



Travaux publics et
Services gouvernementaux Canada
District de Québec

Public Works and
Government Services Canada
Quebec District

SPECIFICATIONS: Mechanical specifications
FOR TENDER

TITLE: Roof replacement
Laurentian forestry centre

No. FILE: R.078957.002

DATE: MAY 9, 2016

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LIST OF BODIES

Plumbing

M01-TO-R_078957_002

END OF SECTION

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For tender

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1.1 DOCUMENTS/SAMPLES TO BE SUBMITTED

- 1.1.1 Shop drawings: submitted shop drawings must bear the Engineer's seal and signature.
- 1.1.2 The shop drawings must show or indicate the following:
 - 1.1.2.1 assembly details;
 - 1.1.2.2 the necessary space to allow the use and maintenance of apparatus;
- 1.1.3 Submit the following documents with the shop drawings and data sheets:
 - 1.1.3.1 detailed drawings of podia, supports/hangers, and anchor bolts;
 - 1.1.3.2 data relating to the acoustic power of systems and apparatus, if applicable;
 - 1.1.3.3 performance curves indicating operating points;
 - 1.1.3.4 a document issued by the manufacturer attesting that the products in question are current models;
 - 1.1.3.5 a certificate of compliance to the pertinent codes.
- 1.1.4 In addition to the transmittal letter, specify the number of the section and article in question.
- 1.1.5 Documents/elements to be handed in at work completion
 - 1.1.5.1 The use and maintenance manual must be approved, before final inspection, by the Engineer, who will keep the final copies.
 - 1.1.5.2 The use sheets must include the following:
 - 1.1.5.2.1 diagrams of control/regulation circuits for each system, including the climate control/regulation circuit;
 - 1.1.5.2.2 a description of each system and its control/regulation devices;
 - 1.1.5.2.3 a description of the operation of each system under various loads, with a schedule of set point changes and an outline of seasonal changes;
 - 1.1.5.2.4 instructions concerning the use of each system and each component;
 - 1.1.5.2.5 a description of measures to be taken in case of failure of apparatus/equipment;
 - 1.1.5.2.6 a table of valving apparatus and a flow diagram;
 - 1.1.5.2.7 the colour code.
 - 1.1.5.3 The maintenance sheets must include the following:
 - 1.1.5.3.1 instructions concerning the maintenance, repair, use, and troubleshooting of each component;
 - 1.1.5.3.2 an implementation schedule specifying the frequency and duration of task execution, as well as the necessary tools for executing the tasks.
 - 1.1.5.4 The performance sheets must include the following:

- 1.1.5.4.1 performance data provided by the manufacturer of the apparatus/equipment, specifying the working point for each one, to be taken down once the activation is finished;
- 1.1.5.4.2 the results of performance tests of the apparatus/equipment;
- 1.1.5.4.3 all other particular performance data specified elsewhere in the contractual documents.
- 1.1.5.5 Approval
 - 1.1.5.5.1 For the purposes of approval, submit to the Engineer two (2) copies of the preliminary version of the use and maintenance manual. Unless otherwise instructed by the Engineer, the sheets must not be submitted individually.
 - 1.1.5.5.2 Make the required changes to the use and maintenance manual and resubmit it to the Engineer.
- 1.1.5.6 Additional Information
 - 1.1.5.6.1 Prepare sheets with additional information and append them to the use and maintenance manual if, during the aforementioned training sessions, such sheets are deemed necessary.
- 1.1.5.7 Documents to keep on site
 - 1.1.5.7.1 The Engineer will provide one (1) reproducible set of mechanical drawings for progressively indicating all changes made over the course of the project.
 - 1.1.5.7.2 Transfer the information recorded on the copy to the drawings in such a way that they show the mechanical systems and apparatus as they are actually installed.
 - 1.1.5.7.3 Use a different-coloured pen with indelible ink for each system.
 - 1.1.5.7.4 Keep these drawings on site and make them available to the concerned persons for reference and verification purposes.
- 1.1.5.8 As-built drawings
 - 1.1.5.8.1 Before proceeding with TAB (Testing, Adjusting, and Balancing of HVAC systems) operations, complete the as-built drawings.
 - 1.1.5.8.2 Identify each drawing in the lower-right corner, in letters at least 12 mm tall, as follows: "AS-BUILT DRAWING: THIS DRAWING HAS BEEN REVIEWED AND SHOWS THE MECHANICAL SYSTEMS/APPARATUS AS THEY ARE ACTUALLY INSTALLED". (Signature of the Contractor) (Date).
 - 1.1.5.8.3 Submit the drawings to the Engineer for approval, and make the necessary corrections according to his instructions.
 - 1.1.5.8.4 Carry out the testing, adjusting, and balancing of HVAC systems with the as-built drawings in hand.
 - 1.1.5.8.5 Submit the reproducible copies of the completed as-built drawings along

with the use and maintenance manual.

1.1.5.9 Submit sets of as-built drawings, which will be attached to the definitive TAB report.

1.2 QUALITY CONTROL

1.2.1 Quality control: in accordance with Section 01 45 00 - Quality Control.

1.3 MAINTENANCE

1.3.1 Provide the following spare parts:

1.3.1.1 one (1) set of packing for each pump;

1.3.1.2 one (1) gasket packing for each size of pump;

1.3.1.3 one (1) head gasket for each heat exchanger;

1.3.1.4 one (1) glass tube for each level indicator;

1.3.1.5 one (1) cartridge or one (1) set of filters for each filter or battery of filters, in addition to those that will be installed before the definitive acceptance of the facility.

1.3.2 Provide a kit with all special tools necessary for the maintenance of the apparatus/equipment, in accordance with the recommendations of the manufacturers.

1.3.3 Provide one (1) commercial-quality grease gun, grease, and adaptors for all categories of grease and grease fittings used.

1.4 TRANSPORTATION, STORAGE, AND MAINTENANCE

1.4.1 Waste management and disposal

1.4.1.1 Construction/demolition waste management and disposal: sort and recycle waste with a view to reusing and recycling it in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.5 ADDITIONAL GENERAL INSTRUCTIONS

1.6.1 Refer to Section 21 05 02.

2 PRODUCTS

2.1 Not applicable.

3 EXECUTION

3.1 REPAIR /REFURBISHING

3.1.1 Dress and retouch surfaces whose painted finish has been damaged, and ensure that the new finish corresponds to the original finish.

3.1.2 Refurbish all surfaces whose finish has been too greatly damaged to merely require a coat of primer and retouching.

3.2 CLEANING

3.2.1 Clean the inside and outside of all elements, apparatus, and systems, including screens and

filters, and vacuum inside air conduits and air treatment apparatus.

3.3 ON-SITE QUALITY CONTROL

- 3.3.1 On-site testing: carry out the following tests in accordance with Section 01 45 00 - Quality Control and submit the reports according to the requirements stated in the DOCUMENTS/SAMPLES TO BE SUBMITTED section from PART 1.
- 3.3.2 On-site inspections carried out by the manufacturer
 - 3.3.2.1 Obtain a written report from the manufacturer confirming the compliance of the work to the specified criteria regarding the maintenance, implementation, and application of products as well as the protection and cleaning of the structure, and submit this report in accordance with the DOCUMENTS/SAMPLES TO BE SUBMITTED section from PART 1.
 - 3.3.2.2 The manufacturer must formulate recommendations regarding the use of the product(s) and make periodic visits to verify whether the implementation has been carried out according to his recommendations.
 - 3.3.2.3 Anticipate site visits in accordance with the QUALITY ASSURANCE section from PART 1.

3.4 DEMONSTRATION

- 3.4.1 The Engineer will use certain apparatus, equipment, and systems for testing purposes before they have been accepted. Provide the necessary labour, equipment, and instruments for carrying out testing.
- 3.4.2 Provide the tools, equipment, and services of qualified instructors to ensure that use and maintenance personnel are trained, during normal work hours, with respect to the operation, control/regulation, adjustment, diagnosis of problems / troubleshooting, and maintenance of apparatus, equipment, and systems, before these items are accepted.
- 3.4.3 When specified elsewhere in Division 22 or Division 23, manufacturers must demonstrate the operation of apparatus, equipment, and systems, and guarantee the associated training of the personnel.
- 3.4.4 Training material must include the use and maintenance manual, as-built drawings, and audio-visual aids.
- 3.4.5 The requirements relating to the number of hours of training necessary are indicated in each pertinent section.

3.5 PROTECTION

- 3.5.1 Using appropriate elements, prevent dust, dirt, and other foreign matter from entering through the openings of apparatus, equipment, and systems.

END OF SECTION

1. GENERAL POINTS

1.1 GENERALITIES

- 1.1.1 This section covers topics common to all sections on mechanics.
- 1.1.2 The sections on the architectural specifications are an integral part of this section.
- 1.1.3 General Instructions:
 - 1.1.3.1 Above all, these instructions define the distinctive features that must be followed, and do not mention the usual design elements that one usually expects to find in plans and specifications.
 - 1.1.3.2 In the case of disagreement between standards, codes and the present instructions, the strictest and most rigorous requirements must be met.
- 1.1.4 Inspection of the Specifications and Premises
 - 1.1.4.1 Before submitting his bid, the bidder must visit the premises and the surrounding areas in order to familiarize himself with anything that might affect the work in any way. No complaint due to ignorance of the local conditions will be recognized by the owner.
 - 1.1.4.2 The bidder must carefully study the structural, architectural and design plans and specifications in order to ensure that the work under this contract may be satisfactorily executed, as indicated on the plans. Before starting work, examine the work done by other specialty contractors and report to the ministerial representative any defect or any obstacle to executing the work described in these specifications or affecting the required guarantee.
 - 1.1.4.3 No additional indemnity will be granted to the contractor for the consequences of his failure to carry out this inspection.
- 1.1.5 Startup:
 - 1.1.5.1 Install and start up the systems covered by these specifications in such a way that they perform the functions for which they were designed.
- 1.1.6 It is the responsibility of the contractors to verify from competent authorities that their choices of materials and systems respond to the requirements of the codes and regulations in effect.

1.2 PRIVATE SERVICES

- 1.2.1 Known Facilities:
 - 1.2.1.1 Consult the ministerial representative before starting work, and comply with his written instructions.
 - 1.2.1.2 Once the facilities have been located, any damage caused during excavation work and any resulting repair and replacement fees are the responsibility of these presents.

1.3 COORDINATION

- 1.3.1 Avoid conflicts by coordinating work with work from other sections.
- 1.3.2 Position the distribution networks, equipment and materials in such a way as to limit obstacles during the course of the work and keep as much work space as possible.

- 1.3.3 In the case of an obstacle at work, the ministerial representative must approve any changes of equipment, regardless of what is planned in the implementation schedule. It will be the contractor's responsibility to have such changes approved and to report them to the ministerial representative before making them.

1.4 REGULATIONS AND STANDARDS

- 1.4.1 Conform with all laws, codes and regulations in effect governing the construction trade concerned, according to the Québec Construction Code (CNB-95 modified); Québec plumbing code, last edition; Canadian Standards Association (CSA); Canadian General Standards Board (CGSB); Underwriters Laboratories of Canada (ULC).
- 1.4.2 Obtain and pay for all required permits, licences or inspection certificates.
- 1.4.3 Present certificates from competent authorities attesting that the structures comply with the requirements.

1.5 PLANS AND SPECIFICATIONS

- 1.5.1 All contractual documents complement each other, and any instructions from one document are just as executory as if they appeared in all documents.
- 1.5.2 If contradictions arise between the various contractual documents, the documents will be interpreted according to the following order:
 - 1.5.2.1 the contract;
 - 1.5.2.2 instructions to bidders and bidder notice;
 - 1.5.2.3 general conditions;
 - 1.5.2.4 technical specifications;Moreover, complementary documents have precedence over the documents that they complete.
- 1.5.3 The plans serve only to guide the contractor and his sub-contractors as to the approximate number and location of conduits, pipes or other objects.
- 1.5.4 For purposes of work execution and in the event of an obstacle to overcome, the position of a duct, pipe, grill, diffuser, piece of equipment, regulation element, CTC, may be moved within a radius of three (3) metres from the indicated location at no additional cost.

1.6 EQUIPMENT: REQUIREMENTS CONCERNING SETUP

- 1.6.1 To preserve uniformity, use only products from a single manufacturer when equipment of the same type or category is required, unless otherwise specified.
- 1.6.2 Follow the manufacturer's recommendations regarding safety, possibilities of inspection, maintenance and repair.
- 1.6.3 Ensure that maintenance and disassembly can be carried out without harming construction elements or other facilities.
- 1.6.4 Plan means for accessing equipment for maintenance purposes, including lubricated-for-life bearings.
- 1.6.5 When possible, align the edges of pieces of equipment, rectangular cleanouts and other similar

items with the walls of the building.

1.7 RESPONSIBILITY DURING TEMPORARY TESTING

- 1.7.1 Protect the structure against loss or damage until it is accepted.
- 1.7.2 During temporary use, the guarantee period will not be affected.
- 1.7.3 The owner may use facilities and equipment for testing purposes before accepting them. Supply the labour, equipment and instruments necessary for testing.
- 1.7.4 Clean and refurbish the facilities and equipment used and return them to a fully operational state before accepting them and isolating equipment that may be damaged.
- 1.7.5 Prevent dust, dirt and other foreign matter from entering through the openings of the facilities and equipment during their temporary use.

1.8 INSTALLATION AND ELECTRICAL

- 1.8.1 The electrical work must be performed according to the requirements of the electrical code of Quebec, last edition, according to the following requirements of paragraph.
 - 1.8.1.1 Electrical equipment should wear a CSA approval. Get special inspections labels required by provincial authority.

1.9 SCREW, BOLT AND TIES

- 1.9.1 Using ordinary commercial hardware, size and current models, the material and the finished suit the needs and are similar in all respects.

1.10 SUPPORTS FOR PIECES OF EQUIPMENT

- 1.10.1 The contractor must provide all accessories and plywood necessary for installing electrical and mechanical equipment.

1.11 HIDDEN STRUCTURES

- 1.11.1 No structure can be concealed without approval.
- 1.11.2 If the specialty contractor happens to break this clause, he may be obligated to uncover the hidden structures. The resulting fees will be charged to the offender, whether the work had been well executed or not.

1.12 TESTING

- 1.12.1 Give written warning 24 hours before testing dates.
- 1.12.2 Do not heat-proof or cover structures before they have been tested and approved.
- 1.12.3 Carry out testing in the presence of the responsible persons and the owner's representative.
- 1.12.4 Assume all costs, including those for retesting and restoration.
- 1.12.5 Piping:
 - 1.12.5.1 Carry out hydrostatic testing on piping networks using a pressure equal to 1.5 times the network's working pressure, or at least 860 kPa; choose the higher of

these two values.

- 1.12.5.2 Unless otherwise indicated, put the network under pressure and ensure that no leakage occurs during a 4-hour period.
- 1.12.5.3 Carry out tests of waste piping and ventilation in conformance with the requirements of the National Building Code and competent authorities.
- 1.12.5.4 Carry out tests in conformance with the instructions stipulated in the pertinent sections of the specifications.
- 1.12.5.5 Before proceeding with the tests, isolate or disconnect all pieces of equipment or other material not designed for resisting test pressures.

1.13 MATERIALS

- 1.13.1 Provide new materials, equipment and sets, of recognized quality and design, of recent model, whose characteristics are known and whose replacement parts are available on demand.
- 1.13.2 These materials will be in conformance with applicable standards and will bear the required seals for their use, including: CSA, CEMA, ASTM, ASME, UL, AWWA, CGSR, BNQ, etc.

1.14 DIELECTRIC FITTINGS

- 1.14.1 Plan for dielectric fittings for joining pipes and equipment made of different metals.
- 1.14.2 Fittings compatible with the network type and capable of withstanding the network's nominal pressure.
- 1.14.3 Use union fittings for joining pipes whose nominal diameter is equal to or less than DN 2 and dielectric flanges for joining pipes whose nominal diameter is greater than DN 2.

1.15 TRAINING OF OPERATION AND MAINTENANCE PERSONNEL

- 1.15.1 Provide tools, equipment and the services of qualified instructors to ensure that operation and maintenance personnel are properly trained for operating, controlling, adjusting, diagnosing and maintaining all systems and equipment, during normal work hours and before the systems and equipment have been accepted and delivered.
- 1.15.2 When specified by the stipulations of divisions 21, 22 and 23, manufacturers must give demonstrations and provide training for personnel.
- 1.15.3 Training courses must be based on the operation and maintenance manual and drawings as built.
- 1.15.4 The requirements relating to the number of hours of training necessary are indicated in each pertinent section.

1.16 SPECIFIED PRODUCTS

- 1.16.1 The drawings and specifications mention the names of equipment manufacturers and catalogue numbers corresponding to specified products. The bidder is obliged to present his bid with the specified materials and equipment.
- 1.16.2 If the bidder wishes to present alternatives, he is obliged to attach to his bid a list of equivalents, indicating the following for each product: brand, model number, technical characteristics and credit amount if applicable. Any equivalent presented after bids have been tendered will be

rejected.

1.16.3 The contractor will be obliged to have his equivalences approved by the ministerial representative, who will be the only judge accepting or refusing the proposed equivalences. If the ministerial representative rejects a proposed equivalence, the contractor will be obliged to provide the specified products without additional remuneration, including any fees incurred. This can go as far as defraying the ministerial representative's cost for analyzing these requests for equivalence.

1.16.4 Ten (10) days after the contract is awarded, and before placing any orders for materials, provide the ministerial representative with the list of manufacturers of the chosen equipment for his approval.

1.17 CONTRACT TIME

1.17.1 The general contractor has full responsibility for co-ordinating the project and following the implementation schedule. If the project is not complete by the date set by the contractual documents, the contractor must pay the ministerial representative, as damages for having prolonged the ministerial representative's duties, all costs incurred during the excess period for work supervision, including costs for movement, living expenses and lodging.

2 MATERIAL

2.1 Not applicable.

3 EXECUTION

3.1 Not applicable.

END OF SECTION

1 GENERAL POINTS

1.1 WORK IN AN EXISTING BUILDING

1.1.1 Generalities

1.1.1.1 The contractor must visit the premises in order to see the scope of the work to be carried out in the building. He must examine the construction type in order to take note of the difficulties that will be encountered during construction due to walls, beams, conduits, wires, pipes, etc., that are already in place and/or are called for in the plans.

1.1.1.2 No additional indemnity will be granted as a result of a failure on the contractor's part to carry out all required examination.

1.1.1.3 The contractor must note that it will be his responsibility to remove all existing mechanical equipment that will not be used after the present project. The costs for this work will be included in his bid.

1.2 OTHER SPECIALTY CONTRACTORS

1.2.1 The contractor will carefully consult the drawings of the other specialty contractors before presenting his bid in order to examine the modifications to the existing building and to coordinate his work.

1.3 UNUSED PIPING AND DUCTS

1.3.1 When existing pipes or ducts will not be used after modification, they and all hangers must be completely removed.

1.4 OBSTACLES

1.4.1 All relocation and/or bypassing of obstacles will be performed by the present contractor according to the ministerial representative's instructions.

1.5 DEMOLITION WORK

1.5.1 The following demolition work must be performed by the contractor concerned by this work.

1.5.1.1 Put watertight plugs on any existing couplings and outlets that will not be reused and that are on piping and master ducts.

1.5.1.2 Use plugs made of the same material and calibre as the piping and master ducts.

1.5.1.3 All other work required.

1.5.2 All materials, apparatus, and equipment resulting from demolition will remain the property of the owner, and the contractor will have to dispose of them in a location determined by the owner on a case by case basis.

2 PRODUCTS

2.1 Not applicable.

3 EXECUTION

3.1 Not applicable.

END OF SECTION

1. GENERAL INFORMATION

1.1. SCOPE OF WORK

- 1.1.1. The work includes but not limited to, labor, materials, installation, testing and commissioning of systems or parts of plumbing systems of this book.

1.2. DETAILSCOPE OF WORK

- 1.2.1 The work includes, without limitation, the provision, handling, transportation, development and installation of all the systems and accessories described below and/or on the drawings, all of which should be operational.
- 1.2.2 Connect new roof drains supplied and installed by others.
- 1.2.3 Connect the new roof drains on existing storm drainage system
- 1.2.4 Replace mechanical vents.
- 1.2.5 Provide and install the brackets and suspensions for the piping in accordance with Section 23 05 29.
- 1.2.6 Connect piping to the new roof drain provided and installed by other.
- 1.2.7 Supply and install new vents.
- 1.2.8 All other systems and/or equipments proper for the project.
- 1.2.9 Proceed to the identification of the piping, equipment and other accessories, in accordance with Section 23 05 53
- 1.2.10 Proceed to the work of insulation according to the section 21 07 15.
- 1.2.11 Work on the existing remains.
- 1.2.12 Include all required tests.
- 1.2.13 Obtain all required permits.

1.3. REFERENCE CODE

- 1.3.1 All must conform to "Canada's National Plumbing Code" last edition, and the requirements of municipal authorities.

1.4. REQUIREMENTS OF REGULATORY ORGANIZATIONS

- 1.4.1 Electrical equipment should be labeled with the CSA, as well as that of the ULC, certifying that it meets the test standards of these organizations and it was listed on their registration lists.

1.5. WORKSHOP LISTING TO SUBMIT

- 1.5.1 The workshop listing is indicated in the Appendix A.

END OF SECTION

Roof replacement
Laurentian forestry centre
PWGSC
R.078957.002

Section 22 00 03
PLUMBING

APPENDIX A

LIST OF SHOP DRAWINGS TO SUBMIT

CONTRACTOR :		PROJECT TITLE :	Roof replacement Laurentian forestry centre PWGSC
SPECIALTY :	PLUMBING		
PROJECT MANAGER :		PROJECT NUMBER. :	112018.003

[illegible]

Note : All shop drawings must be sent in a single shipment.

Prepared by :	Pascal Boily, tech.
Date :	2016-04-21

1 GENERAL

1.1 CONTENTS OF THE SECTION

- 1.1.1 Piping of evacuation and ventilation in cast iron and copper, materials and related methods of installation.

1.2 REFERENCES

- 1.2.1 ASTM International Inc.
 - 1.2.1.1 ASTM B 32, Standard Specification for Solder Metal.
 - 1.2.1.2 ASTM B 306, Standard Specification for Copper Drainage Tube (DWV).
 - 1.2.1.3 ASTM C 564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
 - 1.2.2 Canadian Standards Association (CSA International).
 - 1.2.2.1 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - 1.2.2.2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - 1.2.2.3 CAN/CSA-B125, Plumbing Fittings.
 - 1.2.2.4 CSA-B602, Joins of evacuation of piping.
 - 1.2.3 Green Seal Environmental Standards (GSES)
 - 1.2.3.1 Standard GS-36, Commercial Adhesives.
 - 1.2.4 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168, Adhesive and Sealant Applications.
 - 1.2.5 National plumbing Code of Canada, last edition (publishing).
 - 1.2.6 Underwriters Laboratories of Canada (ULC) : ULC S201.2, Join of evacuation of piping.
- ### **1.3 DOCUMENTS / SAMPLES TO BE SUBMITTED) FOR APPROVAL / INFORMATION**
- 1.3.1 Submit documents and samples required according to general sections 21 05 01, 21 05 02-Prescriptions.
 - 1.3.2 Data sheets: Submit data sheets required as well as specifications and documentation of the manufacturer concerning the piping, the joins and the products of waterproofness. These index cards have to indicate the rate of broadcast emission of COV of adhesives and solvents during the application and the period of cure.
 - 1.3.3 At request of the engineer, submit the samples of the product or one of its components described in the present section.
 - 1.3.4 Documents / elements to be put back to the completion of the works
 - 1.3.4.1 Supply the index cards of operation and maintenance required and to join them to the manual worker mentioned in general sections 21 05 01, 21 05 02-Prescriptions.
 - 1.3.4.2 Supply the reports of the controls made and signed on the spot, by the manufacturer and the Entrepreneur, with regard to the supervision of the installation and to the started. Inform

the engineer at least 48 hours before proceeding to the started and to the tests.

1.4 INSURANCE OF THE QUALITY

- 1.4.1 Reliability of the technical data: the technical data pulled by the documentation of the manufacturers have to be reliable data, confirmed by essays having been made by the manufacturers, or on their behalf, by the independent laboratories, and certifying the conformity of elements with the requirements of the codes and the existing standards.

2 PRODUCTS

2.1 SUSTAINABLE MATERIAL

- 2.1.1 Requirements regarding sustainable development: materials, materials and products corresponding to general sections 21 05 01, 21 05 02-Prescriptions.
- 2.1.2 Select materials / materials and products containing recycled materials (subjects) or presenting characteristics associated with an effective use of the resources.
- 2.1.3 Adhesives and products of waterproofness: shape to sections 21 05 01, 21 05 02-general Prescriptions. The content in COV must be lesser than that indicated in the standard Green Seal GS 36 and in the regulation (payment) 1168 of the SCAQMD.

2.2 CAST IRON PIPING AND FITTINGS

- 2.2.1 The pipes of evacuation of sanitary waters, evacuation of rainwaters and ventilation (in cast iron of equal nominal diameter or upper to DN 2, intended to be buried in the ground, as well as the related joins, have to be in accordance with the standard CAN / CSA-B70 and covered with a coat) of protective filler .

2.2.1.1 Joints:

- 2.2.1.1.1 Mechanical joints: Neoprene or butyl rubber compression gaskets: to CAN/CSA-B70 or ASTM C564

- 2.2.1.1.1.1 Stainless steel clamps.

- 2.2.1.1.2 Hub and spigot:

- 2.2.1.1.2.1 Caulking lead: to CSA B67.

- 2.2.1.1.2.2 Cold caulking compounds.

- 2.2.2 The pipes of evacuation of sanitary waters, evacuation of rainwaters and ventilation intended to be installed above-ground, as well as the related joins, have to be in accordance with the standard CAN / CSA-B70

2.2.2.1 Joints:

- 2.2.2.1.1 Mechanical joints: Neoprene or butyl rubber compression gaskets with stainless steel clamps.

- 2.2.2.1.2 Interlocking Joints

- 2.2.2.1.2.1 Lead seals Compliant with CSA B 67.

- 2.2.2.1.3 Couplings Cast: couplings equipped with neoprene gaskets and bolts with stainless steel bolts.

3 EXECUTION

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

- 3.2.1 Install the piping according to the section 23 05 05 - Installation of the piping as well as in the prescriptions of the present section.
- 3.2.2 Unless opposite indication, to install elements according to the requirements of the Canadian Code of the plumbing, the provincial Code of the plumbing and the competent local authorities.
- 3.2.3 To install the piping is similar in a parallel to walls and near the latter, so as to reduce the least possible the useful volume of the area of installation.
- 3.2.4 Block pipes and joins by means of corks or of hoods so that no fragment gets inside during the works.

3.3 VENT

- 3.3.1 Plan a complete system of vent of ventilation of the network of sanitary drainage. The horizontal piping of vents has to have a 1 mm slope per meter towards drains.
- 3.3.2 Extend vents without decrease of thickness up to 600 mm over the roof and increase them by a diameter from this joint. Make the change of diameter by means of long conical joins.

3.4 TESTING

- 3.4.1 Submit the pipings to hydrostatic tries to make sure that they are not blocked and that the slope is suited.
- 3.4.2 Make the try of the piping such as prescribes to general sections 21 05 01, 21 05 02-Prescriptions as well as to present section.
- 3.4.3 All the openings and the mouths of pipe of the complete installation must be perfectly filled. The whole installation (including the rises of vents), connections in the side dishes), the horizontal drains and the main conduits) must be filled with water until the highest level. The water has to remain at this level for at least two hours (o'clock). If it is impossible to feel all the installation at one time, she can be divided into several parts) and each of them felt in a described higher way. However, the column of water has to be of at least 3 m higher than the proven part of the system.
- 3.4.4 The piping must be always experienced up to the roof.
- 3.4.5 These essays, which are or corresponding in the requirements of the Code of plumbing of the province of Quebec, or more demanding than these, must be realized in the presence of the inspectors in plumbing or of the engineer. Put back the results of the essays signed and dated to the engineer.

3.5 PERFORMANCE VERIFICATION

- 3.5.1 Put a label of identification suited on the various pipings according to the recommendations of the section 23 05 53 – Mechanical identification.

END OF SECTION

1. GENERAL

1.1 SCOPE OF WORK

- 1.1.1 The work includes, but not limited to, the labor required for temporary dismantling of ventilation equipment.

1.2 PRINCIPAL JOBS TO DO

- 1.2.1 This section specifies requirements for the discipline breakdown on the results of work.
- 1.2.2 Divisions 21, 22 and 23 are an integral part of this section.
- 1.2.3 Dismantle temporary ventilation equipment to allow access to the roof drains. Coordinate with the plumbing contractor.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

- 1.1.1 The present section specifies the general requirements on the installation of the piping and the started.

1.2 REFERENCES

- 1.2.1 Canadian General Standards Board (CGSB): CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

1.3 DOCUMENTS / SAMPLES TO BE SUBMITTED

- 1.3.1 Submit documents and samples required according to general sections 21 05 01, 21 05 02-Prescriptions.

2 EXECUTION

2.1 APPLICATION

- 2.1.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

2.2 CONNECTIONS TO EQUIPMENT

- 2.2.1 In accordance with manufacturer's instructions unless otherwise indicated.
- 2.2.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- 2.2.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

2.3 CLEARANCES

- 2.3.1 A clear space around the equipment to facilitate inspection, maintenance and observation of the functioning of these according to manufacturer's recommendations.
- 2.3.2 Plan also a workspace being enough for defusing and removing devices or rooms of material, where necessary, without it is necessary to interrupt the functioning of the other devices or the elements of the network. The fitted out space has to be of dimension in compliance with the indications of drawings or in compliance with the recommendations of the manufacturer, the highest value that must be held.

2.4 DIELECTRIC COUPLINGS

- 2.4.1 Use dielectric joins suited to the type of piping and suiting in the nominal pressure of the network.
- 2.4.2 Use appropriate dielectric fittings to the type of pipe and suitable for the nominal pressure of the network.
- 2.4.3 Dielectric joins of equal nominal diameter or lower than DN 2: joins-unions or bronze faucets.

2.5 PIPING

- 2.5.1 Cover the threading of joins to be screwed of ribbon in Teflon.
- 2.5.2 Warn the introduction of foreign materials in the not linked openings.

- 2.5.3 Install the piping so as to be able to isolate the various devices and so allow the dismantling or the removal (kidnapping) of the latter, where necessary, without it is necessary to interrupt the functioning of the other elements of the network.
- 2.5.4 Assemble pipes (by means of joins made according to the relevant standards ANSI).
- 2.5.5 Stands of connecting can be used on the main pipes if the diameter of the pipe of linked diversion is not upper in the middle of the diameter of the main pipe. Before welding the stand, practising an opening by means of a saw or of a drill in the main pipe, of a diameter equal to the full internal diameter of the pipe of diversion to be linked, and well there to trimr banks.
- 2.5.7 Install the piping hidden so as to minimize the space reserved for furs and to maximize the free height and the available space.
- 2.5.8 Except for the indicated places, install (the piping so as to allow the insulation of every pipe.
- 2.5.9 Group pipes where it is possible, according to the indications.
- 2.5.10 Deburr the pipe ends and rid them of slag and foreign matter accumulated prior to the assembly..
- 2.5.11 Use eccentric reducers in the changes of diameter to assure (the free flow (s) of the conveyed fluid and the free ventilation () of the network.
- 2.5.12 Plan ways to compensate for the thermal movements of the piping, according to the indications.

2.6 PROTECTION FIREBREAK

- 2.6.1 In the case of pipes and insulated conduits, watch to maintain the integrity of the lagging and of adorn vapor.

2.7 ESSAYS UNDER PRESSURE OF DEVICES, MATERIALS AND PIPING

- 2.7.1 Inform the engineer at least 48 hours before the holding of the essays under pressure.
- 2.7.2 Make the try of the piping according to the relevant sections aiming at the systems and at the heating systems, of ventilation and air conditioning.
- 2.7.3 Put the network under pressure and make sure it does not happen to leak for a period of at least four (4) hours, unless a longer period is prescribed in the relevant sections to the systems and mechanical installations.
- 2.7.4 Before the tests, isolate network devices and elements that are not designed to withstand the pressure or the planned test agent
- 2.7.5 The essays must be realized in the presence of the engineer.
- 2.7.6 Where necessary, meet the expenses of repair or replacement of the defective elements, the delivery on approval and the restoration of the network. The engineer will if necessary determine to repair or to replace elements considered defective.
- 2.7.7 Insulate or hide the works only having made approve and certify the essays by the engineer.

2.8 EXISTING NETWORKS

- 2.8.1 Link the new piping with existing networks at the moments approved by the engineer.
- 2.8.2 Ask for a written approval at least ten (10) days before beginning the works.

- 2.8.3 Assume the full responsibility of the damage that the present works in the existing installation could talk.
- 2.8.4 Clean places daily.

END OF SECTION

1 GENERAL

1.1 CONTENTS OF THE SECTION

- 1.1.1 Concrete (t) bases, supports and suspensions for the pipings, the ventilation shafts and other mechanical installations.

1.2 REFERENCES

- 1.2.1 American Society of Mechanical Engineers (ASME)
 - 1.2.1.1 ASME B31.1, Power Piping.
 - 1.2.1.2 ANSI/MSS-SP-58, Pipe Hangers and Supports – Materials, Design and Manufacture.
- 1.2.2 ASTM International
 - 1.2.2.1 ASTM A 125, Standard Specification for Steel Springs, Helical, Heat-Treated.
 - 1.2.2.2 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - 1.2.2.3 ASTM A 563, Standard Specification for Carbon and Alloy Steel Nuts.
- 1.2.3 Factory Mutual (FM)
- 1.2.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - 1.2.4.1 MSS SP 58, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - 1.2.4.2 MSS SP 69, Pipe Hangers and Supports - Selection and Application.
 - 1.2.4.3 MSS SP 89, Pipe Hangers and Supports - Fabrication and Installation Practices.
- 1.2.5 Underwriter's Laboratories of Canada (ULC)

1.3 CRITERIA FOR CALCULATING

- 1.3.1 Requirements of conception design (criteria of calculating)
 - 1.3.1.1 The supportage of the pipings must be realized according to the recommendations of the manufacturers, by means (parts, plays), of elements and of current assemblies.
 - 1.3.1.2 The maximal rated loads must be determined from the indications aiming at the acceptable constraints, contained in the standards ASME B31.1 or MSS SP 58.
 - 1.3.1.3 Supports, guides and anchorings do not have to pass on (transmit) too much heat in the elements of skeleton.
 - 1.3.1.4 Supports and suspensions must be designed to support the pipings, the ventilation shafts and the mechanical devices in operation conditions, allow the movements of contraction and dilation of the supported) elements and prevent the excessive constraints on pipes and devices with which the latter are linked.
 - 1.3.1.5 Supports (and suspensions must be able to be vertically adjusted after their implementation and during the putting into service of the installations. The scale of the regulation has to be in accordance with the standard MSS SP 58.
- 1.3.2 Criterion of calculation - Overloads due to earthquakes: supports (suspensions, platforms and

footbridges must be calculated to be able to support () the overloads due to earthquakes, according to the prescriptions of the section 23 05 49.

1.4 DOCUMENTS / SAMPLES TO BE SUBMITTED

- 1.4.1 Submit documents and samples required according to sections 21 05 01, 21 05 02-general Prescriptions.
- 1.4.2 Submit drawings of workshop and data sheets in the case of the following elements:
 - 1.4.2.1 Bases, supports and suspensions.
 - 1.4.2.2 Connectings in devices and in skeleton.
 - 1.4.2.3 Structural Assemblies.
 - 1.4.2.4 Necklaces for rising columns.
 - 1.4.2.5 Stands and shields of protection.
 - 1.4.2.6 (Parts,Plays) of contreventement.
- 1.4.3 At request of the engineer, submit the samples of the product or one of these components described in the present section.
- 1.4.4 Certificates: submit documents signed by the manufacturer, guaranteeing that products, materials and materials (satisfy the prescriptions as for the physical characteristics and for the criteria of performance.
- 1.4.5 Instructions: subject installation instructions supplied by the manufacturer.
- 1.4.6 Documents / elements to be put back to the completion of the works
 - 1.4.6.1 Supply the required index cards and join them to the manual worker mentioned in general sections 21 05 01, 21 05 02-Prescriptions.
 - 1.4.6.2 Supply the reports of the controls with signature made on the spot by the Entrepreneur with regard to the supervision of the installation and to the quality control.

1.5 INSURANCE OF THE QUALITY

- 1.5.1 Reliability of the technical data: the data pulled (by catalogs and by documentation of the manufacturers will have to be reliable data, based on trial results having been made by the manufacturers or, on their behalf, by the independent laboratories, and having allowed to certify the conformity of elements with the requirements of the codes and the existing standards.

2 PRODUCTS

2.1 MATERIALS / MATERIALS SUSTAINABLE

- 2.1.1 Requirement regarding sustainable development: materials, materials and products corresponding to sections 21 05 01, 21 05 02-general Prescriptions.
- 2.1.2 Select materials / materials and products containing recycled materials (s) or presenting characteristics associated with an effective use of the resources.

2.2 GENERAL

- 2.2.1 Supports (, suspensions and (parts,plays) of contreventement must be made according to the standards ANSI B31.1 and MSS SP 58.
- 2.2.2 Elements being the object of the present section must be used for purposes of supportage only. They should not serve to raise, to lift or to go up other elements or devices.
- 2.2.3 Supports (M) and suspensions must be fixed to the elements of skeleton. If there are no elements of skeleton or if the cartridges of anchoring are not at the right place, to supply and to install () all the necessary additional (parts,) of skeleton (profiled "J" or steel valleys).

2.3 PIPE HANGERS

- 2.3.1 Finishes:
 - 2.3.1.1 Supports (M) and suspensions must be galvanized and dressed () in a zinc rich filler only when there are risks of corrosion after manufacturing.
 - 2.3.1.2 Elements must be galvanized by electroplating or by hot dumping.
 - 2.3.1.3 The steel suspensions which get in touch with copper pipings must be copper-colored and dressed (n) in epoxide resin.
- 2.3.2 Upper attachment structural: suspension from lower flange of I-Beam:
 - 2.3.2.1 Cold pipings of equal nominal diameter or lower than DN 2: mounting flanges "C", in moldable cast iron, with screw of wedging with end basin, steel tempered, locknut and steel clamp collar in the carbon.
 - 2.3.2.1.1 Stalk of suspension: 9 mm, approved by the UL, 13 mm, approved by the FM.
 - 2.3.2.1.2 Accepted products: Anvil FIG 93, Tailor, Erico.
- 2.3.3 Upper attachment structural: suspension from upper flange of I-Beam:
 - 2.3.3.1 Cold pipings of equal nominal diameter or lower than DN 2: mounting flanges "C" for top of beam, in ductile cast iron, with screw of wedging with end basin, steel tempered, locknut and steel clamp collar in the carbon, approved by the UL, approved by the FM and corresponding to the standard MSS SP 69. Accepted products: Anvil FIG 93, Tailor, Erico.
- 2.3.4 Steel beams
 - 2.3.4.1 Cold piping of diameter equal or lower than DN 2: plaque of steel support, with two nuts of blocking. Acceptable products: Anvil FIG 60, Tailor, Erico.
- 2.3.5 Profiles or steel (lower wing)
 - 2.3.5.1 Cold piping of diameter equal or lower than DN 2: stirrup "C", in moldable cast iron, in compliance with the standard MSS-SP58, the type (chap) 23, approved by the ULC. Acceptable products: Anvil FIG 86, Tailor, Erico.
- 2.3.6 Profiles or steel (superior wing)
 - 2.3.6.1 Cold piping of diameter equal or lower than DN 2: stirrup "C" (for top of beam), in moldable cast iron, in compliance with the standard MSS-SP58, the type (chap) 19, approved by the ULC. Acceptable products: Anvil FIG 93, Tailor, Erico.

- 2.3.7 Elements of anchoring for suspensions fixed in concrete (t) works
 - 2.3.7.1 Elements to be anchored in ceiling: stirrup, plate (h), fixation (g), ankles and stalk with carnation welded, steel in the carbon, with nut with forged steel carnation without weld. The carnation has to be one diameter of at least 6 mm upper to that of the stalk.
 - 2.3.7.2 Slot-in supports in the concrete: in place and in plate of protection provided with a breakable pastille, approved by the UL, approved by the FM and corresponding to the standard MSS SP 69 for piping of diameter DN ¾ to DN 8. Acceptable products: Anvil FIG 281, Tailor, Erico.
 - 2.3.7.3 Steel plate in the carbon with stirrup, for assembly in wall lamp, with nut with eye, without weld, steel forged, and at least two expansibles ankles and two bolts for every suspension. Acceptable products: Anvil FIG 49, nut with eye, FIG 290, Tailor, Erico.
- 2.3.8 Assemblies made in workshop (studio) and on the spot
 - 2.3.8.1 Steel supports.
 - 2.3.8.2 Parts, Plays of contreventement for systems of earthquake-resistant protection: shape to the section 23 05 49
- 2.3.9 Stalks of suspension: thread, corresponding to the standard MSS SP 58
 - 2.3.9.1 The stalks of suspension must not be subjected to other efforts that tractions.
 - 2.3.9.2 Elements of joint must be planned at the need to allow the horizontal movement and the vertical movement of the supported piping.
 - 2.3.9.3 It is forbidden to use stalks 22 mm or 28 mm in diameter. Acceptable products: Anvil FIG 146, Tailor, Erico.
- 2.3.10 Elements of support shape to the standard MSS SP 58
 - 2.3.10.1 For steel pipings: steel elements in the galvanized carbon.
 - 2.3.10.2 For copper pipings: black steel elements in the copper-colored finity.
 - 2.3.10.3 Shields of protection must be planned for the insulated hot pipings. Acceptable products: Anvil FIG 260, Tailor, Erico.
 - 2.3.10.4 The elements of support (m) must be oversized.
- 2.3.11 Adjustable stirrups: shape to the standard MSS SP 69, approved by the UL and approved by the FM, provided with a bolt with nipple-espaceur, with a nut of vertical regulation and with a locknut for copper cold or hot piping with horizontal movement of less than 300 mm in length.
 - 2.3.11.1 The profile "U" of the stirrup has to contain an opening partially low to allow to riveter the stirrup in the shield of protection of the lagging. Acceptable products: Anvil FIG CT-65, Tailor, Erico.
- 2.3.12 Not metallic piping: adjustable stirrup in compliance with the standard MSS SP 69, typifies 9. Accepted products: Anvil FIG CT-69, Tailor, Erico.
- 2.3.13 Type of media

2.4 NECKLACES FOR RISING COLUMNS

- 2.4.1 Steel pipings or in cast iron: steel necklaces in the galvanized carbon, corresponding in the standard MSS SP 58, typify 42, approved by the UL and approved by the FM. Accepted products: Anvil FIG 261, Tailor, Erico.
- 2.4.2 Copper pipings: steel necklaces in the carbon in the copper-colored finity, corresponding in the standard MSS SP 58, typify 42. Accepted products: Anvil FIG CT-121, Tailor, Erico.
- 2.4.3 Not metallic piping: steel necklace in the carbon in compliance with the standard MSS St 69. Accepted products: Anvil FIG 261, Tailor, Erico.
- 2.4.4 Bolts: shape to the standard ASTM A 307.
- 2.4.5 Nuts: shape to the standard ASTM A 563.

2.5 SUPPORTS FOR DEVICES

- 2.5.1 When they are not supplied by the manufacturer of devices, elements intended for the supportage of the latter must be made steel of construction in compliance with the requirements and the clauses dealing with some structural steel for buildings. Subject the calculations with the drawings of workshop.
- 2.5.2 Supply and install all the necessary metallic supports (for devices, heat exchangers (s), reservoirs and accessories mentioned in the plans and the estimate of the present section.
- 2.5.3 These supports will be made of metallic profiles welded and built according to the rules of the art as well as according to the standards of the provincial codes concerning these works. This work will have to be executed by the skilled labor.

2.6 BOLTS OF ANCHORING AND TEMPLATES (SIZES)

- 2.6.1 Supply the sizes which will allow to determine the exact location of the bolts of anchoring.

2.7 OTHER TYPES (S) OF SUPPORTS (M) OF DEVICE

- 2.7.1 The supports of device must be made by structural steel in compliance with the requirements and the clauses dealing with some structural steel for buildings .
- 2.7.2 Submit the calculations with the drawings of workshop.

3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- 3.2.1 Install in accordance with:
 - 3.2.1.1 Manufacturer's instructions and recommendations.
 - 3.2.1.2 All the supports of every type of hot or cold piping will be completely settled except the lagging.
- 3.2.2 Vibration Control Devices: Install on piping systems at pumps, boilers, chillers, cooling towers, and

as indicated.

3.2.3 Clamps on riser piping:

3.2.3.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

3.2.3.2 Bolt-tightening torques to industry standards.

3.2.3.3 Steel pipes: install below coupling or shear lugs welded to pipe.

3.2.3.4 Cast iron pipes: install below joint.

3.2.4 Elements of anchoring for suspensions fixed in concrete works: fix elements and stirrups in the concrete work by means of at least four parts of anchoring, one in every corner.

3.2.5 Fix the suspensions to elements of skeleton. In this respect, supply and install (s) all the (parts of necessary additional steel structures if there are no structural supports ready in position in the planned points of installation or still if the cartridges of anchoring are not arranged in the required places.

3.2.6 Use approved constant support type hangers where:

3.2.6.1 Vertical movement of pipework is 13 mm or more,

3.2.6.2 Transfer of load to adjacent hangers or connected equipment is not permitted.

3.2.7 Use variable support spring hangers where:

3.2.7.1 Transfer of load to adjacent piping or to connected equipment is not critical.

3.2.7.2 Variation in supporting effect does not exceed 25 % of total load.

3.3 SPACING ENTERS SUPPORTS () AND SUSPENSIONS

3.3.1 Piping of network of plumbing: meet the most rigorous requirements indicated in the Canadian Code of the plumbing, in the relevant provincial code, or still specified by the competent authority.

3.3.2 Piping of network of fire protection: according to the requirements of the relevant code of prevention of the fires.

3.3.3 Piping of fuel oil and gas of equal nominal diameter or lower than DN 1/2: a support / suspension all 1.8 m.

3.3.4 Copper piping of equal nominal diameter or lower than DN 1/2: a support / suspension all 1,5 m.

3.3.5 Piping in the extremities grooved by rolling and in the flexible joints: according to the indications of the picture () below, by counting at least a support / suspension in every joint. The picture applies to the rectilinear sections distractedly of load and in the case of which a complete linear movement is not necessary.

3.3.6 A support / suspension over 300 mm of each elbow..

3.3.7 For the piping of nominal diameter upper to DN 12, conform to the standard MSS SP 69.

Maximal nominal diameter of the piping (DN)	Maximal spacing Steel piping	Maximal spacing copper Piping
Until 1¼	2,1 m	1,8 m
1½	2,7 m	2,4 m
2	3,0 m	2,4 m
2½	3,7 m	3,0 m

3.4 HANGER INSTALLATION

- 3.4.1 Install hanger so that rod is vertical under operating conditions.
- 3.4.2 Adjust hangers to equalize load.
- 3.4.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

- 3.5.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- 3.5.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

- 3.6.1 Adjust hangers and supports:
 - 3.6.1.1 Ensure that rod is vertical under operating conditions.
 - 3.6.2.2 Equalize loads.
- 3.6.2 Adjustable clevis:
 - 3.6.2.1 Tighten hanger load nut securely to ensure proper hanger performance.
 - 3.6.2.2 Tighten upper nut after adjustment.
- 3.6.3 C-clamps: Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- 3.6.4 Beam clamps: Hammer jaw firmly against underside of beam.

END OF SECTION

1 GENERAL

1.1 SUMMARY

- 1.1.1 Systems and devices to protect against shock loads due to earthquakes. The technical equipment static Bracketing and technical equipment elastic support forces is to say isolated against vibration, including all mechanical devices and systems, control systems / control of mechanical building installations and facilities protection against fire.

1.2 REFERENCES

- 1.2.1 Canada's National Building Code.
- 1.2.2 ASHRAE : A Practical Guide to Seismic Restraint.
- 1.2.3 SMACNA : Seismic Restraint Manual Guide Lines for Mechanical Systems.

1.3 REACH(T) OF THE WORK - CHARACTERISTICS OF THE SYSTEMS OF EARTHQUAKE-RESISTANT PROTECTION

- 1.3.1 The systems of earthquake-resistant protection must be compatible with what follows and to be perfectly integrated into it:
 - 1.3.1.1 Design, supply and install a complete system of earthquake-resistant fixation for the mechanical and electric material, isolated against the vibrations and not isolated against the vibrations, and related systems.
 - 1.3.1.2 Supply a complete and functional earthquake-resistant system of fixation designed by a professional engineer, accredited in the province of Quebec and which is a specialist regarding systems design of earthquake-resistant fixation.
 - 1.3.1.3 The system of earthquake-resistant fixation must be completely integrated and compatible with the requirements of reduction of the noise and the antivibratory system of the mechanical and electric material and the related systems, such as specified on drawings and somewhere else.
 - 1.3.1.4 The system of earthquake-resistant fixation must be compatible with the mechanical design, the electric design and the design of structure of the building.
 - 1.3.1.5 During or after the earthquake, the fixed material does not inevitably have to stay in working order as in the normal conditions of use. The compulsory requirements are that the system of earthquake-resistant fixation prevents the systems and the mechanical material from causing wounds to the people.

1.4 QUALIFICATION OF THE MANUFACTURER

- 1.4.1 Provide vibration devices including earthquake dampers, separate earthquake dampers, mounting hardware of relaxed cables and other fastening systems from manufacturers that regularly produce the same hardware.
- 1.4.2 The whole earthquake-resistant system of fixation must be supplied by the same supplier.
- 1.4.3 Acceptable suppliers: Korfund-Sampson, Tecoustics, Vibra-Sonic Control and Vibron.

1.5 DOCUMENTS/SAMPLES TO BE SUBJECTED

- 1.5.1 The contractor shall submit to the engineer for approval, 100% complete construction documents,

- sealed by a professional engineer design seismic systems, prepared in accordance with the standard of quality and document dimensions construction of which these tender documents. These should contain full working drawings, material lists, design calculations, drawings and specifications that are used for detailed design of earthquake-resistant fasteners.
- 1.5.2 Once the construction was ended, the contracting party has to put back to the engineer complete all the documents of construction original and revised so as to take into account conditions of the system such as built.
- 1.5.3 The Contractor shall waive any claim of ownership and copyrights to models, drawings, working drawings, specifications and details for the Ministry of National Defence, which becomes the sole owner.
- 1.5.4 Submit documents and samples required according to general sections 21 05 01, 21 05 02-Prescriptions.
- 1.5.5 Drawings of workshop: the drawings of subdued workshop have to carry the seal and the signature of a recognized competent engineer or authorized to practice in Quebec.
- 1.5.6 Subject the data of calculation below:
- 1.5.6.1 A detailed version of the criteria of calculation.
- 1.5.6.2 The design documents (worksheets and tables), including the calculation of stresses due to seismic forces, according to the CNB..
- 1.5.6.3 Different drawings of workshop for every plan or system of earthquake-resistant protection as well as for each of their elements.
- 1.5.6.4 A document specifying the location of these devices and systems.
- 1.5.6.5 Lists of different types of seismic protection devices and systems and related materials.
- 1.5.6.6 A document showing or giving details of the anchoring and fastening devices, anchoring the costs and methods of bonding the structural members.
- 1.5.6.7 A document specifying the instructions and the methods of installation.
- 1.5.6.8 The documents of calculation, including the calculation of the requests attributable to the seismic strengths in presence, according to the CNB and its supplement.
- 1.5.6.9 Sheets of calcul/de work and detailed table. The careful or simplifying hypotheses can be accepted.
- 1.5.7 Certificates: submit documents signed by the manufacturer, guaranteeing that products, materials and materials satisfy the prescriptions as for the physical characteristics and for the criteria of performance.
- 1.5.8 Instructions: submit installation instructions supplied by the manufacturer.
- 1.5.9 Documents / items to deliver to the completion
- 1.5.9.1 Providing reports with signing checks carried out on site by the specialist engineer for seismic systems design related to system monitoring
- 1.5.9.2 Provide the required documents, which must include the instructions for the device control and seismic protection systems, and attach them to the manual mentioned in Sections 21 05 01, 21 05 02-Prescriptions.

1.6 QUALITY ASSURANCE

- 1.6.1 Reliable technical information: technical data from manufacturers' literature must be reliable, confirmed by tests have been made by the same manufacturers, or on their behalf by independent laboratories, certifying compliance elements to the requirements of codes and standards.

2 PRODUCTS

2.1 MANUFACTURER

- 2.1.1 Devices and systems of earthquake-resistant protection must be supplied by one and the same wealthy manufacturer of the experience in the domain.

2.2 GENERAL

- 2.2.1 Devices and systems of earthquake-resistant protection have to act in flexibility and in a continuous way, so as to limit the impacts.
- 2.2.2 Devices and systems of earthquake-resistant protection have to act in all the directions.
- 2.2.3 Fasteners and bonding points must be able to withstand the same maximum loads that seismic devices and systems
- 2.2.4 Devices and systems of earthquake-resistant protection intended to protect the pipings have to satisfy the following conditions:
 - 2.2.4.1 Allow the respect for the requirements relative to the anchoring and to the guide of the pipings.
 - 2.2.4.2 Do not damage the action of the systems of acoustic and antivibratory insulation.
- 2.2.5 Devices and systems of earthquake-resistant protection established by elements in cast iron, by thread tubes or by the other frangibles materials will not be accepted.
- 2.2.6 Bonding of seismic protection devices and systems protection in concrete skeletons armed.
 - 2.2.6.1 The used anchorings have to be of the type expansible and have to present a high degree of mechanical resistance.
 - 2.2.6.2 No anchoring must be put in the air guns or still put in leaky holes to this end.
 - 2.2.6.3 Produced acceptable: Hilti type HSL.
- 2.2.7 Devices and systems of earthquake-resistant protection do not have to hamper the functioning of elements firebreak nor to compromise the integrity.

2.3 EARTHQUAKE-RESISTANT FIXATIONS(S) FOR THE STATIC MATERIAL (MATERIAL NOT REQUIRING ANTIVIBRATORY SUPPORT

- 2.3.1 Material) and devices on the ground
 - 2.3.1.1 The material and the devices must be subjected to their support() of assembly.
 - 2.3.1.2 The supports of assembly have to be link in the skeleton of the building.
 - 2.3.1.3 The used bolts of anchoring have to be of the thickness indicated on the drawings of workshop.

2.3.2 Material suspended, including piping, ductwork, power bus lines or communication and other related similar systems

2.3.2.1 Use one or several of the following methods, according to the conditions of places:

2.3.2.1.1 Fix the material solidly to the skeleton.

2.3.2.1.2 Strengthen the material in all the directions.

2.3.2.1.3 Strengthen the points of fixation of the material in the skeleton.

2.3.2.1.4 Fix the material with relaxed cables.

2.3.2.2 The fixation of the piping by relaxed cables prevents the oscillation in the horizontal plan, the balance in the vertical plan and the sliding and the singeing in the axial

2.3.2.3 Precautions must be taken to make sure that the stalks of suspension can support (the load) of compression and do not burn.

2.3.2.4 The seismic protection system must exert a gentle and regular damping effect attributable to an elastomeric material or otherwise, to prevent high impact loads.

2.3.2.5 Acceptable suppliers of systems with relaxed cables: Grinnel, Korfund-Sampson, Tecoustics, Vibra-Sonic control, Vibron.

2.4 EARTHQUAKE-RESISTANT FIXATIONS FOR THE MATERIAL ISOLATED AGAINST THE VIBRATIONS

2.4.1 Material installed on the ground

2.4.1.1 Apply one or several of the following methods, according to the conditions of places:

2.4.1.1.1 Use antivibratory devices with system of integrated amortization.

2.4.1.1.2 Use shock absorbers separated besides the antivibratory devices.

2.4.1.1.3 To Use a system of made amortization compound of elements of skeleton and of a layer élastomérique, with the approval of an engineer.

2.4.1.2 Protective devices earthquake-resistant should not damage not at all the action of the systems insonorisants and antivibratory. Plan a release from 4 to 8 mm, in condition of normal functioning of the material and the systems, between the shock absorbers of protective devices earthquake-resistant and the material.

2.4.1.3 Incorporate devices of earthquake-resistant protection into the antivibratory systems to prevent any complete unloading of the latter.

2.4.1.4 The damping effect exerted, due to an elastomeric material or otherwise, must be smooth and regular to prevent high impact loads..

2.4.1.5 Acceptable Suppliers: Korfund-Sampson, Tecoustics, Vibra-Sonic Control, Vibron.

2.4.2 Suspended equipment, including piping, ductwork, power bus lines or communication and other related similar systems:

2.4.2.1 Use one or several of the following methods, according to the conditions of places:

2.4.2.1.1 Hold the material with relaxed cables.

- 2.4.2.1.2 Strengthen the points of fixation of the material in the skeleton through antivibratory devices with integrated shock absorbers or through additional separate shock absorbers.
- 2.4.2.2 The fixation of the piping by relaxed cables prevents the oscillation in the horizontal plan, the balance in the vertical plan and the sliding and the singeing in the axial direction.
- 2.4.2.3 Care should be taken to ensure that the suspension rods can withstand the compressive load and does not soar
- 2.4.2.4 The system of earthquake-resistant protection has to exercise an effect of soft and regular amortization, to prevent the high loads of impact.
- 2.4.2.5 Acceptable suppliers of systems with relaxed cables: Grinnel, Korfund-Sampson, Tecoustics, Vibra-Sonic Control, Vibron.

3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- 3.2.1 Attachment points and fasteners: To withstand same maximum load that seismic restraint is to resist and in every direction.
- 3.2.2 Slack Cable Systems (SCS):
 - 3.2.2.1 Connect to suspended equipment so that axial projection of wire passes through centre of gravity of equipment.
 - 3.2.2.2 Use appropriate grommets, shackles, other hardware to ensure alignment of restraints and to avoid bending of cables at connection points.
 - 3.2.2.3 Piping systems: provide transverse SCS at 10 m spacing maximum, longitudinal SCS at 20 m maximum or as limited by anchor/slack cable performance.
 - 3.2.2.4 Small pipes may be rigidly secured to larger pipes for restraint purposes, but not reverse.
 - 3.2.2.5 Orient restraint wires on ceiling hung equipment at approximately 90 degrees to each other (in plan), tie back to structure at maximum of 45 degrees to structure.
 - 3.2.2.6 Adjust restraint cables so that they are not visibly slack but permit vibration isolation system to function normally.
 - 3.2.2.7 Tighten cable to reduce slack to 40 mm under thumb pressure. Cable not to support weight during normal operation.
- 3.2.3 Install SRS at least 25 mm from equipment, systems, services:
- 3.2.4 Miscellaneous equipment not vibration-isolated: Bolt through house-keeping pad to structure.
- 3.2.5 Miscellaneous equipment not isolated against vibration: bolt the hardware to the mounting base and the frame of the building using the through-anchor bolts.
- 3.2.6 Co-ordinate connections with other disciplines.
- 3.2.7 Vertical tanks:

3.2.7.1 Anchor through house-keeping pad to structure.

3.2.7.2 Provide steel bands above centre of gravity.

3.2.8 Horizontal tanks: Provide at least two straps with anchor bolts fastened to structure.

3.3 FIELD QUALITY CONTROL

3.3.1 Manufacturer's Field Services:

3.3.1.1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.

3.3.1.2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:

3.3.1.2.1 Once during the progress of the works.

3.3.1.2.2 Once the finished works.

3.3.1.3 Submit the reports of the manufacturer and the engineer specialist regarding systems design of earthquake-resistant fixations in seven days following the visit in the construction site.

3.3.2 Inspection and Certification:

3.3.2.1 Once the installation work is completed, the seismic protection devices and systems must be inspected and certified sealed by an engineer.

3.3.2.2 Replace with the certificate of conformity, a written report to the engineer.

3.3.3 Documents required for commissioning: once the certification report and accepted, provide to the engineer a complete copy of the revised project file and annotated to show the conditions after execution.

END OF SECTION

1 GENERAL

1.1 CONTENTS OF THE SECTION

- 1.1.1 Requirements aiming at the identification of the networks of pipings and ventilation shafts, the faucet factory and the devices of command / regulation, modes) and used elements of identification, including the location of the latter and the related methods of installation.

1.2 REFERENCES

- 1.2.1 Canadian Gas Association (CGA): CSA/CGA B149.1, Natural Gas and Propane Installation Code.
- 1.2.2 Canadian General Standards Board (CGSB)
 - 1.2.2.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.
 - 1.2.2.2 CAN/CGSB-24.3, Identification of Piping Systems.
- 1.2.3 National Fire Protection Association (NFPA)
 - 1.2.3.1 NFPA 13, Standard for the Installation of Sprinkler Systems.
 - 1.2.3.2 NFPA 14, Standard for the Installation of Standpipe and Hose Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- 1.3.1 Submit documents and samples required in accordance with Sections 21 05 01 and 21 05 02 General Prescription.
- 1.3.2 Specifications: submit technical data relating to the products specified in this section, including color chips.
- 1.3.3 Submit samples nameplates, identification plates and labels, as well as the lists of proposed legends.

2 PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- 2.1.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- 2.1.2 Lettering and numbers raised or recessed.
- 2.1.3 Information to include, as appropriate:
 - 2.1.3.1 Equipment: manufacturer's name, model, size, serial number, capacity.
 - 2.1.3.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 EXISTING IDENTIFICATION SYSTEMS

- 2.2.1 Identify added or improved structures according to the existing identification system.
- 2.2.2 When the existing identification system does not provide for the identification of new facilities installed, they must be identified according to the requirements of this section.
- 2.2.3 Before starting the work, written approval of the identification system by the engineer.

2.3 IDENTIFICATION OF PIPING SYSTEMS

- 2.3.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- 2.3.2 Pictograms: Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
- 2.3.3 Legend: Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- 2.3.4 Arrows showing direction of flow:
 - 2.3.4.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - 2.3.4.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
 - 2.3.4.3 Use double-headed arrows where flow is reversible.
- 2.3.5 Extent of background colour marking:
 - 2.3.5.1 To full circumference of pipe or insulation.
 - 2.3.5.2 Length to accommodate pictogram, full length of legend and arrows.
- 2.3.6 Materials for background colour marking, legend, arrows:
 - 2.3.6.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
 - 2.3.6.2 Other pipes: pressure sensitive [plastic-coated cloth] [vinyl] with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.
- 2.3.7. Colours and Legends:
 - 2.3.7.1 When the background colors and legends are not specified, conform to engineering guidelines
 - 2.3.7.2 Colors captions and arrows: according to the table below.
 - 2.3.7.3 background color markings and legends for pipes

Fluid carried	background color	legend
Supply - Domestic Hot Water	Green	SUP DOM HOT WAT.
Supply - Domestic Cold Water	green	SUP DOM COL WAT.
Ventilation (plumbing)	Green	VENT. PLUMB.

3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- 3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- 3.2.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

- 3.2.2 Supply the plates (patches) of ratification ULC and/or CSA (FRENCH BROADCASTING AUTHORITY) required by each of the respective bodies.

3.3 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- 3.3.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- 3.3.2 Adjacent to each change in direction.
- 3.4.3 At least once in each small room through which piping or ductwork passes.
- 3.3.4 On both sides of visual obstruction or where run is difficult to follow.
- 3.3.5 On both sides of separations such as walls, floors, partitions.
- 3.3.6 At beginning and end points of each run and at each piece of equipment in run.
- 3.3.7 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
- 3.3.8 Identification easily and accurately readable from usual operating areas and from access points. Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

END OF SECTION

1 GENERAL

1.1 CONTENTS SECTION

1.1.1 Insulation of pipes and related accessories related to commercial facilities.

1.2 REFERENCES

- 1.2.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE): ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
- 1.2.2 American Society for Testing and Materials International (ASTM)
 - 1.2.2.1 ASTM B 209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate [Metric].
 - 1.2.2.2 ASTM C 335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - 1.2.2.3 ASTM C 411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - 1.2.2.4 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - 1.2.2.5 ASTM C 533, Calcium Silicate Block and Pipe Thermal Insulation.
 - 1.2.2.6 ASTM C 547, Mineral Fiber Pipe Insulation.
 - 1.2.2.7 ASTM C 795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - 1.2.2.8 ASTM C 921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
 - 1.2.2.9 ASTM A167, Specification for Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet and Strip.
- 1.2.3 Canadian General Standards Board (CGSB)
 - 1.2.3.1 CGSB 51-GP-52Ma, Vapor Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - 1.2.3.2 CGSB 51 GP 9M, thermal insulation, mineral fiber ducts for pipes and cylindrical ducts.
 - 1.2.3.3 CGSB 51 GP 11M, Blanket insulation mineral fiber, for pipes, ducts, boilers and machinery.
 - 1.2.3.4 CAN / CGSB 51.12 M Cement insulation and finition.
 - 1.2.3.5 CAN / CGSB 51.40 M thermal insulation, flexible, elastomeric, unicellular, sheet and tubular.
 - 1.2.3.6 CGSB 51 GP 53M, polyvinyl chloride Gaines) sheet for pipes, tubes and Round Ducts.
 - 1.2.3.7 CAN / CGSB-51.60.53, Polyvinyl chloride) sheet for Pipes, containers and Round Ducts.
 - 1.2.3.8 CAN4 S102, Standard Method of Test for Surface Burning characteristic of building

materials and assemblies.

1.2.3.9 ANSI/NFPA 90A, Air Conditioning and Ventilating Systems, Installation of.

1.2.3.10 ANSI/NFPA 90B, Warm Air Heating and Air Conditioning Systems.

1.2.4 Health Canada/system of information about hazardous materials used in the work (SIMDUT): identification sheets (FS).

1.2.5 Manufacturers' Associations: Canadian Association of the heat insulation (ACIT), national Standards of insulation (C2004).

1.2.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.2.7 CSA HA Series M CSA Standards for Aluminum and Aluminum Alloys.

1.3 DEFINITIONS

1.3.1 For purposes of this section:

1.3.1.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

1.3.1.2 "EXPOSED" - will mean "not concealed" as specified.

1.3.1.3 The spaces such as mechanical room, electrical room, boiler room, shed, tunnel and / or gallery space and everything of this nature are considered occupiable..

1.3.1.4 "Material" means any component used for the insulation including, besides the lagging or the insulating material itself, the glues, the ribbons, the coverings (collections), adorns vapors, jacketings, sealings, ties, coated and any necessary product to complete the works.

1.3.1.5 "Network" means piping including accessories, side s (fillings), etc. such as valves, elbows, pumps, tees, etc., which are incorporated.

1.3.1.6 "Domestic" means drinkable and not used exclusively to this end.

1.3.1.7 "Waste water" mean any waters of evacuation except rainwaters.

1.3.1.8 "Throats" mean drain of floor, drain of roof, funnel, etc., connected () with a pipe of evacuation of waste water, or with a piping of rainwater.

1.3.1.9 "Condensat" means water resulting from the condensation of the vapor which returns to the boiler in the vapor via diverse progresses. In this water, can be added by some softened water, drinking water or vapor without (it) loses r (its) definition. Also mean water generating in an air-conditioning system.

1.3.2 AICT Code:

1.3.2.1 CRF: Code Rectangular Finish.

1.3.2.2 CPF: Code Piping Finish.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

1.4.1 Subject documents and samples required according to sections 21 05 01, 21 05 02- General Prescriptions.

1.4.2 Data sheets: submit data sheets required as well as documentation of the manufacturer concerning products. Data sheets have to indicate the characteristics of products, the criteria of performance, the dimensions the limits and the finish. They also have to indicate the rate of emission, of COV of adhesives and solvents, during the application and the period of cure.

1.4.3 Samples

1.4.3.1 At the request of the engineer, submit samples required by the product described in the present section.

1.4.3.2 Submit complete every whole type of complex lagging proposed including the insulating material itself, the filler of cover and the glue. Take up the sample on a panel of plywood of 12 mm. Place under the sample a label indicating the conveyed network/fluid.

1.4.4 Certificates: submit documents signed by the manufacturer, guaranteeing that products, materials and materials satisfy the prescriptions as for the physical characteristics and for the criteria of performance.

1.4.5 Submit installation instructions supplied by the manufacturer.

1.4.6 Make approve the documentation supplied by the manufacturer, aiming at the methods of (installation) of the lagging, the details of manufacturing of insulating elements for pipes (s), joins and devices of faucet factory, as well as the recommendations as for the execution of joints.

1.4.7 Documents/elements to be put back to the completion of the works

1.4.7.1 Supply the index cards of maintenance required and to join them to manual worker mentioned in sections 21 05 01, 21 05 02 general Prescriptions.

1.4.7.2 Supply the reports of the signed controls made on the spot by the supplier and the Entrepreneur relative to the installation.

1.5 QUALITY ASSURANCE

1.5.1 Reliability of the technical data

1.5.1.1 The data pulled by catalogs and by documentation of the manufacturers will have to be reliable data, based on trial results (having been made by the manufacturers or, on their behalf, by the independent laboratories, and having allowed to certify the conformity of elements with the requirements of the codes and the existing standards.

1.5.1.2 The installer has to be an expert in the domain.

1.6 SCOPE OF WORK

1.6.1 The insulation contractor should obtain mechanical contractors of the nature of the piping and equipment to be insulated..

1.6.2 Unless specifically indicated otherwise, the insulating "hidden" not receiving finish and / or cover

other than the factory integrated. By cons, joints must be perfectly sealed.

- 1.6.3 All insulating "apparent" must receive a finish and / or recovery.
- 1.6.4 Use and location: refer to the list of application of different types of insulation shown in part 3 of this section for details on where it applies and their use
- 1.6.5 The thermal insulation must continue through the walls and floors where the pipe passes through them.
- 1.6.6 The insulation must be made according to the rules of the art by an expert installer in the domain and the member of the ACIT.
- 1.6.7 Unless opposite specific indications in the table A in this section, all the pipings will be isolated on all their length.

2 PRODUCTS

2.1 MATERIALS / MATERIALS SUSTAINABLE

- 2.1.1 Select materials/materials and products containing recycled materials or presenting characteristics associated with an effective use of the resources. If necessary, verify with the manufacturer the content in materials recycled before and after consumption of the offered products.
- 2.1.2 Adhesives and products of waterproofness:
- 2.1.3 Use the products of waterproofness, the adhesives, the products of impression and the least toxic possible products of finish, but which satisfy the needs for the works.
 - 2.1.3.1 The content in COV of adhesives and products of waterproofness must be less than that indicated in the standard Green Seal GS-36 and in the regulation 1168 of the SCAQMD.
 - 2.1.3.2 Paint content in COV of in most 250 g/L according to the standard GS-11 according to the regulation number 1113 of the SCAQMD.

2.2 FIRE AND SMOKE RATING

- 2.2.1 The used materials will have to have an indication (index) of distribution of the flame of in most 25 and an indication of smoke power of in most 50, according to the standard CAN4 S102.

2.3 GENERAL

- 2.3.1 Materials must have been felt (according to the standard ASTM C411.
- 2.3.2 Covering preformed in PVC for joins, elbows and for all the piping in the rooms of mechanics.

2.4 TABLE 1

2.4.1 Thickness of insulating material according to the temperatures of networks, according to CMNE B.

Vapour pressure Saturated (kPa or condensat)	Temperature of the fluid (°C)	Thickness of the minimal lagging (mm)			
		Nominal diameter of pipes (DN)			
		1 and less	1 ¼ in 2	2½ in 4	5 and more
827 and more	177 and more	64	64	76	89
104 in 826	122-176	51	64	64	89
0 in 103	94-121	38	38	51	51
Pumped Condensat	61-93	25	25	38	38
--	30-60	25	25	38	38
--	21-29	25	25	25	38
--	5-20	25	25	25	25
--	Less of 5	25	38	38	38
Condensat in low-pressure gravity		25	38	51	51

2.5 I INSULATION TYPE P-1: MINERAL FIBRE; PREFORMED WITH VAPOR OPERATING TEMPERATURE 4 ° C TO 200 ° C

2.5.1 Uses: insulating the P type 1 pipes and fittings. Operating temperature 4 ° C to 200 ° C.

2.5.2 Materials

2.5.2.1 Envelope rigid mineral fiber complies with CGSB 51 GP 9M, with vapor barrier, liner and coating material in compliance with CGSB 51 GP 52M.

2.5.2.2 Acceptable Products: Manson, Alley-K APT, Knauf and Johns Manville's.

2.5.2.3 Thermal insulation with a thermal conductivity coefficient "K" is not more than 0.034 W / m ° C at an average temperature of 24 ° C when tested according to the requirements of ASTM C335.

2.5 INSULATION TYPE P-2: FLEXIBLE MINERAL FIBRE WITH VAPOR; OPERATING TEMPERATURE UP TO 85 ° C

2.5.1 Materials

2.5.1.1 Mattress of mineral fibers (for insulation of pipings) in compliance with the standard CGSB 51-GP-9M with adorns vapor, shirt and material of cover corresponding to the standard CGSB 51-GP-52M.

2.5.1.2 Acceptable Products: Manson Alley Wrap FSK, Knauf and some teed type Of John Manville.

2.5.2 Thickness of the insulation: refer to the picture 1, the art. 2.4.

2.7 STUCK, RIBBONS AND ATTACHED

2.7.1 Use glues with very low (k) content in COV.

2.8 STUCK TO SEAL THE OVERLAPPIINGS OF ADORN VAPOR

2.8.1 Glue with water, fireproofing, compatible with the insulating material.

2.9 FILLER ADORNS VAPOR FOR INTERNAL PIPINGS

2.9.1 Vinyl emulsion of acrylic, compatible type () with the insulating material.

2.10 ENVELOPES AND REMOVABLE PREFABRICATED LAGGING

2.10.1 Uses: expansion joints faucet factory.

2.10.2 Design to allow the free movement of expansion joints and be periodically kidnapped and replaced without risk of damage of the neighboring lagging.

2.10.3 Insulate

2.10.3.1 Shaped to marry the shape of elements to be insulated.

2.10.3.2 The Same thickness as the neighboring lagging.

2.10.3.3 Installations of cooling of water: including one adorns vapor.

2.10.3.4 Wrap: aluminum 1.3 mm in thickness.

2.11 JOINS AND ANGLED

2.11.1 Isolate joins and elbows with sections of insulating material with pipe gangways with tab with tight adjustment. In alternative, isolate joins and elbows with a tight adjusted flexible insulating material of the same thickness as a stiff insulating material on the pipe.

3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

3.1.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

3.2.1 Install in accordance with TIAC National Standards.

3.2.2 Do not put the heat insulating material that once completed mandatory tests and the results approved by the engineer. Ensure that the insulation surfaces and items to be insulated are clean and dry during installation of insulation and during application of a topcoat. Apply materials and accessories and apply finishing plasters according to the manufacturer's recommendations and these requirements.

3.2.3 In the case of piping covered with insulation and a vapor barrier, install a high density insulation in places where there are provided protective shields for insulated pipes. The vapor barrier should not be pierced to let the elements of the media or be interrupted at the location of the sleeves, fittings and brackets.

3.2.4 When the insulation may be damaged by the shocks because of its closeness of the doors of

accesses, the doors, the plates of access, etc., protect it by a steel girdle steel pre-painting of 1.3 mm (calibre 18).

- 3.2.5 To put the material insulates so as to realize a smooth and uniform surface.
- 3.2.6 For the insulating material, apply fillers and products of finish according to the recommendations and the precautions of the manufacturers of lagging, adhesives and fillers.
- 3.2.7 All the supports of every types of piping, hot or cold, will be completely settled except the lagging.
 - 3.2.7.1 To the insulated pipe of a thermally insulating elastomer or flexible mineral fibers, a rigid type material "Foamglass" or "Styrofoam" is used in each carrier and a steel saddle of a suitable length is installed to distribute the weight.
 - 3.2.7.2 To the insulated pipe with a heat insulating mineral fiber preforms or other rigid material, the extension of the insulating material is used for each support and a saddle steel of appropriate length is mounted to distribute the weight.

This material will be supplied and installed by the Contractor insulation. Supports and steel stool will be supplied and installed by each mechanical contractor concerned to the satisfaction of Insulation contractor..

- 3.2.8 Apply high insulation resistance to compression, appropriate conditions of service, when no harness or no insulation protection shield can be installed

3.3 CALORIFUGE

- 3.3.1 Install insulation according to the standards ANSI/NFPA 90A and ANSI/NFPA 90B.
- 3.3.2 Preformed Thermal Insulation: Use an insulated shells for pipe diameter DN ½ or less, and an insulating shells or curved segments for pipe diameter greater than DN ½.
- 3.3.3 Insulate multithicknesses: move the joints of joining end to end of every thickness of lagging.
- 3.3.4 Vertical pipings of diameter upper to DN 3: use supports () of lagging which will be welded or screwed on pipes, directly over the lowest join, then in 4.5 m of interval.
- 3.3.5 Expansion joints of insulation: straight cut the end of each thickness of insulation, according to the manufacturer's instructions. Leave a vacuum of 25 mm between two successive sections and fill with flexible insulation P-2 type inorganic fibers loosely it.
- 3.3.6 Seal and end the visible extremities of the insulation and others with some insulating cement.
- 3.3.7 Expansion joints of the piping: allow the free dilation/contraction of the expansion joint without risk to damage the lagging or its cover.
- 3.3.8 Orifice plate mounting Flanges, unions and fittings to the input and output devices, expansion joints, valves, valves and other components requiring periodic maintenance: let these elements discovered and cut the adjacent insulation bevelled at the location of the studs and nuts so that we can remove these without damaging the insulation..
- 3.3.9 Do not put insulation on the following elements:
 - 3.3.9.1 Pipes devices of faucet factory and chrome-plated joins.
 - 3.3.9.2 Joins-unions and reins of the heating systems in 48°C and less.

3.4 FIXATION OF THE INSULATION

- 3.4.1 Subject every section of lagging by means of ribbons of extremity and intermediate ribbons placed in intervals of in most 900 mm.

3.5 TABLE OF APPLICATION OF THE INSULATION

- 3.5.1 Refer to the TABLE A.

This enumeration, without being exhaustive, includes in a general way the list of application of the various types () of insulating material and the jacketing required on the various pipings within the framework of the project.

TABLE A

INSULATION FOR PIPING

PIPING	OPERATING TEMPERATURE	LOCATION	TYPE	LINER
Vent		3 m inside the thermal envelope	P-2	
storm drainage		Roof drain	P-2	
Vapor vent		roof	P-1	Aluminium

N. B.: Piping of vent of vapor: 25 mm in thickness, distance to be isolated: three meters from the outside thermal envelope. Besides, these will be isolated when they are visible to prevent the risks of burns.

3.6 ON-THE-SPOT QUALITY CONTROL

- 3.6.1 Controls made on the spot by the manufacturer

3.6.1.1 Take the necessary measures so that the manufacturer of products supplied at the end of the present section examines the works relative to the handling, to the installation/l' application, to the protection and to the cleaning of his product or his products, then to submit written reports, in an approved format, which will allow to verify if the works were realized according to the terms of the contract.

3.6.1.2 The manufacturer has to make recommendations as for the use of one or several products, and make a putting on the way and a visit to verify if the implementation was realized according to its instructions.

3.6.1.3 Plan visits of construction site (in the following stages:

3.6.1.3.1 Once during the progress of the works, that is once these finished in 60 %.

3.6.1.3.2 Once the completely finished works and the ended cleaning.

3.6.1.4 Obtain inspection reports in three days following the visit of construction site, and put back them immediately to the engineer.

END OF SECTION