650
150 W - 2780
200 W - 3700
.2 Parabolic aluminized reflector lamps, bulb shape, PAR to 500 W, medium skirted base to 150 W, mogul base 300 to 500 W, clear, 2000 h life, minimum initial lumens:
150 W PAR 38 flood/spot - 1730

2.3 Fluorescent .1 Fluorescent:
.1 Rapid start 430 mA, bulb shape T, medium bipin base, 18000 h life, minimum initial lumens for warm white:
30 W - 2340
40 W - 3050, 1160 MM metric

2.4 High Intensity Discharge .1 Mercury vapour:
.1 Bulb shape E, mogul base, 3000 K, 24000 h life, coated, minimum initial lumens:
100 Watt A-23, 3600 lumens

2.4 High Intensity Discharge (Cont'd)

.2 Metal halide:

.1 Bulb shape BT-28, mogul base, 3800 K, coated, minimum initial lumens:
175 Watt BT-28, 14,000 lumens, 7,500 hr
250 Watt BT-28, 20,500 lumens, 10,000 hr
400 Watt BT-37, 34,000 lumens, 20,000 hr

Note:
All open luminaires shall be provided with shatter shields when using 175 Watt or 250 Watt metal halide lamps.

.3 High Pressure Sodium:

.1 Bulb shape E23½, mogul base, 2100 K, 24,000 h Life, clear, minimum initial lumens.
150 Watt E23½, 16,000 lumens
400 Watt E-18, 50,000 lumens

PART 3 EXECUTION

3.1 Installation

.1 For installation refer to appropriate luminaire sections.

**********END**********

PART 1 - GENERAL

1.1 Product Data .1 Submit product data in accordance with Section 16010.

PART 2 - PRODUCTS

2.1 Materials .1 Ballasts: to CSA C22.2 No. 74-1969.

2.2 Fluorescent Ballasts .1 Fluorescent ballasts shall be supplied with rated voltage matching the supply voltage indicated. Ballasts shall be rapid start, single or two lamp, high power factor, thermal auto-resetting protection and protected non PCB capacitor.

.2 Ballasts shall have a Group 'A' sound rating.

.3 Standard performance, energy saving ballasts, shall be suitable for standard or metric lamps.
.1 Rapid start, 430 mA, for 2-30 or F40 watt lamps.
.2 Rapid start, 430 mA, for 1-30 or F40 watt lamps.

.4 Rapid start, 800 mA outdoor ballast capable of starting the lamps for which they are rated in an ambient temperature of -34°C;
1 - 100 W, 2400 MM lamp

.5 The control dimming ballast shall be form-fit with a standard rapid start ballast, with identical lamp wiring and 2 wire power supply. It must be sound rated "A" for use in office and other low noise applications, shall be thermally protected (automatic re-cycling) with maximum heat rise of 40°C in an ambient of 25°C and be CSA certified.

.6 High efficiency (minimum 90% power consumption of standard high quality rapid start ballast) control ballast for controlling 2 or 1-F40 watt T12 rapid start lamps. Ballasts must be capable of operating the lamps from 120 volt power supply, and controlling the lamp output through the 100% to 20% power range supplied by the power controller, or operating at 100% on straight line power.

2.3 High Intensity Discharge Ballasts

.1 Mercury vapour ballasts, minimum power factor 95%, input voltage range ± 13% of nominal, normal ambient 40°C, minimum starting temperature - 34°C at 87% line voltage, 60 Hz, constant wattage isolated primary winding:

.1 Encased for indoor applications, single lamp 100 watt.

.2 High pressure sodium ballasts shall be supplied with rated voltage matching the supply voltage indicated. Ballasts shall provide lamp lumens equal to or better than the lamp manufacturers published lumen maintenance curve at all points in the life of the lamp. Ballasts shall be of the constant wattage, regulated output type to maintain correct lamp operation over a voltage input rating of +5% and -10%.

**********END**********

Public Works Canada
Ontario Region

DRAWING INDEX

095074/354604

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AC.	ACOUSTIC
AC.MET.D.	ACOUSTIC METAL DECK
AC.PL.	ACOUSTIC PLASTER
AC.U.	ACOUSTIC UNITS
A.C.L.	ACRYLIC CUBE LOUVRE
A/C	AIR CONDITIONER
AL.	ALUMINUM
A.B.	ANCHOR BOLT
AN.	ANODIZED
A.CEM.S.	ASBESTOS CEMENT SHEET
B.H.	BORE HOLE
BR.	BRICK
BLDG.	BUILDING
BHD.	BULKHEAD
CPT.	CARPET
C.B.	CATCH BASIN
CLG.	CEILING
CEM.PL.	CEMENT PLASTER
C/L	CENTRE LINE
C.C.	CENTRE TO CENTRE
C.T.	CERAMIC TILE
CHAN.	CHANNEL
COFF.	COFFERED
COFF.AC.U.	COFFERED ACOUSTIC UNITS AND INTEGRATED CEILING SYSTEM
COL.	COLUMN
CONC.	CONCRETE
CONC.BL.	CONCRETE BLOCK
CONST.	CONSTRUCTION
CONST.JT.	CONSTRUCTION JOINT
C.JT.	CONTROL JOINT
CK.	CORK
C.G.	CORNER GUARD
DAMP.C.	DAMPPROOF COURSE
DAMPG.	DAMPPROOFING
DIA.	DIAMETER
DR.	DOOR
DN.	DOWN
D.	DRAPERY
DWG.	DRAWING
D.F.	DRINKING FOUNTAIN
D.DR.	DUTCH DOOR
ELEC.	ELECTRICAL
EL.	ELEVATION
ELEV.	ELEVATOR
EQ.	EQUAL
EX.	EXHAUST
EXIST.	EXISTING
E.MET.	EXPANDED METAL
E.JT.	EXPANSION JOINT
EXP.STR.	EXPOSED STRUCTURE
EXT.	EXTERIOR
E.C.	EPOXY COATING
FIN.	FINISH
F.E.	FIRE EXTINGUISHER
F.H.C.	FIRE HOSE CABINET
FLR.	FLOOR
FLR.D.	FLOOR DRAIN
FLUOR.	FLUORESCENT
FTG.	FOOTING
FDN.	FOUNDATION
FR.	FRAME
F.B.	FLAT BAR
G.STL.	GALVANIZED STEEL
GL.	GLASS
G.S.B.R.	GRAVEL SURFACE BUILT-UP ROOF
G.BD.	GYPSUM BOARD
G.S.BD.	GYPSUM SHEATHING BOARD
G.L.	GRID LINE
HARD.	HARDENED
HDW.	HARDWARE
HDWD.	HARDWOOD
HTR.	HEATER
HT.	HEIGHT
H.MET.	HOLLOW METAL
H.S.S.	HOLLOW STRUCTURAL STEEL
H.B.	HOSE BIB
HR.	HOUR
HYD.	HYDRANT
H.P.	HYDRO POLE
H.B.G.	HIGH BUILD GLAZE COATING
I.D.	INSIDE DIAMETER
INS.	INSULATION
I.R.M.S.	INVERTED ROOF MEMBRANE SYSTEM

JT.	JOINT
K.P.	KICK PLATE
LAM.P.	LAMINATED PLASTIC
LAV.	LAVATORY
L.S.S.J.	LONG SPAN STEEL JOIST
MACH.	MACHINE
MH.	MANHOLE
MAS.	MASONRY
MAS.F.	MASONRY FLASHING
MAS.O.	MASONRY OPENING
MECH.	MECHANICAL
M.WPG.	MEMBRANE WATERPROOFING
MET.C.L.	METAL CUBE LOUVRE
MET.D.	METAL DECK
MET.F.	METAL FLASHING
MET.G.CLG.	METAL GRID CEILING
MET.L.PL.	METAL LATH AND PLASTER
MET.L.CLG.	METAL LINEAR CEILING
MET.THR.	METAL THRESHOLD
MET.T.PTN.	METAL TOILET PARTITION
MISC.	MISCELLANEOUS
N.E.	NORTH EAST
N.W.	NORTH WEST
N.I.C.	NOT IN CONTRACT
N.T.S.	NOT TO SCALE
O.C.	ON CENTRE
O.W.S.J.	OPEN WEB STEEL JOIST
O.D.	OUTSIDE DIAMETER
O/H	OVERHEAD
PT.	PAINT
PTN.	PARTITION
PL.	PLASTER
PLY.	PLYWOOD
PV.C.	POLYVINYL CHLORIDE
P.CONC.	PRECAST CONCRETE
PREFAB.	PREFABRICATED
P.	PREFINISHED
Q.T.	QUARRY TILE
R.W.L.	RAIN WATER LEADER
RECP.	RECEPTACLE
R.CONC.	REINFORCED CONCRETE
R.B.	RESILIENT BASE
R.STL.DR.	ROLLING STEEL DOOR
R.D.	ROOF DRAIN
RM.	ROOM
R.O.	ROUGH OPENING
SAN.S.	SANITARY SEWER
SH.	SHOWER
S.E.	SOUTH EAST
S.W.	SOUTH WEST
S.&V.	STAIN AND VARNISH
S.STL.	STAINLESS STEEL
STL.	STEEL
ST.	STORAGE
ST.S.	STORM SEWER
STR.	STRUCTURE OR STRUCTURAL
TEL.	TELEPHONE
TER.	TERRAZZO
THR.	THRESHOLD
U/G	UNDERGROUND
U/S	UNDERSIDE
UR.	URINAL
U/N	UNLESS NOTED
VEST.	VESTIBULE
V.A.T.	VINYL ASBESTOS TILE
V.C.F.	VINYL COATED FABRIC
W.H.	WALL HYDRANT
W.R.	WASHROOM
WPG.	WATERPROOFING
W.M.	WELDED WIRE MESH
W.OAK	WHITE OAK
WD.	WOOD
WD.H.C.	WOOD HOLLOW CORE
WD.S.C.	WOOD SOLID CORE
WVC.	WIND VAPOUR CLOSURE

MATERIAL AND COLOUR

GENERAL NOTE:	Manufacturer's trade names and material numbers are to establish pattern, colour and texture. Other manufacturers meeting the material quality requirements specified are acceptable providing the patterns, colours and textures are within reasonable limits of that noted and as determined by the Engineer. Submit colours, patterns and textures.
1. Bollards and Guardrails	PT.-2
2. Loading dock	PT.-3
3. Metal siding and metal flashing	All PT.-1 except where shown otherwise.
4. Aluminum doors and frame	Clear anodized.
5. Aluminum Windows	Exterior PT.-2. All interior surfaces aluminum clear anodized.
6. Exterior light fixtures on building	PT.-1
7. Pole lights and poles	PT.-2
8. Flagpole	PT.-1
9. Metal linear ceiling	PT.-1

MATERIAL AND COLOUR	
10. Exterior roof top mechanical devices	PT.-1
11. Colours	See interior finish and colour schedule for paint and coating colours.
12. Communications Tower	PT.-1 and PT.-2 as shown on drawings.
13. Anemometer Tower	PT.-2
14. Windsock Tower	PT.-2
15. Windsock pipe mast supplied by Owners painted and installed by this contract	PT.-2
16. Exterior H.MET. Doors	PT.-2 unless shown otherwise.
17. Exterior railing	PT.-2
18. Metal column covers	PT.-1
19. Hydrants	Paint approved yellow.
20. Metal ladders	PT.-7

MATERIAL AND COLOUR	
21. Diesel exhaust stack	PT.-7
22. Overhead and vertical lift doors	PT.-2
23. Existing Ships Stores Bldg:	
Ext. walls	PT.-1
Doors, windows, facia	PT.-2

MATERIALS AND COLOUR

GENERAL NOTE:	Manufacturer's trade names and material numbers are to establish pattern, colour and texture. Other manufacturers meeting the material quality requirements specified are acceptable providing the patterns, colours and textures are within reasonable limits of that noted and as determined by the Engineer. Submit colours, patterns and textures.
1. Paint (Exterior and Interior)	Glidden PT. 70-63 PT.-1 White (Shall match CGSB 513-101 White) PT.-2 Red (Shall match CGSB 509-102 Red) PT.-3 To match LAM.P.-1 PT.-4 73-47 Yellow PT.-5 77-44 Blue PT.-6 To match LAM.P.-3 PT.-7 79-07 Grey PT.-8 Black (shall match CGSB-512-101)
2. Vinyl coated fabric	Metro Wallcoverings, 66 Orfus Road, Toronto. Highlands, V.C.F.-1 Galloway Stripe Pattern No. 6122 Page 79. V.C.F.-2 Chevron Pattern No. 6223 Page 65.
3. Stain and varnish	Glidden
4. Metal toilet partitions and lockers	General Steel Wares, G-701 Sandalwood
5. Carpet	Krossley Karastan 2901464 Toscana Mushroom
6. Terrazzo	Terrazzo & Tile Association Plate No. 752G
7. Vinyl Asbestos Tile	Flintkote Classic 3307
8. Resilient Base	Finercraft - Bisk
9. Ceramic Tile (Floor)	Clifton Ceramics Ltd. Frontenac C.T. 200 x 100 R164 disk
10. Ceramic Tile Base	Clifton Ceramics Ltd. Frontenac C.T. 200 x 100 bullnose top C.T.-3 200 x 100 Universal cove
11. Ceramic Tile (wall and base)	Olympia, Maple Leaf C.T.-1 3160 Primrose C.T.-2 3400 Willow Mist
12. Laminated Plastic	Formica LAM.P.-1 910 Lindenwood LAM.P.-2 933 Mission White LAM.P.-3 853 Ocean Gray

MATERIAL AND COLOUR

13. Floor Grille	K.N. Crowder Mfg. Ltd. Grey
14. Interior miscellaneous metal, stairs, railings, crane beams.	PT.-3
15. Interior H.MET. and STL. doors and frames	PT.-3 unless shown otherwise.
16. LAM.P. on doors	LAM.P.-1
17. LAM.P. on cabinets	LAM.P.-3 unless shown otherwise.
18. LAM.P. countertops	LAM.P.-2
19. LAM.P. window stools	LAM.P.-2
20. Corner guards	To match wall.
21. Interior of elevator	LAM.P.-3
22. Elevator doors	LAM.P.-1
23. Metal Linear ceiling	PT.-1
24. Ducts, conduits	To match colour of background surface.
25. Finish on oak	Matte urethane.
26. Chalkboard	Durasteel, Charcoal Brown.
27. Tackboard	Krommenie Tan 2166.
28. Tackboard and Chalkboard	Duracron Non metallic Earthtone UC-500096/mineral brown
29. Vertical Blinds	Clearview SB-100 PVC
30. Curtain: First Aid 183	Caya Fabrics Ltd., Kitchener, Ont. "Cayacube" Beige
31. High Build Glaze Coating	Colour to match Glidden 70-63.
32. Epoxy Coating	Colour to match Glidden 70-63.
33. Floor: Hangar 101.	Sternson "Colorplete LR": French Grey plus matching Colorhard Wax.

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	HANGAR BUILDING									
101	170[illegible]6250	D10	METAL	PT.-1 PT.-2	GL.-6	-	-	-	4	Multileaf, Vertical Lift Hanger Door. Provide special Paint Design on Exterior of Door PT.-1 on inside.
101A	910x2150x45	D13	H.MET.	PT.-2	GL.-4	F5	H.MET.	PT.-2	17	
101B	910x2150x45	D13	H.MET.	PT.-2	GL.-4	F5	H.MET.	PT.-2	17	
101C	810x1700x45	D2	H.MET.	PT.-1	-	F5	H.MET.	PT.-1	45	Door Jamb on all 4 sides.
101D	700x1500x45	D2	H.MET.	PT.-3	-	F3	H.MET.	PT.-3	20	Door & Frame: 1-1/2 hr label.
102	910x2150x45	D1	AL.	AN.	GL.-2	FL2	AL.	AN.	5	Door set in screen S1.
102A	910x2150x45	D13	H.MET.	PT.-3	GL.-2	F1	H.MET.	PT.-3	6	
103	910x2150x45	D13	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	12	Door & Frame: 3/4 hr label
104	910x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	7	
105	910x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	7	
106	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F1	H.MET.	PT.-3	13	Door & Frame: 3/4 hr label
108	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F1	H.MET.	PT.-3	7	
109	2-910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	14	Door & Frame: 3/4 hr label
110	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	12	Door & Frames 3/4 hr label
111	810x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	7	

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	HANGAR BUILDING (cont'd)									
112	810x2150x45	D3	H.MET.	PT.-3	GL.-1	F1	H.MET.	PT.-3	7	
113	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	15	Door & Frame: 1-1/2 hr label.
114	910x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	7	Door & Frame: 3/4 hr label. + Closer #8203 BC AL. (NOCHS)
115	910x2150x45	D2	H.MET.	PT.-1	-	F5	H.MET.	PT.-1	16	
116	810x2150x45	D2	H.MET.	PT.-2	-	F1	H.MET.	PT.-3	8	
117	710x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	8	
118	810x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	35	Door & Frame: 3/4 hr label.
119	810x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	10	
120	NOT USED									
	FLAMMABLE LIQUIDS STORAGE BUILDING									
121	3000x3800x50	D6	H.MET.	PT.-2	-	F16	STL.	PT.-2	4	Sectional, high-lift O/H door.
121A	910x2150x45	D2	H.MET.	PT.-2	-	F6	H.MET.	PT.-2	2	910x1590x45 Transom panel.
121B	910x2400x45	D2	H.MET.	PT.-2	-	F5	H.MET.	PT.-2	3	Door & Frame: 1-1/2 hr label.
122	2-1000x2400x50	D2	H.MET.	PT.-2	-	F5	H.MET.	PT.-2	1	Door & Frame: 1-1/2 hr label.

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	SHOP WING MAIN BUILDING									
123	910x2150x45	D1	AL.	AN.	GL.-2	F11	AL.	AN.	~~22~~ 5 (N.C. #8)	Door set in screen S4.
123A	910x2150x45	D1	AL.	AN.	GL.-2	F11a	AL.	AN.	22	Door set in Screen S3.
128	910x2150x45	D1	AL.	AN.	GL.-2	F11	AL.	AN.	22	Door set in Screen S7.
128A	910x2150x45	D1	AL.	AN.	GL.-2	F11a	AL.	AN.	5	Door set in Screen S6.
129	2-1000x2550x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	53	Door & Frame: 1-1/2 hr label.
129A	910x2150x45	D13	H.MET.	PT.-2	GL.-4	F6	H.MET.	PT.-2	19	910x1587x70 Transom Panel
129B	4000x3797x50	D5	H.MET.	PT.-2	GL.-6	F16	STL.	PT.-2	4	Sectional, high-lift O/H door.
130	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 1-1/2 hr label.
130A	3700x3797x50	D5	H.MET.	PT.-2	GL.-6	F16	STL.	PT.-2	4	Sectional, high-lift O/H door.
130B	3700x3797x50	D5	H.MET.	PT.-2	GL.-6	F16	STL.	PT.-2	4	Sectional, high-lift O/H door.
130C	910x2150x45	D13	H.MET.	PT.-2	GL.-4	F6	H.MET.	PT.-2	19	910x1587x70 Transom Panel
131	2-1000x2550x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	53	Door & Frame: 1-1/2 hr label.
131A	910x2550x45	D14	H.MET.	PT.-2	GL.-4	F6	H.MET.	PT.-2	19	910x1187x70 Transom panel

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	SHOP WING MAIN BUILDING (cont'd)									
131B	4000x3797	D8a	METAL	PT.-2	GL.-6	F16 .	STL.	PT.-2	4	Multileaf, vertical-lift door.
132	2-1000x2550x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	24	
133	910x2150x45	D13	H.MET.	PT.-3	GL.-2	F15	H.MET.	PT.-3	7	Door set in Screen S5.
134	810x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	8	
135	810x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	8	
136	810x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	9	Door & Frame: 3/4 hr label.
137	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	9	Door & Frame: 3/4 hr label.
138	2-910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	25	Door & Frame: 3/4 hr label.
139	2-910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	25	Door & Frame: 3/4 hr label.
139A	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label.
140	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label.
141	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	26	Door & Frame: 3 hr label.
141A	810x1700x45	D2	H.MET.	PT.-1	-	F5	H.MET.	PT.-3	29	Door Jamb on all 4 sides.
141B	910x2150x45	D2	H.MET.	PT.-2	-	F5	H.MET.	PT.-2	18	910x114x70 Transom Panel. Space for 910x356 louver.
142	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	28	
142A	910x2150x45	D13	H.MET.	PT.-2	GL.-4	F6	H.MET.	PT.-2	19	910x1587x70 Transom Panel.

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	SHOP WING MAIN BUILDING (cont'd)									
142B	3062x3797x50	D5	H.MET.	PT.-2	GL.-6	F16	STL.	PT.-2	4	Sectional, high-lift O/H door.
142C	3000x3000	D9	METAL	PT.-3	-	F13	STL.	PT.-3	4	Roll-up O/H door.
143 Panel.	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	28	910x850x45 Transom
143A	3000x3000	D9	METAL	PT.-3	-	F13	STL.	PT.-3	4	Roll-up O/H door.
143B	910x2150x45	D13	H.MET.	PT.-2	GL.-4	F5	H.MET.	PT.-2	19	
143C	2200x2400x50	D7	H.MET.	PT.-2	GL.-6	F16	STL.	PT.-2	4	Sectional, vertical lift O/H door.
143D	2400x2400x50	D7	H.MET.	PT.-2	GL.-6	F16	STL.	PT.-2	4	Sectional, Vertical Lift O/H door.
144	2-910x2150	D4	W.M.	PT.-3	-	F17	STL.	PT.-3	30	In W.M. partition.
146	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label. 910x850x45 Transom Panel.
146A	3000x3000	D9	METAL.	PT.-3	-	F13	STL.	PT.-3	4	Roll-up O/H door: 3/4 hr label.
146B	3000x3000	D9	METAL.	PT.-3	-	F13	STL.	PT.-3	4	Roll-up O/H door: 3/4 hr label.
146C	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label. 910x850x45 Transom Panel.
146D	810x2150x45	D13	H.MET.	PT.-3	GL.-2	F10	H.MET.	PT.-3	27	Door set in Screen S9.

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	SHOP WING MAIN BUILDING (cont'd)									
146E	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label.
148	910x2150x45	D13	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label.
149	810x2150x45	D2	H.MET.	PT.-3	-	F10	H.MET.	PT.-3	7	Door set in Screen S9.
150	810x2150x45	D2	H.MET.	PT.-3	-	F10	H.MET.	PT.-3	7	Door set in Screen S9a.
151	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 1-1/2 hr label.
151A	2-1000x2400x45	D3	H.MET.	PT.-3	GL.-1	F9	H.MET.	PT.-3	53	Door & Frame: 1-1/2 hr label.
151B	2-1000x2400x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	24	Door & Frame: 3/4 hr label.
151C	910x2150x45	D2	H.MET.	PT.-1	-	F3	H.MET.	PT.-1	17	
152	2-1000x2400x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	24	
153	2-1200x2400x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	53	Door & Frame: 3/4 hr label.
153A	910x2440x45	D14	H.MET.	PT.-2	GL.-4	F6	H.MET.	PT.-2	19	910x3697x70 Transom Panel.
153B	4000x4880	D8	METAL	PT.-2	GL.-6	F16	STL.	PT.-2	4	Multileaf, Vertical Lift Door.
154	2-1000x4240x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	21	Doors to be copped to fit around monorail.
155	1000x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	23	Door & Frame: 3/4 hr label.
156	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label.

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	SHOP WING MAIN BUILDING (cont'd)									
156A	3000x3000	D9	METAL	PT.-3	-	F13	STL.	PT.-3	4	Roll-up O/H Door: 3/4 h label.
156B	910x2440x45	D14	H.MET.	PT.-2	GL.-4	F6	H.MET.	PT.-2	19	910x3697x70 Transom Panel
156C	4000x4880	D8	METAL	PT.-2	GL.-6	F16	STL.	PT.-2	4	Multileaf, Vertical Lift Door
156D	1-800x4950x75 1-2600x4950x75	D11 D11	H.MET. H.MET.	PT.-3 PT.-3	- -	F16 F16	STL. STL.	PT.-3 PT.-3	57 57	Swinging Door. Swinging Door.
156E	1100x2400	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr labe
157	910x2150x45	D2	H.MET.	PT.-3	-	F10	H.MET.	PT.-3	7	Door set in screen S10.
158	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label
158A	3000x3000	D9	METAL	PT.-3	-	F13	STL.	PT.-3	4	Roll-up O/H Door: 3/4 hr label.
158B	910x2440x45	D14	H.MET.	PT.-2	GL.-4	F6	H.MET.	PT.-2	19	910x3697x70 Transom Panel.
158C	4000x4880	D8	METAL	PT.-2	GL.-6	F16	STL.	PT.-2	4	Multileaf, Vertical Lift Door.
158D	1-800x4950x75 1-2600X4950X75	D11 D11	H.MET. H.MET.	PT.-3 PT.-3	- -	F16 F16	STL. STL.	PT.-3 PT.-3	57 57	Swinging Door. Swinging Door.
159	910x2150x45	D2	H.MET.	PT.-3	-	F10	H.MET.	PT.-3	7	Door set in screen S11.
160	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label.
160A	910x2440x45	D14	H.MET.	PT.-2	GL.-4	F6	H.MET.	PT.-2	19	910x3697x70 Transom Panel.

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	SHOP WING MAIN BUILDING (cont'd)									
160B	4000x4880	D8	METAL	PT.-2	GL.-6	F16	STL.	PT.-2	4	Multileaf, Vertical Lift
160C	4000x5610 2 doors for opening	D12	METAL	PT.-3	-		METAL	PT.-3	4	Horizontal Sliding To fit around monorail.
161	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	48	Door & Frame: 1-1/2 hr label.
161A	910x2150x45	D13	H.MET.	PT.-2	GL.-4	F6	H.MET.	PT.-2	19	910x3757x70 Transom Panel.
161B	4000x4880	D8	METAL	PT.-2	GL.-6	F16	STL.	PT.-2	4	Multileaf, Vertical Lift Door.
161C	910x2150x45	D13	H.MET.	PT.-1	GL.-1	F5	H.MET.	PT.-1	18	
161D	910x2150x45	D13	H.MET.	PT.-1	GL.-1	F5	H.MET.	PT.-1	18	
161E	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	48	Door & Frame: 3/4 hr label.
	ADMINISTRATION WING OF MAIN BUILDING: GROUND FLOOR									
162	2-1000x2400x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	53	Door & Frame: 3/4 hr label
162A	3000x3800x50	D5	H.MET.	PT.-2	GL.-6	F16	STL.	PT.-2	4	Sectional, High-Lift O/H Door.
163	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label
163A	2-1000x2400x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	31	Door & Frame: 3/4 hr label
164	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: GROUND FLOOR (cont'd)									
164A	2-1000x2400x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	31	
165	2-910x2310x45	D1	AL.	AN.	GL.-2	F11	AL.	AN.	33	Door set in Screen S12.
165A	2-910x2310x45	D1	AL.	AN.	GL.-2	F12	AL.	AN.	32	Door set in Screen S13.
167	910x2150x45	D13	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr labe 910x1790x45 Transom Panel.
168	910x2150x45	D13	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	42	Door & Frame: 3/4 hr labe 910x1790x45 Transom Panel.
172	2-910x2310x45	D1	AL.	AN.	GL.-2	F11	AL.	AN.	33	Door set in screen S15.
172A	2-910x2310x45	D1	AL.	AN.	GL.-2	F12	AL.	AN.	32	Door set in screen S14.
173	910x2350x45	D3	H.MET.	PT.-3	GL.-1	F4	H.MET.	PT.-3	36	Door & Frame: 3/4 hr labe
174	910x2330x45	D2	WD.S.C.	LAM.P.-1	GL.-2		WD.	PT.	41	See Dwg A-23 (details).
175	810x2150x45	D2	WD.S.C.	LAM.P.-1	-		WD.	PT.	8	With Transom Panel. See dwg. A-23 (details).
176	910x2150x45	D2	WD.S.C.	LAM.P.-1	-		WD.	PT.	40	With Transom Panel. See dwg. A-23 (details).
177	910x2350x45	D2	H.MET.	PT.-2	-	F4	H.MET.	PT.-2	36	Door & Frame: 3/4 hr labe
177A	910x2150x45	D2	WD.S.C.	LAM.P.-1	-	F14	H.MET.	PT.	38	Pocket Door, Transom Panel See dwg. A-23 (details).

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: GROUND FLOOR (cont'd)									
178	2-910x2150x45	02	H.MET.	PT.-3	-		WD.	PT.	39	With Transom Panel. See dwg. A-23 (details).
179	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label.
181	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F1	H.MET.	PT.-3	37	Door & Frame: 3/4 hr label.
181A	910x2150x45	D13	H.MET.	PT.-2	GL.-4	F5	H.MET.	PT.-2	18	
182	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label.
183	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	20	Door & Frame: 3/4 hr label.
184	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	34	Door & Frame: 3/4 hr label.
186	710x2150x45	D2	WD.S.C.	LAM.P.-1	-	F1	H.MET.	PT.-3	8	
189	910x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	34	Door & Frame: 3/4 hr label.
190	810x2150x45	D2	WD.S.C.	LAM.P.-1	-	F1	H.MET.	PT.-3	8	
191	2-1250x3000x45	D14	H.MET.	PT.-3	GL.-1	F7	H.MET.	PT.-3	52	Door & Frame: 3/4 hr construction.
191A	910x3000x45	D3	H.MET.	PT.-3	GL.-1	F2	H.MET.	PT.-3	51	Door & Frame: 1-1/2 hr label.
191B	2500x3000x45	D9	METAL	PT.-3	-	F13	STL.	PT.-3	4	Roll-up O/H door Door & Frame: 1-1/2 hr label.

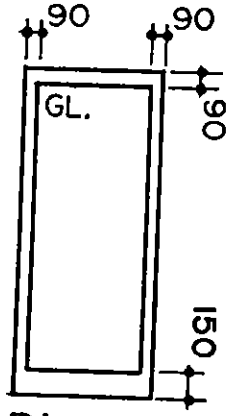
DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: GROUND FLOOR (cont'd)									
192	710x2150x45	D2	H.MET.	PT.-3	-	F2	H.MET.	PT.-3	35	Door & Frame: 3/4 hr label
	WINCH HOUSE									
193	2-910x2100x45	D2	H.MET.	PT.-2	-	F5	H.MET.	PT.-2	47	
193A	2-650x405								56	See Dwg. A-34.
	GUARDHOUSE									
194	810x2150x45	D13	H.MET.	PT.-2	GL.-4	F3	H.MET.	PT.-2	54	
194A	2-360x2150x45	D2	WD.S.C.	LAM.P.-1	-	See detail Dwg. A-30			55	
194B	760x640	D2				See detail Dwg. A-30			50	
	ADMINISTRATION WING OF MAIN BUILDING: 2ND FLOOR									
202	910x2150x45	D2	WD.S.C.	LAM.P.-1	-	F1	H.MET.	PT.-3	11	
203	910x2150x45	D2	WD.S.C.	LAM.P.-1	-	F1	H.MET.	PT.-3	11	
205	910x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	9	Door & Frame: 3/4 hr label.
206	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F1	H.MET.	PT.-3	37	Door & Frame: 3/4 hr label.
207	910x2150x45	D3	H.MET.	PT.-3	GL.-1	F4	H.MET.	PT.-3	43	Door & Frame: 3/4 hr label.
208	910x2150x45	D2	H.MET.	PT.-3	-	F3	H.MET.	PT.-3	44	

DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: 2ND FLOOR (cont'd)									
209	910x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	35	
210	910x2150x45	D13	H.MET.	PT.-3	GL.-1	F4	H.MET.	PT.-3	43	Door & Frame: 3/4 hr label.
211	910x2150x45	D2	WD.S.C.	LAM.P.-1	-	F3	H.MET.	PT.-3	7	
212	910x2150x45	D2	WD.S.C.	LAM.P.-1	-	F3	H.MET.	PT.-3	7	
213	910x2150x45	D2	H.MET.	PT.-3	-	F3	H.MET.	PT.-3	13	
214	910x2150x45	D13	H.MET.	PT.-3	GL.-1	F4	H.MET.	PT.-3	42	Door & Frame: 3/4 hr label.
215	910x2150x45	D2	WD.S.C.	LAM.P.-1	-	F15	AL.	AN	7	Door set in Screen S16.
217	910x2540x45	D2	WD.S.C.	LAM.P.-1	-	F15	AL.	AN.	7	Door set in Screen S18.
218	910x2540x45	D2	WD.S.C.	LAM.P.-1	-	F15	AL.	AN.	7	
219	910x2540x45	D2	WD.S.C.	LAM.P.-1	-	F15	AL.	AN.	7	Door set in Screen S17.
220	910x2540x45	D2	WD.S.C.	LAM.P.-1	-	F15	AL.	AN.	7	Door set in Screen S17.
221	910x2540x45	D2	WD.S.C.	LAM.P.-1	-	F15	AL.	AN.	7	
	PENTHOUSE									
301	910x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	46	Door & Frame: 3/4 hr label.
302	910x2150x45	D2	H.MET.	PT.-1	-	F5	H.MET.	PT.-1	45	
302A	910x2150x45	D2	H.MET.	PT.-1	-	F5	H.MET.	PT.-1	45	

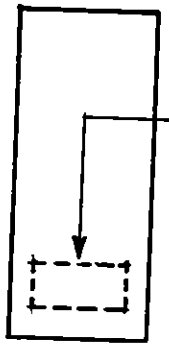
DOOR NO.	SIZE mm	TYPE	MATERIAL	FINISH	GLASS	FRAME TYPE	FRAME MATERIAL	FRAME FINISH	HDW. GROUP	NOTES
	PENTHOUSE (Cont'd)									
303	910x2150x45	D2	H.MET.	PT.-3	-	F1	H.MET.	PT.-3	49	Door & Frame: 3/4 hr label
303A	810x1700x45	D2	H.MET.	PT.-1	-	F5	H.MET.	PT.-1	29	Door jamb on all 4 sides.

L E G E N D :

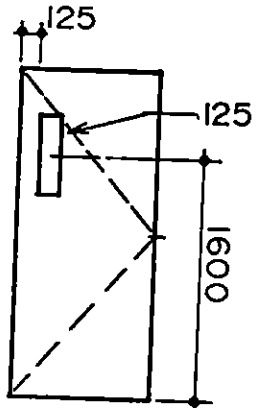
GL.-1	CLEAR WIRED GLASS
GL.-2	CLEAR TEMPERED GLASS
GL.-3	CLEAR SHEET GLASS
GL.-4	CLEAR TEMPERED HERMETICALLY SEALED DOUBLE GLAZING
GL.-5	HERMETICALLY SEALED DOUBLE GLAZING
GL.-6	DOUBLE CLEAR POLYCARBONATE GLAZING
GL.-7	HERMETICALLY SEALED DOUBLE GLAZING CLEAR SHEET GLASS OUTSIDE CLEAR WIRED GLASS INSIDE



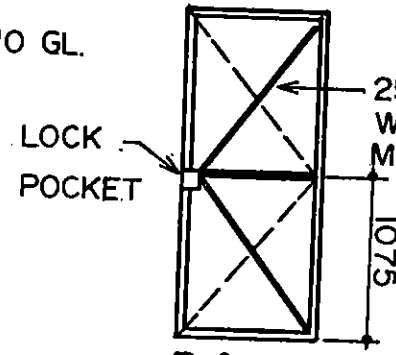
D1



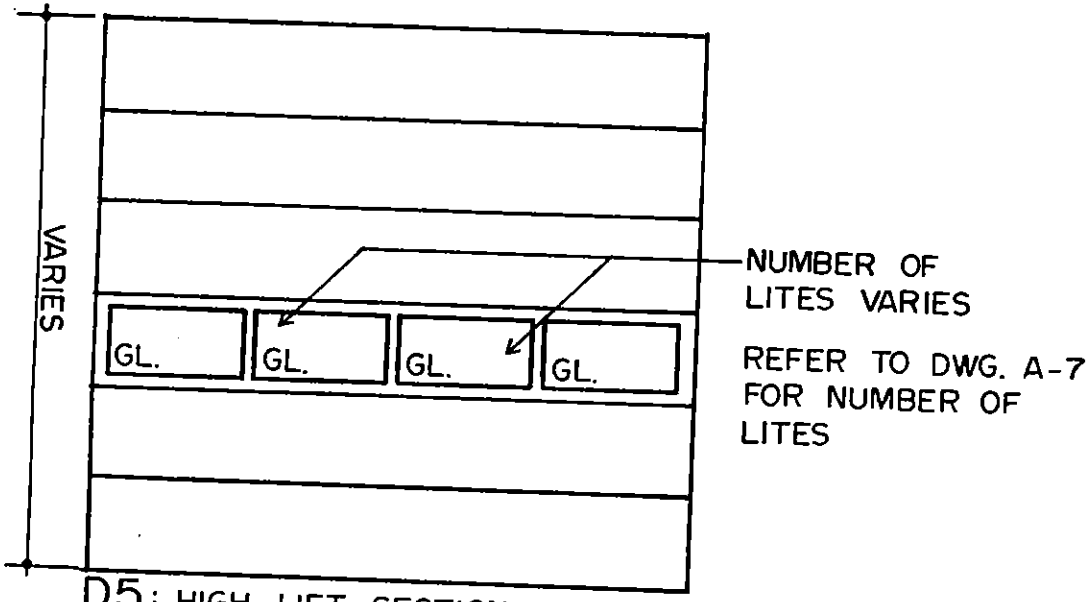
D2



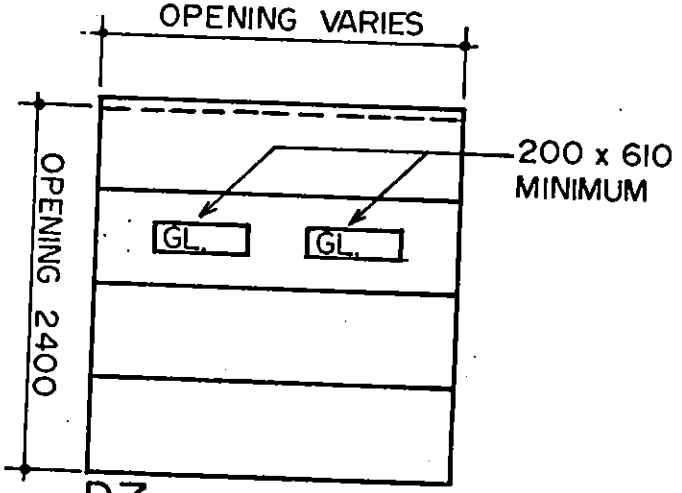
D3



D4



D5: HIGH-LIFT SECTIONAL
D6: SIMILAR - NO GLAZING



D7: VERTICAL LIFT SECTIONAL

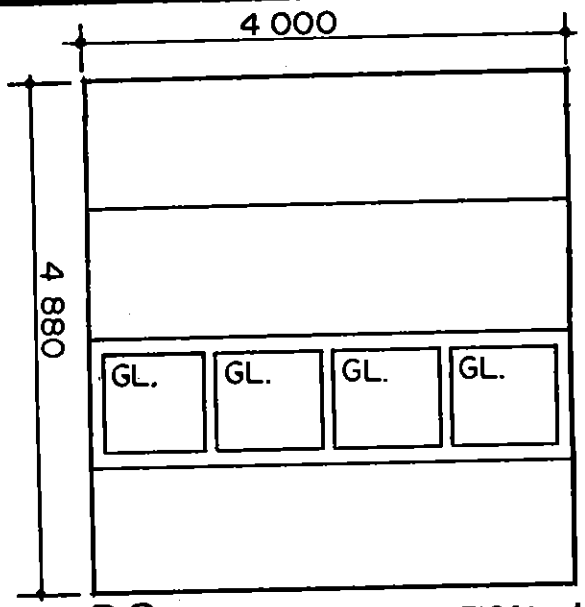
Public Works Canada
Ontario Region

DOOR TYPES

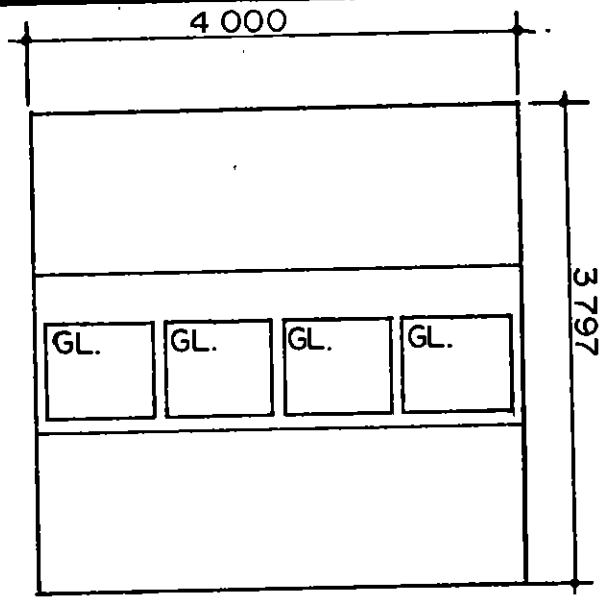
A-123

0-408 (80-05)

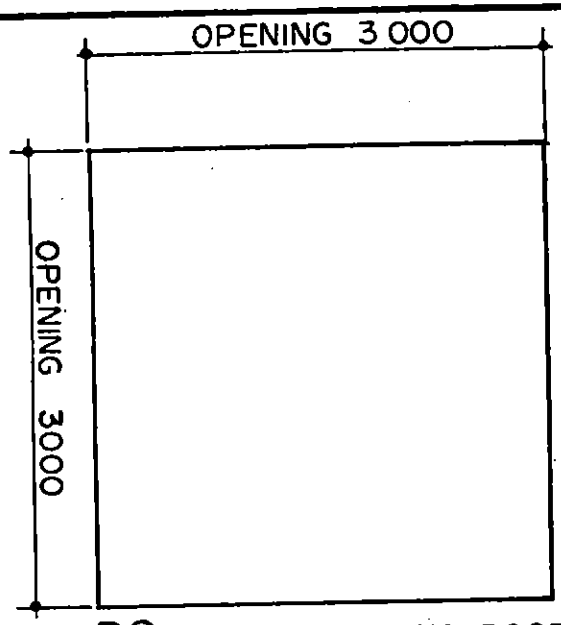
095074/354604



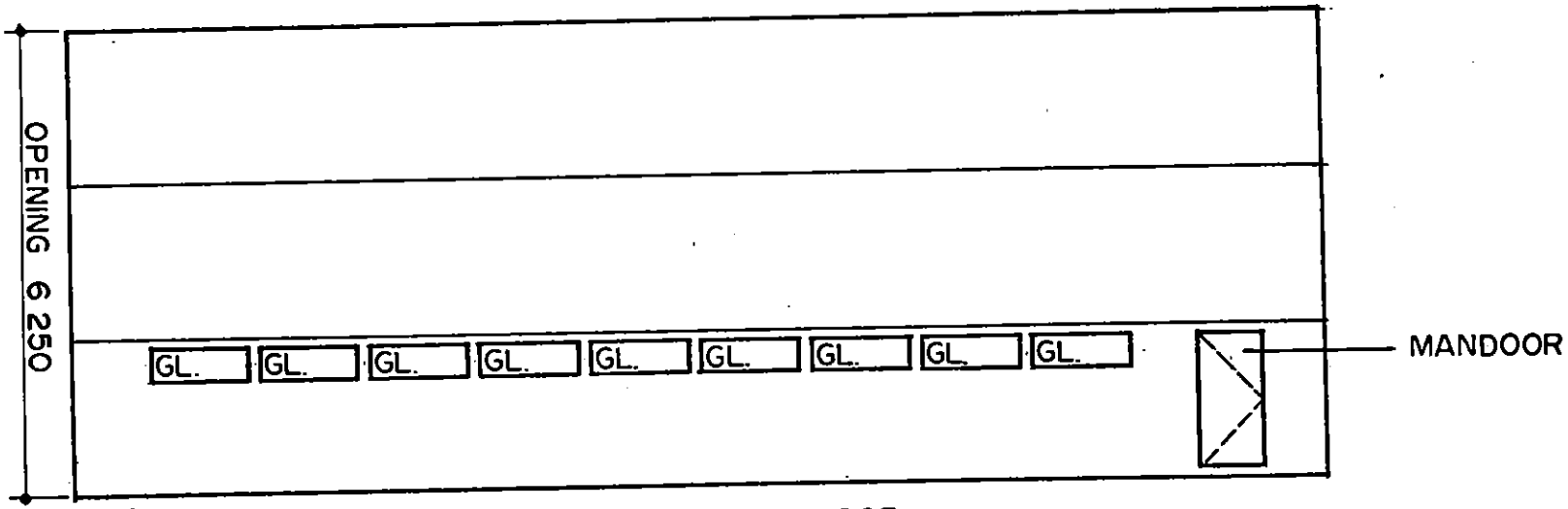
D8: MULTILEAF VERTICAL LIFT



D8a: MULTILEAF VERTICAL LIFT



D9: METAL ROLLING DOOR



D10: MULTILEAF VERTICAL LIFT HANGAR DOOR

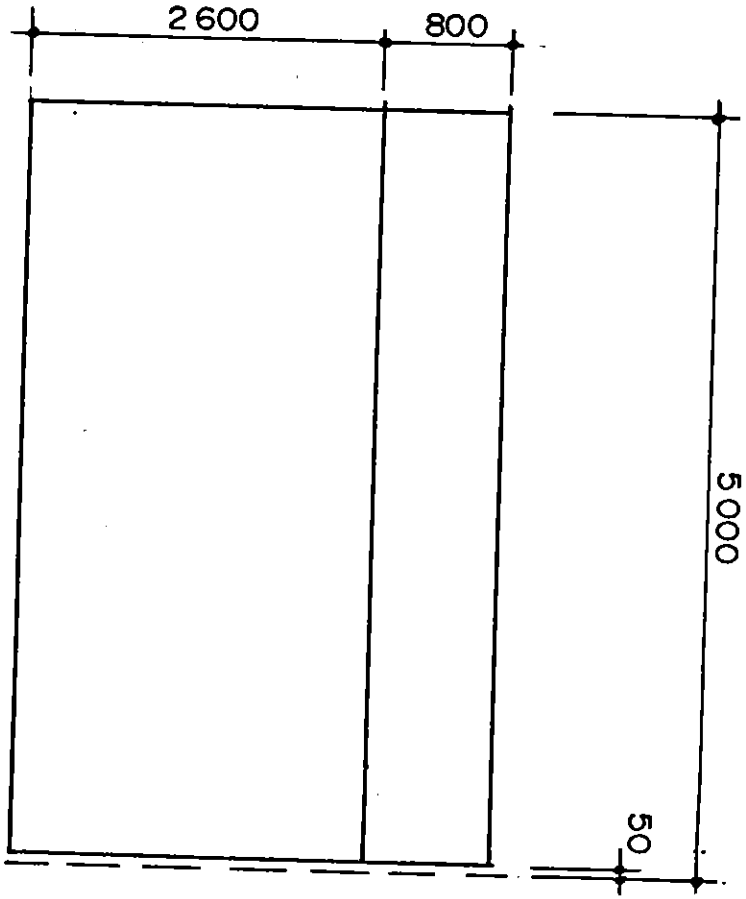
Public Works Canada
Ontario Region

DOOR TYPES

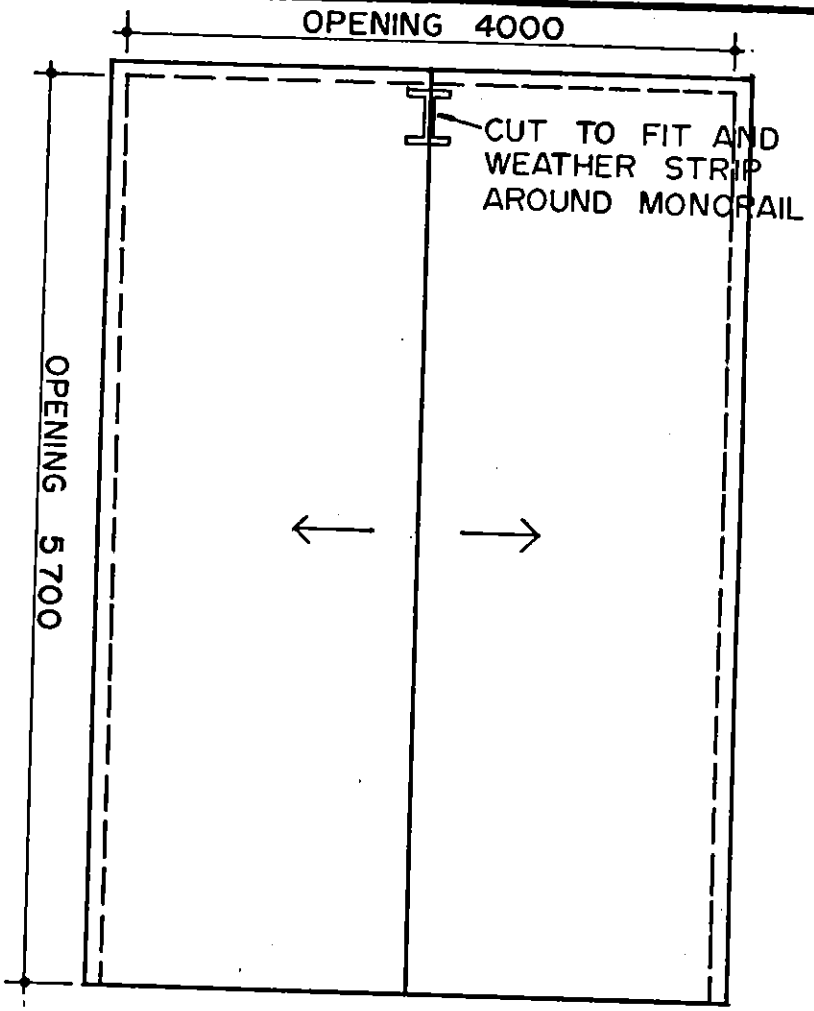
A-124

095074/354604

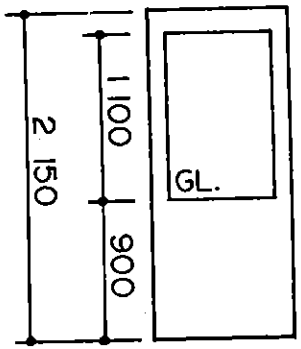
0-408(80-05)



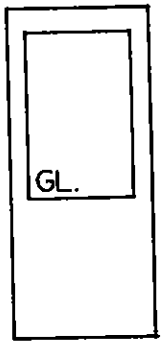
D 11: SIDE HINGED STEEL DOOR



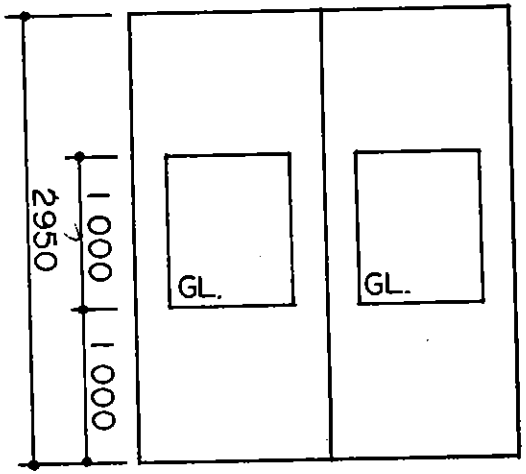
D 12: SLIDING METAL FIRE DOOR



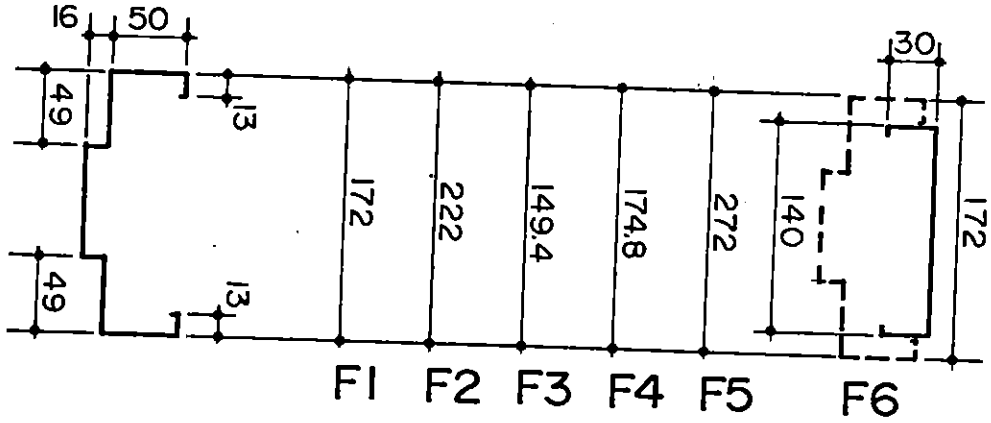
D13



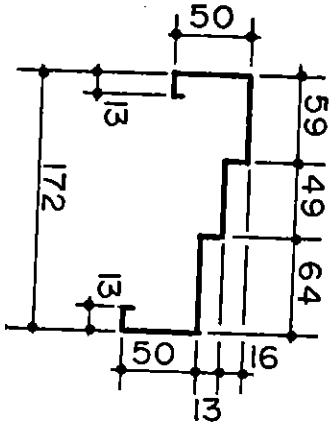
D14 : HEIGHT OF GLASS TO LINE UP WITH GLASS ADJACENT IN OVERHEAD DOORS



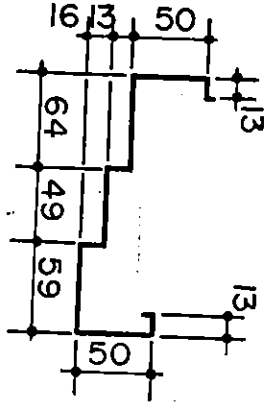
D15



F1 F2 F3 F4 F5 F6

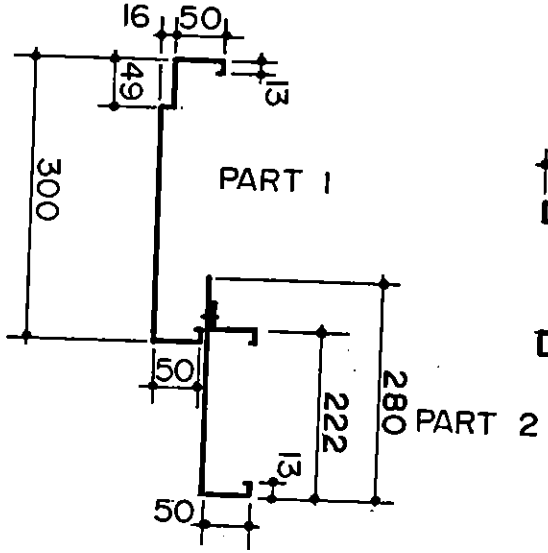


F7



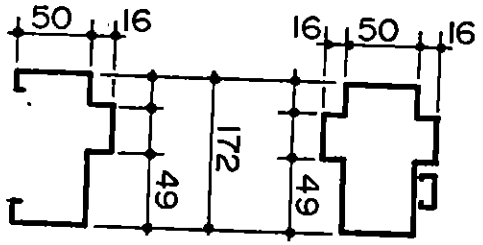
PROVIDE MOUNTING
CHANNEL & TRANSOM BAR

F8: NOT USED



F9

PARTS 1 & 2 NOT CONNECTED



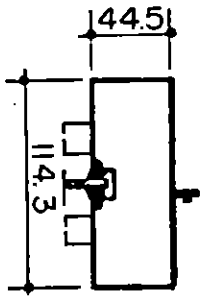
F10 F10a

PART OF STEEL SCREEN

Public Works
Canada
Ontario Region

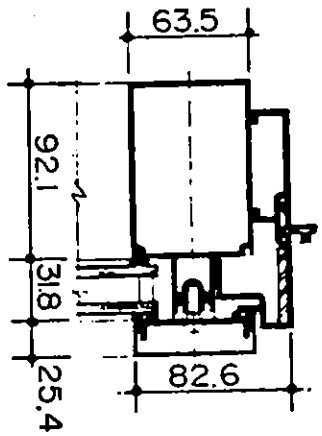
FRAME TYPES

A-127

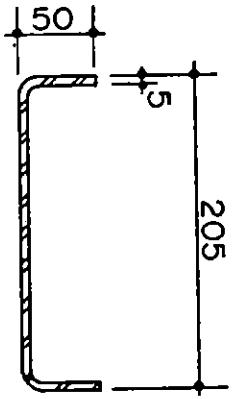


F11

F11a: FOR DOUBLE GLAZED UNIT.
AL.



F12
AL.



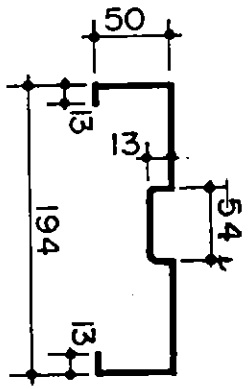
F13

MISC. FRAME TYPES:

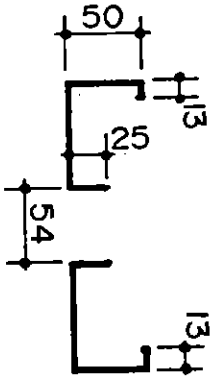
F15 FRAME PART OF DEMOUNTABLE PTN. SYSTEM

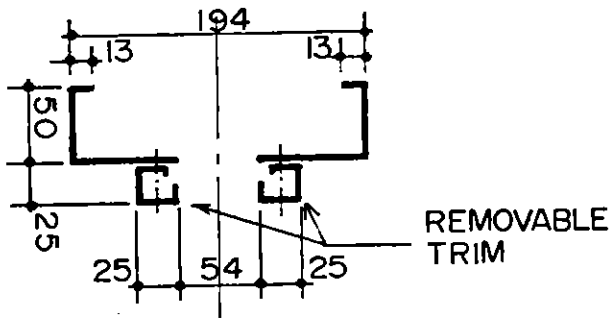
F16 STR. STL. FRAME - REFER TO DETAIL ON DRAWINGS

F17 FRAME PART OF STL. MESH PTN.

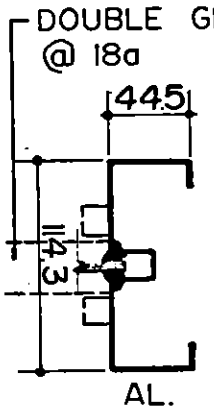


F14



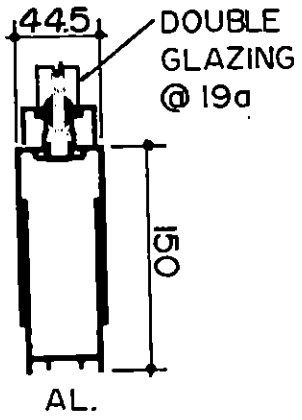


HEAD



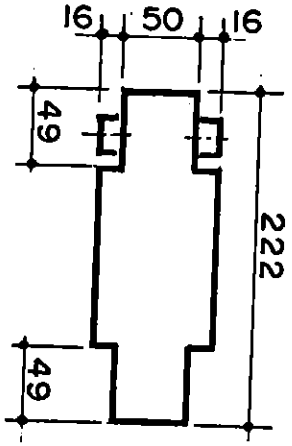
F18

F18a: FOR DOUBLE GLAZED UNIT

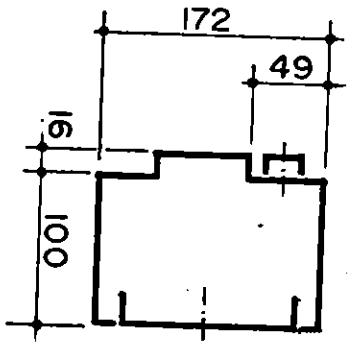


F19

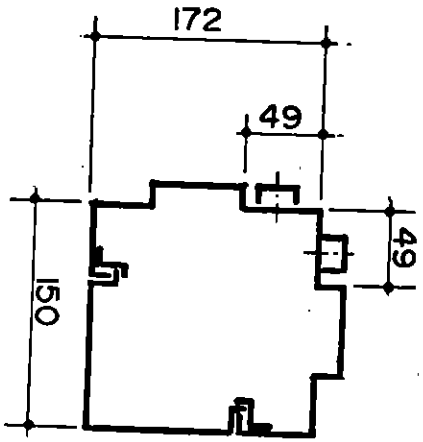
F19a: FOR DOUBLE GLAZED UNIT



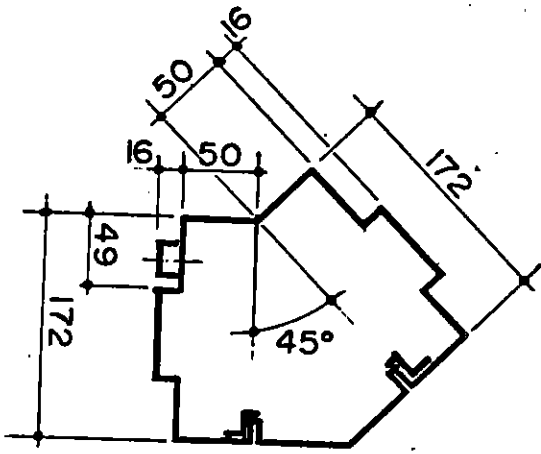
F20



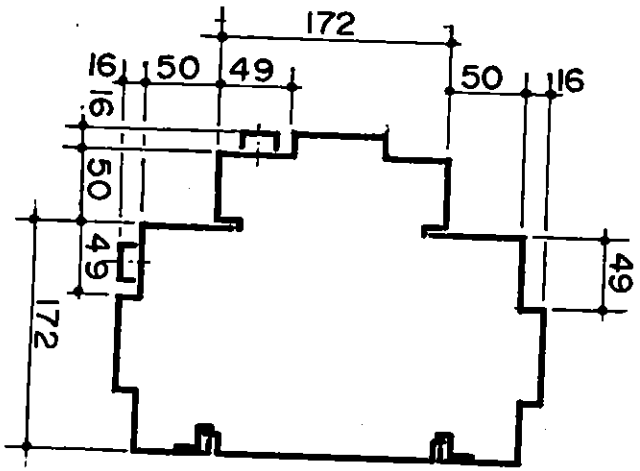
F21



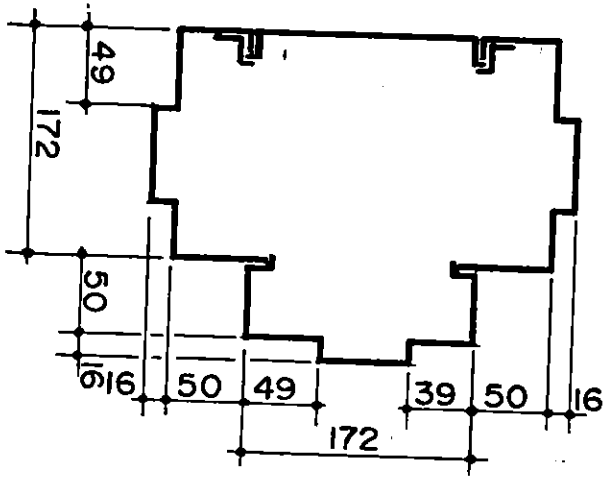
F22



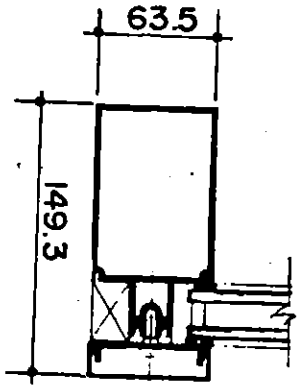
F22a



F23



F24



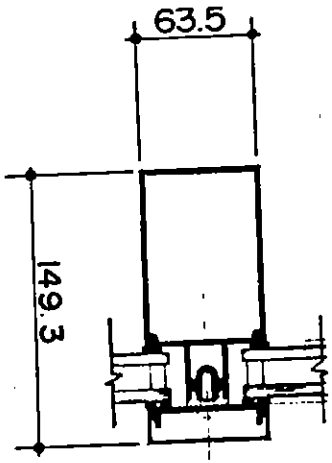
F25

AL.

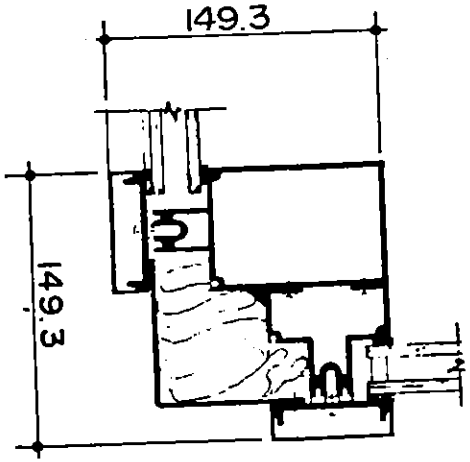
Public Works Canada
Ontario Region

FRAME TYPES

A-129



F25a AL.



F26
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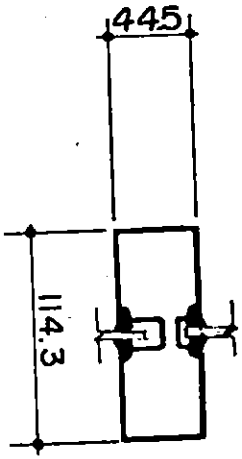

F27
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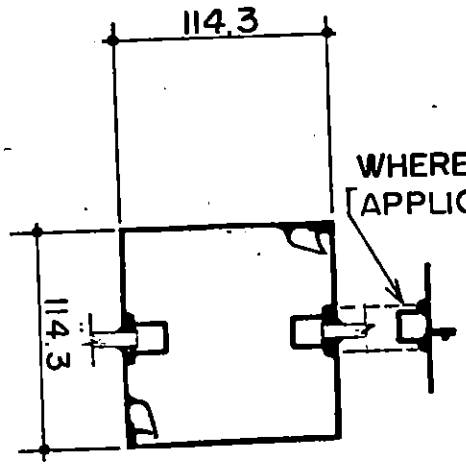

F28
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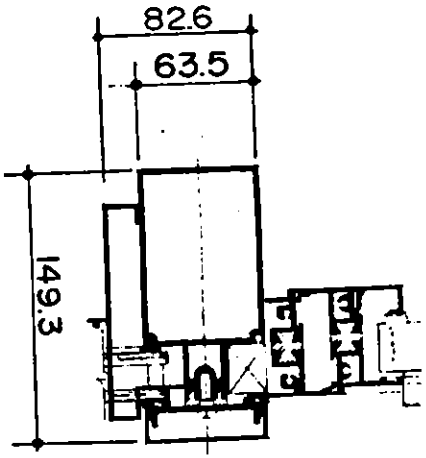
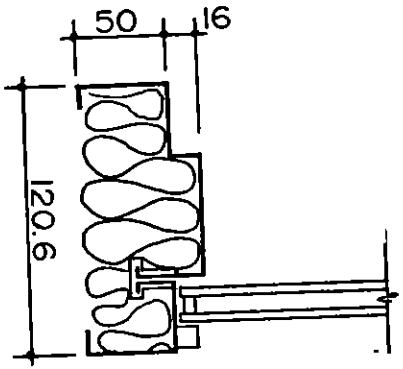
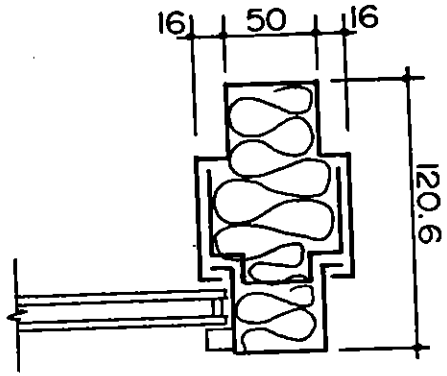


F29
AL.



F30



F31

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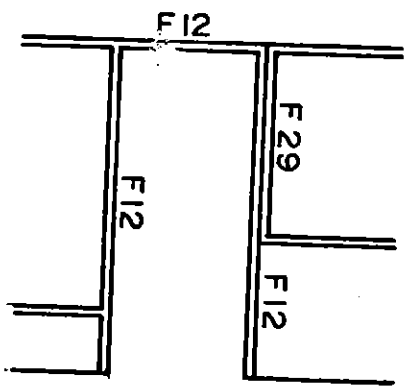
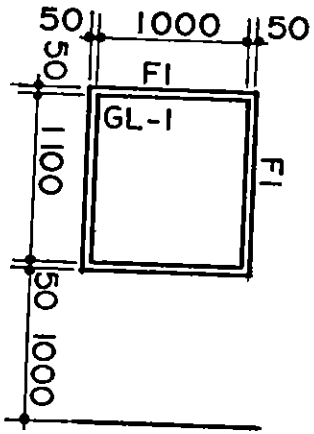
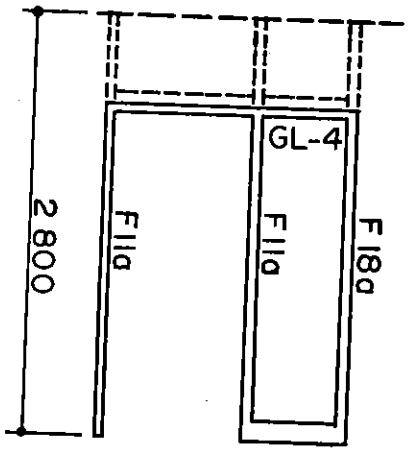


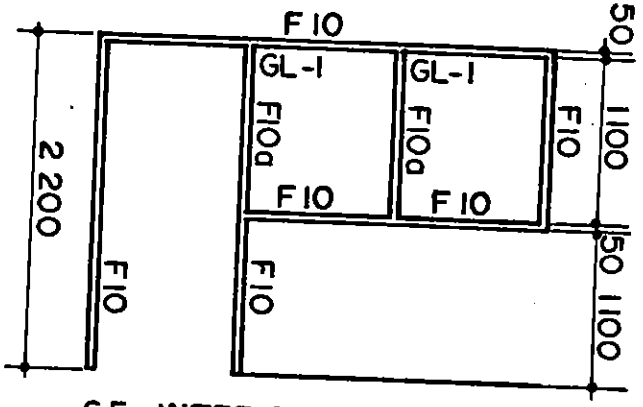
S1 EXTERIOR



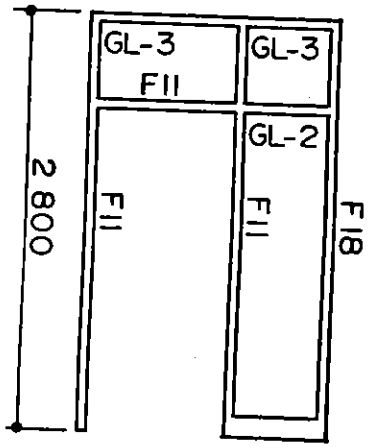
S2 INTERIOR



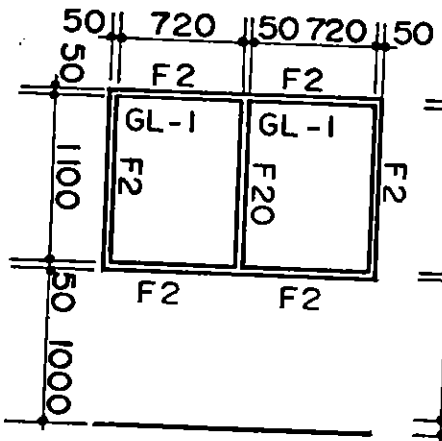
S3 EXTERIOR
DOUBLE GLAZED
REFER TO SECTION 14/4 12



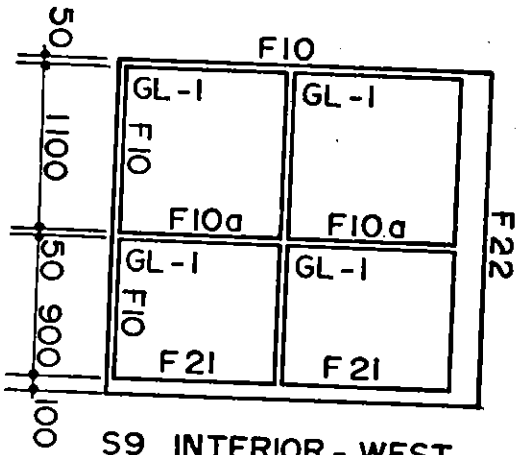
S5 INTERIOR



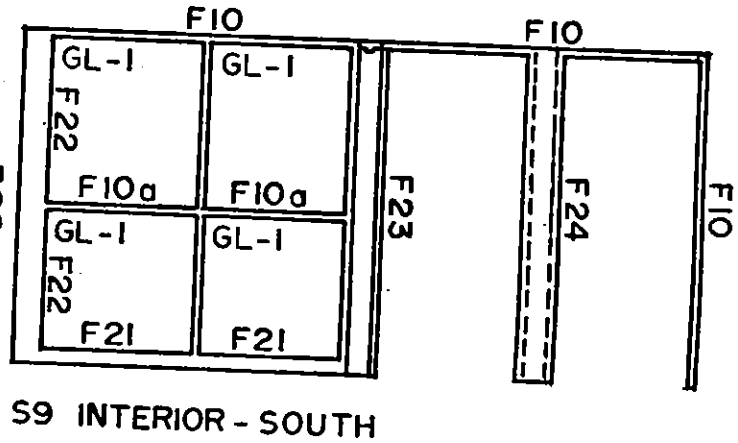
S4 INTERIOR



S8 INTERIOR



S9 INTERIOR - WEST



S9 INTERIOR - SOUTH

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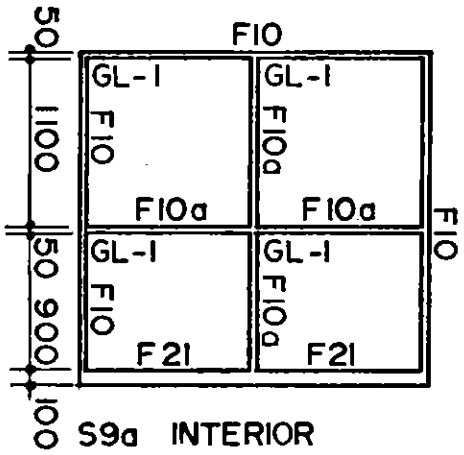
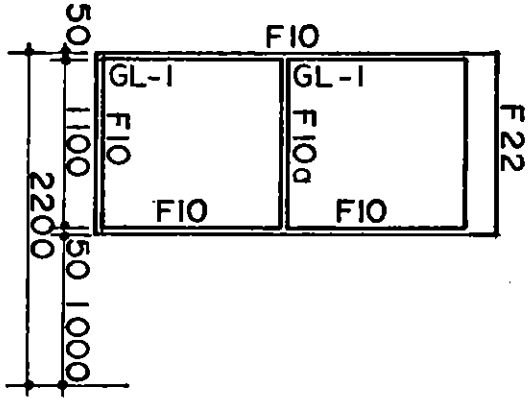
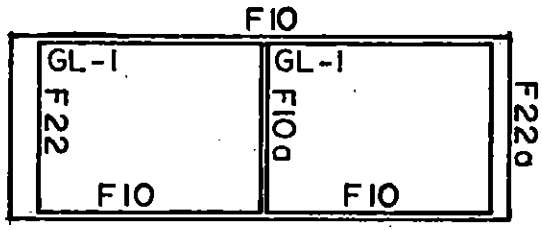


S9a INTERIOR



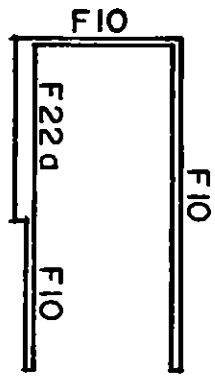
S10 INTERIOR - SOUTH

S11 INTERIOR - SOUTH



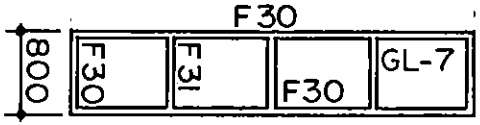
S10 INTERIOR - EAST

S11 INTERIOR - EAST

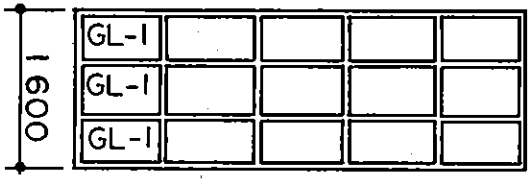


S10 INTERIOR - N.E.

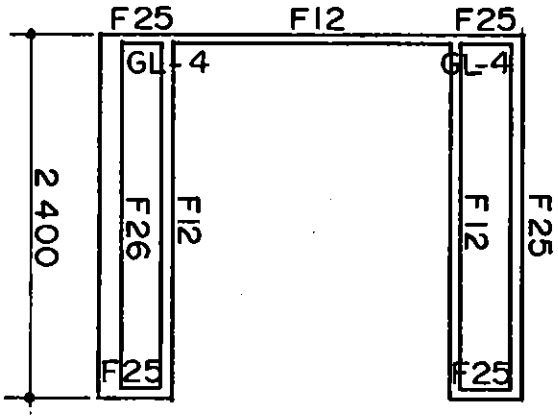
S11 INTERIOR - N.E.



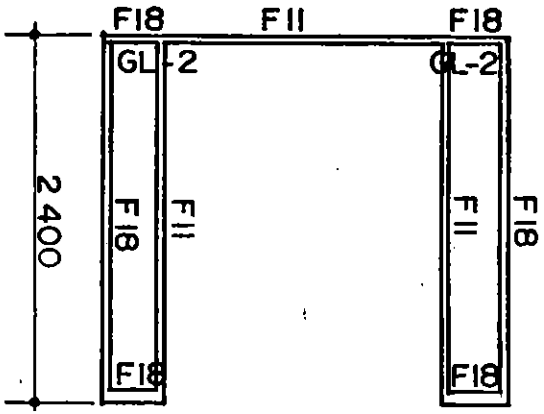
S 20 EXTERIOR



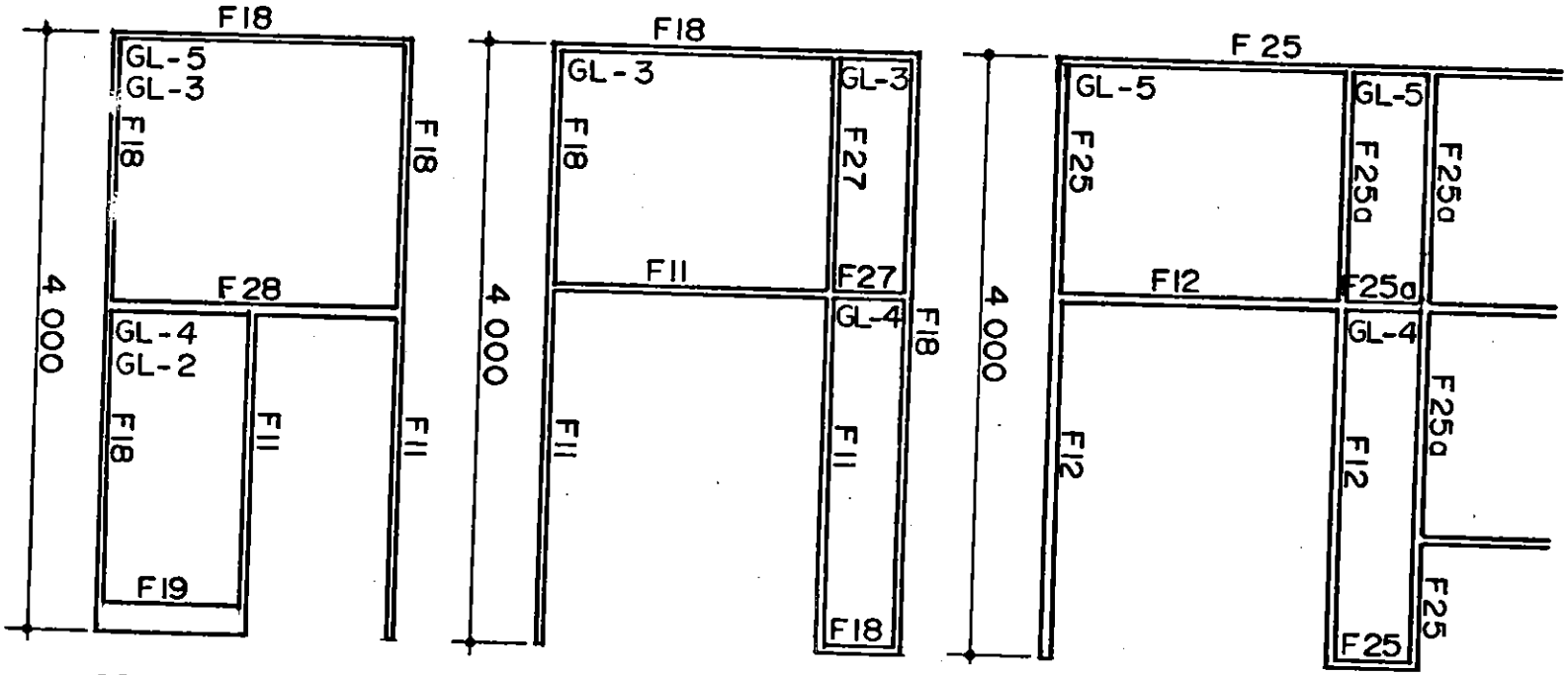
S 21 INTERIOR
REFER TO DWG.
A-20,21,22



S 14 EXTERIOR



S 15 INTERIOR



S6 EXTERIOR
DOUBLE GLAZED

S7 INTERIOR
SINGLE GLAZED

S12 INTERIOR

S13 EXTERIOR
DOUBLE GLAZED

Public Works
Canada
Ontario Region

SCREEN TYPES

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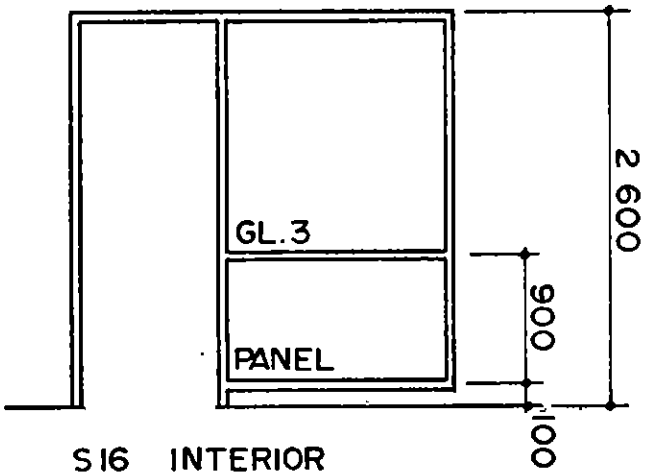
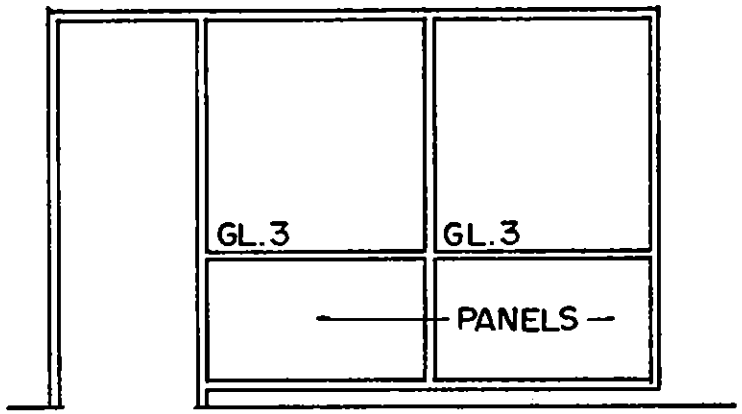
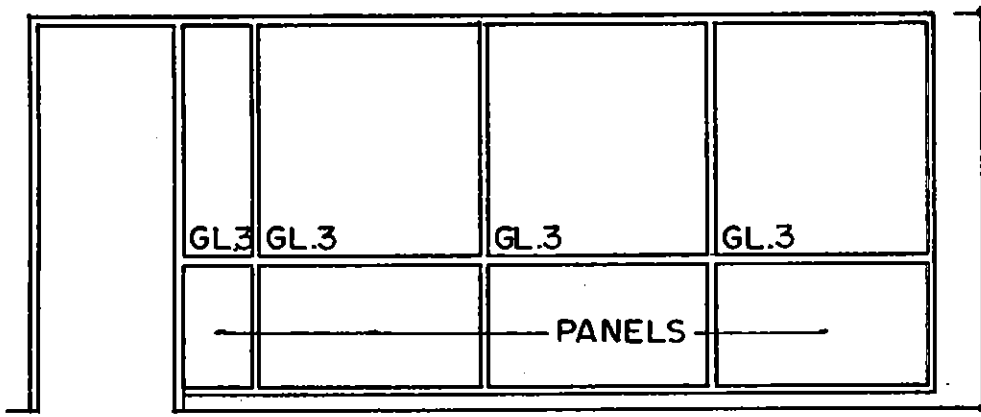


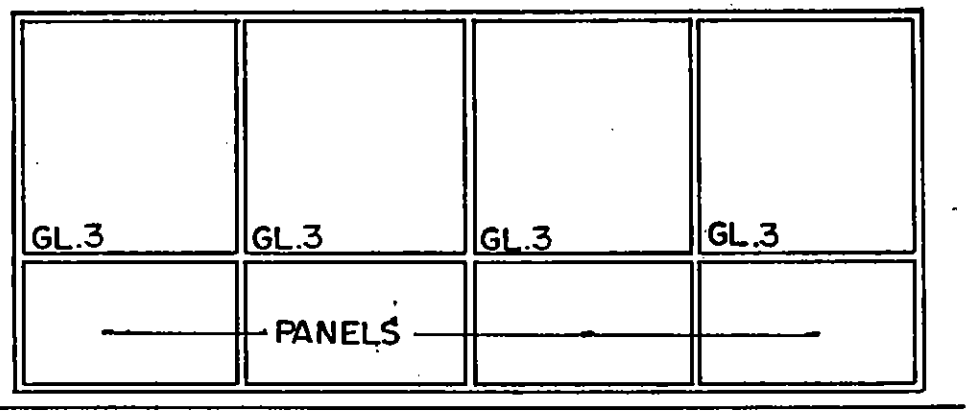
S16 INTERIOR



S17 INTERIOR



S 18 INTERIOR



S 19 INTERIOR

Public Works
Canada
Ontario Region

SCREEN TYPES

A-134

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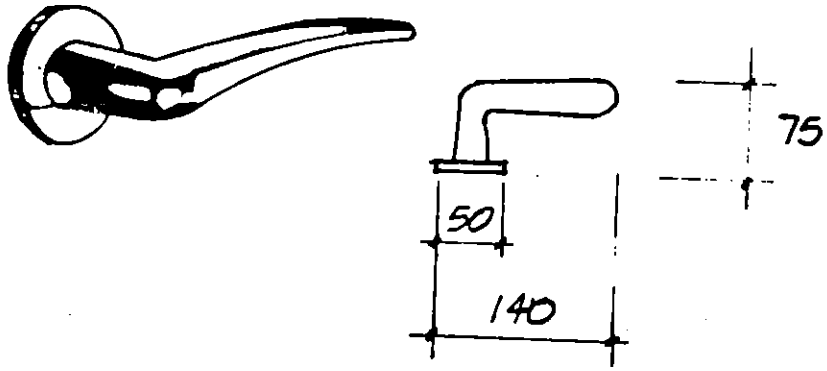
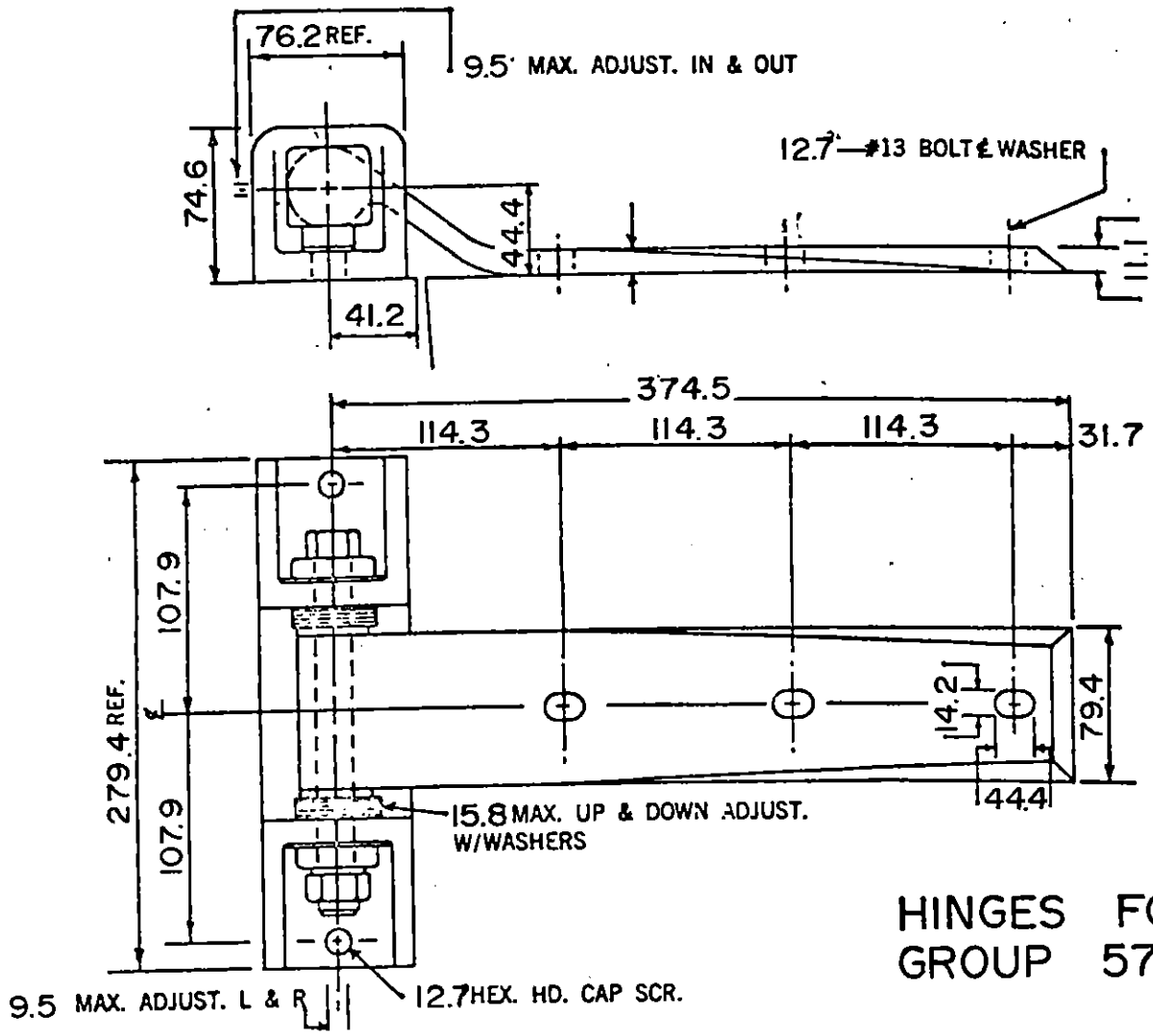


TYPICAL DOOR HANDLE
N.T.S.



HINGES FOR HARDWARE GROUP 57

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	CEILING HEIGHT mm	NOTES
	HANGAR BUILDING								
101	HELICOPTER HANGAR	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. AC.MET.D	PT.		
102	WAITING	C.T.	C.T.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
103	CORRIDOR	C.T.	C.T.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
104	CHIEF PILOT	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
105	CHIEF MECHANIC	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
106	CREW ROOM	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
107	LOG CONTROL RM	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
108	FLIGHT PLANNING & CHARTS	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
109	FINE WORKSHOP	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	LAY-IN AC.U.-1	P.	2600	
110	PARTS	HARD. CONC.	C.T.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
111	QUARANTINE RM	HARD. CONC.	C.T.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	CEILING HEIGHT mm	NOTES
	HANGAR BUILDING (cont'd)								
112	SAFETY EQUIPMENT	HARD. CONC.	C.T.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
113	OIL ROOM	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	LAY-IN AC.U.1	P.	2600	
114	BATTERY ROOM	HARD. CONC.	C.T.	CONC.BL.	E.C.	LAY-IN AC.U.-1	P.	2600	
115	PUMPS AND ELECTRICAL	HARD. CONC.	-	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
116	FEMALE W.R.	C.T.	COVED C.T.-1	C.T.-1	P.	LAY-IN AC.U.-1	P.	2400	
117	SHOWER	C.T.	COVED C.T.-1	C.T.-1	P.	LAY-IN AC.U.-2	P.	2400	
118	JANITOR	C.T.	C.T.-3	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2400	C.T. DADO AT SINK 1200 HT.
119	MALE W.R.	C.T.	COVED C.T.-1	C.T.-1	P.	LAY-IN AC.U.-1	P.	2400	
120	NOT USED	-	-	-	-	-	-	-	-

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	CEILING HEIGHT mm	NOTES
	FLAMMABLE LIQUIDS STORAGE BUILDING								
121	FLAMMABLE LIQUIDS ST.	HARD. CONC.	-	CONC.	PT.	CONC.	-	3500	
122	STORE	HARD. CONC.	-	CONC	PT.	CONC.	-	3500	
	SHOP WING MAIN BUILDING								
123	VESTIBULE	HARD. CONC.	C.T.	CONC.BL.	PT.	CONC.	PT.		
124	CORRIDOR	HARD. CONC.	C.T.	CONC.BL.	PT.	O.W.S.J. MET.D. CONC.	PT.		PT.-7 ABOVE 4000 (WALLS AND CEILING). PT.-6 SOUTH WALL. PT.-5 N.E. WALL BY DOOR 158A. PT.-6 IN D.F. ALCOVE. PT.-6 IN D.F. ALCOVE BULKHEADS AT SKYLIGHT AND AT CORRIDOR 124.
125	CORRIDOR	HARD. CONC.	C.T.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	4200	
126	CORRIDOR	HARD. CONC.	C.T.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	4200	PT.-5 ON EAST WALL. PT-4 ON WEST WALL
127	CORRIDOR	HARD. CONC.	C.T.	CONC.BL.	PT.-7	O.W.S.J. AC.MET.D.	PT.-	-	
128	VESTIBULE	HARD. CONC.	C.T.	CONC.BL. AL.	PT.	LAY-IN AC.U.-1	P.	4000	
129	MECHANICS SHOP	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. AC.MET.D.	PT.		

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	HEIGHT mm	NOTES
	SHOP WING MAIN BUILDING (cont'd)								
130	YARD EQUIPMENT	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. AC.MET.D.	PT.		
131	MARINE EMERGENCY	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. AC.MET.D.	PT.		
132	WORKSHOP	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.SJ. AC.MET.D.	PT.		
133	OFFICE	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
134	WASHROOM	C.T.	COVED C.T.-2	C.T.-2	P.	LAY-IN AC.U.-1	P.	2400	
135	WASHROOM	C.T.	COVED C.T.-2	C.T.-2	P.	LAY-IN AC.U.-1	P.	2400	
136	JANITOR	C.T.	C.T.-3	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2400	C.T. DADO AT SINK 1200 HT. x 1800
137	JANITOR ST.	HARD. CONC.	C.T.	CONC.BL.	PT.	O.W.S.J. AC.MET.D.	PT.		
138	BOILER ROOM	HARD. CONC.	-	CONC.BL.	PT.	O.W.S.J. AC.MET.D.	PT.		
139	ELECT. ROOM	HARD. CONC.	-	CONC.BL.	PT.	O.W.S.J. AC.MET.D.	PT.		
140	SIGNAL ROOM	HARD. CONC.	-	CONC.BL.	PT.	O.W.S.J. AC.MET.D.	PT.		

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	CEILING HEIGHT mm	NOTES
	SHOP WING MAIN BUILDING (cont'd)								
141	EMERGENCY GENERATOR	HARD. CONC.	-	CONC.BL.	PT.	O.W.S.J. AC.MET.D.	PT.		
142	CONSTR. EQUIPMENT	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. MET.D.	PT.		
143	SHIPPING, RECEIVING	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. MET.D.	PT.		
144	HAND TOOLS/ ELECTRICAL PARTS	HARD. CONC.	-	CONC.BL.	H.B.G.	O.W.S.J. MET.D.	PT.		
145	NOT USED	-	-	-	-	-	-	-	
146	CENTRAL STORES	HARD. CONC.	-	CONC.BL.	H.B.G.	O.W.S.J. MET.D.	PT.		
147	FAST ISSUE	V.A.T.	R.B.	CONC.BL.	PT.	O.W.S.J. MET.D.	PT.	-	
148	WAITING	V.A.T.	R.B.	CONC.BL.	PT.	O.W.S.J. MET.D.	PT.		
149	OFFICE	V.A.T.	R.B.	CONC.BL.	PT.	MET.D.	PT.		
150	OFFI	V.A.T.	R.B.	CONC.BL.	PT.	MET.D.	PT.		
151	ILLUMINATION	HARD. CONC.	C.T.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	3000	

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	CEILING HEIGHT mm	NOTES
	SHOP WING MAIN BUILDING (cont'd)								
151C	TEMPORARY CORRIDOR	HARD.	-	CONC.BL. G.BD.	-	EXP.STR.			Finishes in 151 to be extended into 151C after Stage 3.
152	DECOMMISSIONED STORAGE	HARD. CONC.	C.T.	CONC.BL.	PT.	O.W.S.J. MET.D.	PT.	-	
153	AIDS TECHNICIANS MECHANICS SHOP	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. AC.MET.D.	PT.	-	
154	TEST ROOM	HARD. CONC.	C.T.	SOUND CONC.BL.	H.B.G.	CONC.	PT.	4300	
155	BATTERY CHARGING	HARD. CONC.	C.T.	CONC.BL.	E.C.	LAY-IN AC.U.-1	P.	3000	
156	CARPENTRY SHOP	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. AC.MET.D. EXP.STR.	PT.		
156E	SAW DUST COLLECTOR	HARD. CONC.	-	CONC.BL.	-	O.W.S.J. AC.MET.D.	PT.		
157	OFFICE	V.A.T.	R.B.	CONC.BL.	PT.	-	PT.	2400	
158	MACHINE SHOP	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. AC.MET.D.	PT.		
159	OFFICE	V.A.T.	R.B.	CONC.BL.	PT.	EXP.STR.	PT.	2400	
160	WASHDOWN AREA	HARD. CONC.	C.T.	CONC.BL.	H.B.G.	O.W.S.J. AC.MET.D.	P.	-	RUBBER SHEETING 3000 HIGH ON NORTH AND SOUTH WALLS.

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	CEILING HEIGHT mm	NOTES
	SHOP WING MAIN BUILDING (cont'd)								
161	SPRAY PAINT	HARD. CONC.	-	CONC.BL.	H.B.G.	LAY-IN AC.U.-4	P.	5610	
161F	FAN ROOM	CONC.	-	CONC.BL.	PT.	EXP.STR.	P.	-	
161S	STAIR	CONC.	-	CONC.BL.	PT.	EXP.STR.	P.	-	
	ADMINISTRATION WING OF MAIN BUILDING: GROUND FLOOR								
162	MARSHALLING	HARD. CONC.	C.T.	CONC.BL.	PT.	G.BD.	PT.	4500	
163	ELECTRICAL	V.A.T.	R.B.	CONC.BL.	H.B.G.	LAY-IN AC.U.-1	P.	3000	
164	ELECTRONICS	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	3000	
165	VESTIBULE	TER.	COVED TER.	PL.	PT.	MET.L.CLG.	P.	4000	FLOOR GRILLE.
166	CORRIDOR	TER.	COVED TER.	PL.	PT.	MET.L.CLG.	P.	4000	
167	YARD OFFICE	TER.	COVED TER.	PL.	PT.	LAY-IN AC.U.-2	P.	4000	
168	LUNCH ROOM	TER.	COVED TER.	PL.	PT.	LAY-IN AC.U.-2	P.	4000	

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	HEIGHT mm	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: GROUND FLOOR (cont'd)								
169	DISPLAY AREA	TER.	COVED TER.	PL.	PT.		P.	OPEN TO ABOVE	SEE REFLECTED CEILING PLAN.
170	ELEVATOR LOBBY	TER.	COVED TER.	PL. TYPE 2 SIDING	PT.	MET.L.CLG.	P.	2400	SIDING PT.-2
171	LOBBY	TER.	COVED TER.	PL. TYPE 2 SIDING	PT. P.	MET.L. CLG.	P.	2400+	PT.-2 BAND, SEE SECTION SEE REFLECTED CEILING PLAN & SECTIONS. SIDING PT.-2.
172	VESTIBULE	TER.	COVED TER.	PL. TYPE 2 SIDING	PT. P.	MET.L. CLG.	P.	2400	SIDING PT.-2 ALCOVE ON WEST SIDE PT.-6. FLOOR GRILLE.
173	ANTE ROOM	TER.	COVED TER.	PL.	V.C.F.-1	LAY-IN AC.U.-2	P.	2600	
174	INTERVIEW	CPT.	R.B.	PL.	PT.	LAY-IN AC.U.-2	P.	2600	
175	WASHROOM	TER.	TER.	PL.	V.C.F.-1	LAY-IN AC.U.-2	P.	2600	FILLED TRAVERTINE COUNTERTOP AND BACKSPLASH.
176	MULTI-PURPOSE RM	CPT.	W.OAK	G.BD.	V.C.F.-1	LAY-IN AC.U.-2	P.	2600	
177	SERVERY	TER.	TER.	G.BD.	PT.	LAY-IN AC.U.-2	P.	2400	

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	HEIGHT mm	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: GROUND FLOOR (cont'd)								
178	STORAGE	V.A.T.	R.B.	G.BD. CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2400	
179	EL. MACH. RM.	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
180	ELEVATOR LOBBY	V.A.T.	R.B.	CONC.BL.	PT.-6	G.BD.	PT.	2400	
181	STAIR	V.A.T.	R.B.	CONC.BL.	PT.-6	G.BD.	PT.		HARD. CONC. IN STAIR TREADS WITH NON-SLIP STRIPS, FINISHES ALSO APPLY TO UPPER PART OF 181.
182	FAN SUPPLY RM	CONC.	-	CONC.BL.	PT.	EXP.STR.	PT.		
183	FIRST AID	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2600	
184	MALE LOCKER RM	C.T.	C.T.-3	CONC.BL.	PT.	AC.U.-3	P.	3000	G.BD. BULKHEAD. C.T.-3 BASE ALSO BELOW LOCKERS AND AT BENCH LEGS.
185	DRY	C.T.	C.T.-3	C.T.-2	P.	AC.U.-3	P.	3000	
186	WASHROOM	C.T.	C.T.-3	C.T.-2	P.	AC.U.-3	P.	2400	
187	SHOWER	C.T.	C.T.-3	C.T.-2	P.	AC.U.-3	P.	2600	COVED C.T. GUTTERS.
188	MALE W.R.	C.T.	C.T.-3	C.T.-2	P.	AC.U.-3	P.	2400	

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	HEIGHT mm	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: GROUND FLOOR (cont'd)								
189	FEMALE W.R.	C.T.	C.T.-3	C.T.-2	P.	AC.U.-3	P.	2400	
190	SHOWER	C.T.	C.T.-3	C.T.-2	P.	AC.U.-3	P.	2400	
191	CORRIDOR	V.A.T.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	4000	PT.5 WEST WALL PT.6 EAST WALL PT.6 D.F. ALCOVE
192	JANITOR	C.T.	C.T.-3	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2400	C.T. DADO AT SINK 1200 HT x 2300 W.
	WINCH HOUSE								
193	WINCH HOUSE	BY OTHERS	-	CONC.BL.	PT.	CONC.	PT.	-	
	GUARDHOUSE								
194	GUARDHOUSE	C.T.	C.T.-3	G.BD.	PT.	G.BD.	PT.	-	
195	BASEMENT	HARD. CONC.	-	CONC.	-	EXP.STR.	-	-	

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	CEILING HEIGHT mm	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: 2ND FLOOR								
201	ELEV. LOBBY	CPT.	R.B.	G.B.D PL.	V.C.F.-2 PT.	MET.L.CLG.	P.		SEE REFLECTED CEILING PLAN & SECTI V.C.V.-2 ON WALL AROUND WASHROOM 2 SEE DRAWING A-25.
202	MALE W.R.	C.T.	C.T.-2	C.T.-2	P.	AC.U.-3	P.	2400	
203	FEMALE W.R.	C.T.	C.T.-1	C.T.-1	P.	AC.U.-3	P.	2400	
204	CORRIDOR	CPT.	R.B.	PL.	PT.-7 V.C.F.-2	G.BD.-1	PT.	2600	V.C.F.-2 ON WALL AT WEST END OF OF WASHROOM 203. SEE DRAWING A-25
205	JANITOR	C.T.	C.T.-2	CONC.BL.	PT.	AC.U.-3	P.	2200	C.T. DADO AT SINK 1200 HT x 2600 W
206	STAIR	V.A.T.	R.B.	CONC.BL.	PT.-6	EXP.STR.	PT.		HARD. CONC. IN STAIR TREADS.
207	CORRIDOR	V.A.T.	R.B.	G.BD.	PT.	COFF. AC.U.	P.	2600	
208	LOCK-UP STORAGE	V.A.T.	R.B.	G.BD. PL.	PT.	COFF. AC.U. G.BD.	P. PT.	2600	PLASTER ON SOUTH WALL.
209	EQUIPMENT CLEANING	V.A.T	R.B.	PL.	PT.	LAY-IN AC.U.-1	P.	2600	
210	TELECOM & ELECTRONICS	V.A.T.	R.B.	G.BD. PL.	PT.	COFF. G.BD.	P. PT.	2600	PLASTER ON CONC.BL.
211	SUPERVISOR	V.A.T.	R.B.	G.BD.	PT.	COFF. AC.U. G.BD.	P. PT.	2600	

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	HEIGHT mm	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: 2ND FLOOR (cont'd)								
212	TECHNICIANS & LIBRARY	V.A.T.	R.B.	G.BD. PL.	PT.	COFF. AC.U. G.BD.	P. PT.	2600	
213	LOCKERS	V.A.T.	R.B.	G.BD.	PT.	COFF. AC.U. G.BD.	P. PT.	2600	
214	LUNCH ROOM	V.A.T.	R.B.	G.BD.	PT.	COFF. AC.U.-1 G.BD.	P. PT.	2600	
215	DIST. FLEET SUPERINTENDENT	CPT.	R.B.	G.BD.	PT.	COFF. AC.U. G.BD.	P. PT.	2600	
216	OFFICE SPACE	CPT.	R.B.	PL. G.BD.	PT. V.C.F.-2	COFF. AC.U. G.BD.	P. PT.	2600	V.C.F.-2 ON WALL AROUND WASHROOMS 202 AND 203 SEE DRAWING A-25.
217	CENTRAL REGISTRY	CPT.	R.B.	G.BD.	PT.	COFF. AC.U.	P.	2600	
218	SUPER.N.AIDS	CPT.	R.B.	G.BD.	PT.	COFF. AC.U. G.BD.	P. PT.	2600	
219	DIST. FINANCIAL O.	CPT.	R.B.	G.BD.	PT.	COFF. AC.U. G.BD.	P. PT.	2600	

ROOM NO.	NAME	FLOOR	BASE	WALLS MATERIAL	WALLS FINISH & COLOUR	CEILING MATERIAL	CEILING FINISH & COLOUR	HEIGHT mm	NOTES
	ADMINISTRATION WING OF MAIN BUILDING: 2ND FLOOR (cont'd)								
220	DIST. PERSONNEL O.	CPT.	R.B.	G.BD.	PT.	COFF. AC.U. G.BD.	P. PT.	2600	
221	DISTRICT MANAGER	CPT.	R.B.	G.BD.	PT. V.C.F.-1	COFF. AC.U. G.BD.	P. PT.	2600	V.C.F.-1 ON NORTH & WEST WALLS, FLOOR TO CEILING.
	PENTHOUSE								
301	STAIRS	HARD. CONC.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2400	
	UPPER PART OF MONITOR								AS PER ELEVATOR LOBBY 201.
302	VESTIBULE	HARD. CONC.	R.B.	CONC.BL.	PT.	LAY-IN AC.U.-1	P.	2400	
303	FAN ROOM	HARD. CONC.	-	CONC.BL.	PT.	EXP.STR.	P.	-	