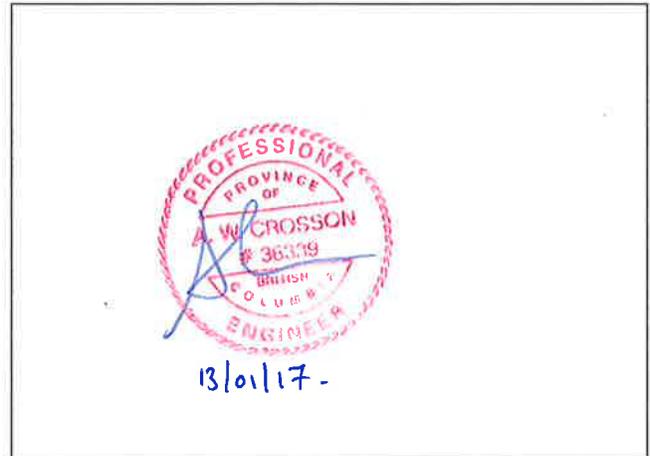
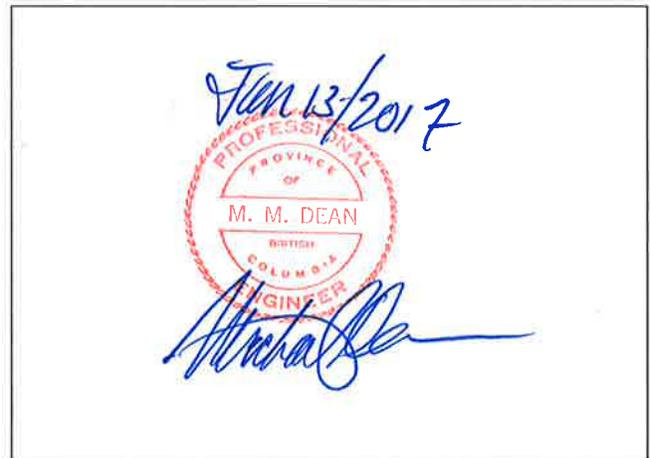


Electrical
WSP Canada Inc



Mechanical
WSP Canada Inc.



END OF SECTION

Drawings		Page Total
X001	Cover Sheet	1
E200	Site Plan and Legend	1
E201	MCTS Building and Flammable Storage Building Fire Alarm Layout	1
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E203	Helicopter Hangar Fire Alarm Layout	1
E300	Fire Alarm Riser Diagrams	1
E400	Fire Alarm Specifications	1
F-001	Legend and Drawing List	1
F-101	Workshop Building Ground Floor and Mezzanine Fire Protection	1
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END OF SECTION

Summary of Work

Seal Cove Fire Panel and Fire Suppression Refurbishment

**Seal Cove Coast Guard Base, Prince Rupert
B.C.**

1.0 Introduction

1.1 Title

Seal Cove Fire Panel and Fire Suppression Refurbishment

1.2 Project Introduction

Electrical and Mechanical Site Services are being sought for the installation and integration of an addressable fire alarm system and devices, as well as fire suppression system refurbishments into the existing life safety equipment and system on site. This Canadian Coast Guard Base in Prince Rupert BC is a Fisheries and Oceans Canada facility operated by its Real Property Branch.

2.0 Scope of Work

2.1 Services Required

Department of Fisheries & Oceans Canada (DFO) will retain a Contractor through PWGSC for the provision of construction services for this project.

Contractors are to provide a lump sum bid. Contractors are to bid according to the current site conditions observed at the bidders site visit as well as specifications provided.

This work must be completed before 30 April 2017

2.2 Overview of Scope

The Contractor will provide all labour, materials, and equipment required to complete the full installation and integration of the new life safety system components with the existing system. The contractor shall provide each component in accordance with the component descriptions in the attached specifications, general drawings, details, as well as comply with the overall intent of the National Building Code, the British Columbia Building Code, the Canadian Electrical Code, and instruction from electrical and mechanical engineering firm assisting in the project oversight.

The contractor shall install, test and commission the equipment in accordance with the tender drawings.

Contractor is responsible for providing any necessary fire watch when any existing fire safety component is not available to operate in normal function mode due to modifications to the system underway.

The contractor will inspect the equipment on site and advise the owner and engineer of any

deficiencies, concerns or missing equipment prior to the work commencing.

.1 The installation will be undertaken in a live environment. Any interruptions to electrical service to the facility require a minimum of 72 hours' notice. All interruptions will be agreed in advance with the owner.

.2 The MCTS building and the helicopter hangar are 24 hours a day 7 days a week operational zones. All work in these areas require 48 hours notice and written approval from owner.

2.3 Specifications and Standards

- .1 Work performed under this contract shall meet the objectives laid out in the SOW, Specifications, General Drawings, and Details by taking a logical, structured and cost effective approach.
- .2 The workmanship is to be of a uniform, high quality finish in accordance with the best trade practices. Electrical permit to be obtained at Contractors cost.
- .3 The Contractor shall ensure work complies with the National Building Code, the Master Municipal Construction Drawings, and the British Columbia Building Code. Where conflict arises, the more stringent standard shall apply. The contractor is responsible for obtaining clarifications prior to Tender Closing in the time allotted.
- .4 The Contractor shall comply with all WorkSafe BC Health and Safety Standards and provide a Health and Safety Plan prior to commencement

2.4 Milestones

- .1 The following milestones (in calendar days) have been established for the implementation of this project. The Contractors detailed schedule should meet the milestones or match as closely as possible for each task.

Project Milestone	Time-Frame
Contract Award	Day 0
Pre-commencement Meeting	Award + 7 days
Contractor Shop Drawings/Submittals to DFO Project Manager	Award + 14 days
Contract Completion Date (CCD-100%)	30 April 2017

- .2 Following the approval of the Contractor's schedule by the DFO Project Manager, the Contractor shall notify the tenants of the work schedule, and take the necessary measures to complete the work within the scheduled time-frame
- .3 Product submittals are required to ensure that the specified material and products are furnished and installed in accordance with design intent as expressed in the contract

documents. Until submittals are reviewed and approved by the project authority, work involving relevant material or product may not proceed. Submittals will be reviewed by the project authority and responses provided within 3 working days.

2.5 Method and Source of Acceptance

Unless otherwise noted, the manner in which the work will be judged as complete and satisfactory will only be accepted in writing from the overseeing Mechanical and Electrical Engineering firm. Contractor is responsible to provide close out documents including O&M manuals, warranty documentation, and new as built drawings in AutoCAD. All Close out documentation is to be submitted electronically in pdf format.

2.6 Tender Prices

Bidders are to provide a lump sum quotation.

3.0 Other Terms and Conditions of the SOW

3.1 Communications Management

.1 All communications shall be directed to the DFO Project Manager.

3.2 Health and Safety

.1 Health and safety considerations required to ensure that DFO shows due diligence towards health and safety on construction sites, and meets the requirements laid out in PWGSC/RPB Departmental Policy DP 073 - Occupational Health and Safety - Construction.

.2 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Province of British Columbia

.1 Workers Compensation Act, RSBC 1996 - Updated 2006.

.3 SUBMITTALS

- .1 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must
 - Results of site specific safety hazard assessment.
 - Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .2 Submit copies of reports or directions issued by Provincial health and safety inspectors.
- .3 Submit copies of incident and accident reports.
- .4 Consultant will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Consultant within 5 days after receipt of comments from Consultant.
- .5 Consultant's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .6 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

.4 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

.5 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

.6 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Consultant prior to commencement of Work.

.7 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.8 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

.9 COMPLIANCE REQUIREMENTS

- .1 Comply with Workers Compensation Act, B.C.

.10 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.

.11 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have working knowledge of occupational safety and health regulations.
 - .2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .4 Be on site during execution of Work and report directly to and be under direction of site supervisor.

.12 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Consultant.

.13 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Consultant.
- .2 Provide Consultant with written report of action taken to correct non-compliance of health and safety issues identified.

- .3 Consultant may stop Work if non-compliance of health and safety regulations is not corrected.

3.3 Site Control

- .1 Contractor supplied disposal bins are to have a closable lid, and remain closed when being loaded.
- .2 Clean-up, temporary fencing, and storage; The Contractor shall provide, install and maintain all necessary control measures to ensure the work does not impact the adjacent environment or occupants. Provide secure temporary storage facilities and fencing for materials and equipment if necessary. Clean up debris daily from the work area and ensure all hazardous impediments are removed or adequately stored or protected. The jobsite shall be left clean, neat and in a safe condition at the completion of each workday to the satisfaction of the DFO representative.
- .3 Adequate storage areas for material and equipment will be provided onsite for the Contractor for the duration of the project
- .4 The contractor shall provide sanitary facilities for use by employees.
- .5 Smoking is not permitted on the worksite.

3.4 Security

1.5 SECURITY CLEARANCES

- .1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter the premises, unless directed otherwise by the owners representative.
- .2 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

1.6 SECURITY ESCORT

- .1 Personnel employed on this project must be escorted when executing work in non-public areas during normal working hours. Personnel must be escorted in all areas after normal working hours.
- .2 Submit an escort request to Consultant at least 10 days before service is needed. For requests submitted within time noted above, costs of security escort will be paid for by a DFO Departmental Representative. Cost incurred by late request will be Contractor's responsibility.
- .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 4 hours before scheduled time of escort. Cost incurred by late request

will be Contractor's responsibility.

.4 Calculation of costs will be based on average hourly rate of security officer for minimum of eight hours per day for late service request and of four hours for late cancellations.

3.5 Hours or Work

Hours or work are to be between 0800-1600 Monday to Friday. Evening and weekend work may be required to accommodate the MCTS building and helicopter hangar operational schedule. Any work conducted outside of the stipulated hours; require owner's written approval before commencing.

4.0 Site Parking

Site parking will be made available for official "Company Marked" Vehicles only. Personal vehicles will not be permitted onsite.

Part 1 General

1.1 DEFINITIONS

- .1 Provide means supply and install.
- .2 Work means material and labour.
- .3 Engineer means WSP Canada Inc.

1.2 GENERAL SCOPE

- .1 Provide the work indicated in the contract documents and as required to provide complete, tested and fully operational systems including all work not normally indicated but necessary for a complete and operational installation.
- .2 The Contractor is expected to be experienced and competent and knowledgeable about the trades and applicable codes, ordinances and industry standards and shall perform the work accordingly, on schedule and fully coordinated with all other trades.
- .3 The Contract Documents for this Division are an integral part of the complete contract documents for the project and will be interpreted in conjunction with all other Divisions.
- .4 This Section pertains to the fire protection systems and fire protection water supply to a connection point beyond the exterior face of the building at the fire water main as described in the contract document drawings for the BUOY Maintenance shop, Marine Emergencies Storage, Flight Services Station building. This building complex is existing and without fire protection systems. A complete and installed wet fire protection system to NFPA 13 current edition is required.
- .5 This Section pertains to the fire protection systems from the point of connection to the water main at the backflow prevention unit, including the backflow prevention unit for the Administration and Stores and Workshop Buildings.
- .6 All equipment, elbows, fittings, nipples, drains, test connections and all accessory pipework for a complete and operational fire protection system is included in this Section of the work within the basic Tender price.
- .7 No extra cost will be considered based on failure of Contractor to allow for all required equipment, piping and fittings. This shall include extra fittings and pipework as required during construction to avoid existing structure, ductwork or other obstacles whether shown on drawings or not.

1.3 CODES, REGULATIONS AND STANDARDS

- .1 The work of this Section shall conform to the edition of codes, regulations and standards in effect at the time of award of Contract, and conform to the requirements of the Authorities Having Jurisdiction.

1.4 REFERENCES

- .1 National Fire Prevention Association (NFPA)
 - .1 NFPA 13-[2013], Standard for the Installation of Sprinkler Systems.
 - .2 NFPA 24-[2013], Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

- .3 NFPA 25-[2014], Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

1.5 LIABILITY

- .1 Be responsible for layout of work and for any damage caused by improper execution of work.
- .2 Be responsible for condition of materials and equipment supplied and protect all work until work completed and accepted.

1.6 PERMITS AND FEES

- .1 Obtain all required permits and pay all fees including service connection fees as applicable to the work of this Section. Comply with all Provincial, Municipal and other legal regulations and bylaws applicable to the work.
- .2 Where Authorities Having Jurisdiction provide inspection, arrange for their inspection of all work. On completion of the work, furnish final unconditional certificates of approval by the inspecting authorities.

1.7 DRAWINGS AND MEASUREMENTS

- .1 Except where precisely indicated, the contract documents are diagrammatic and generally indicate the scope of work and general arrangement and establish minimum quality and performance requirements. Where there are conflicting requirements the Contractor shall allow for and provide the better quality and/or greater quantity unless the conflicting requirements are interpreted otherwise in writing by the Engineer.

1.8 SITE VISIT

- .1 This project involves renovations to an existing building. Visit the site before tendering and examine all local and existing conditions on which the work is dependent. No consideration will be granted for any misunderstanding of work to be done where the necessary information could have reasonably been obtained by an examination of the site.

1.9 WARRANTY

- .1 Provide the Owner with a written warranty that the equipment installed and the work performed under this contract will remain in serviceable condition for one (1) year from the date of final acceptance. Warranty shall include parts and labour.

1.10 WORKMANSHIP

- .1 Workmanship shall be in accordance with well-established practice and with standards accepted and recognized by the Engineer and the Trade.
- .2 The Engineer may reject any work not conforming to the Contract Documents or to accepted standards of performance, quietness of operation, finish or appearance.
- .3 Employ only tradesmen with valid Provincial Trade Qualification Certificates to perform only work permitted by their certificates.

1.11 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Shop drawings/product data shall be reviewed, signed and processed as described in Section 013300, and as further described by the Mechanical Contractors Association of British Columbia.

- .2 Provide an electronic copy or five (5) hard copies of shop drawings of all equipment on the drawings and specifications to the Engineer for review.
- .3 Review or non-review of shop drawings does not alter the requirements of the equipment and materials provided to conform to the specification.
- .4 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for each product and include product characteristics, performance criteria, physical size, finish and limitations.
- .5 Shop Drawings:
 - .1 Submit shop drawings to the Engineer, which have been approved and stamped by the Authority Having Jurisdiction and sealed by the Fire Protection Engineer registered or licensed in British Columbia, Canada. Allow a minimum of three weeks for review by Engineers.
 - .2 Indicate on drawings:
 - .1 Shop drawings shall indicate all the information required by NFPA, and the Authority Having Jurisdiction.
 - .2 Indicate essential building construction features such as direction and size of concrete beams, partitions and lighting.
 - .3 Indicate piping and sprinkler head elevations, the sprinkler temperature rating, the spacing and types of hangers; seismic bracing details; drain test and flushing connections; type of sprinkler alarm; location and type of sprinkler control valve; and all other essential features of the piping system.
 - .4 Mounting arrangements.
 - .5 Operating and maintenance clearances.
 - .3 Bring to the attention of the Engineer any sprinkler head, pipe, valve or system component in a location different from where specifically shown on the project Fire Protection Drawings. These alternate locations shall be reviewed during the shop drawing review.
 - .4 Shop drawings and product data accompanied by:
 - .1 Certification of compliance to applicable codes.
 - .2 Fire Protection Sprinkler System:
 - .1 Fire department connections.
 - .2 Flow switches.
 - .3 Supervisory switches.
 - .4 Valves, Backflow Prevention Device, fittings and couplings.
 - .5 Piping
 - .3 Wet Sprinkler System:
 - .1 Sprinkler heads and escutcheon plates.
 - .2 Riser manifolds.
 - .4 Dry Sprinkler System:
 - .1 Sprinkler heads and escutcheon plates.
 - .2 Alarm Check Valve
 - .3 Compressor

- .6 Test reports:
 - .1 Submit hydrostatic test reports to meet requirements of NFPA 13.
- .7 Certificates:
 - .1 Submit Contractor's Material and Test Certificate for Aboveground Piping.
 - .2 Submit Contractor's Material and Test Certificate for underground Piping.
 - .3 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .8 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.

1.12 PRODUCT QUALIFICATION / ALTERNATE MATERIALS AND EQUIPMENT

- .1 The product specified as Standard of Acceptance was used in preparing the design. Tenders may be based on the specified Standard of Acceptance or on any Acceptable Product listed provided that it meets every aspect of the drawings and specifications including efficiency and energy consumption.
- .2 Where other than the specified Standard of Acceptance is supplied, include for the cost of any resulting additional work (both under this Division and other Divisions) and any necessary redesign of installation or structure.
- .3 Addition of manufacturer's names as Acceptable Products will be by addendum only.
- .4 Multiple items of equipment material of the same type shall be of the same manufacturer.
- .5 Install and test all equipment and material in accordance with the detailed instructions and recommendations of the manufacturer.

1.13 ASBESTOS

- .1 All material/products provided shall be free of asbestos.
- .2 If existing asbestos is discovered which will be affected by the work of the Contract, immediately notify the Engineer. All work related to existing asbestos shall be handled in accordance with the requirements of WorkSafeBC (Workers' Compensation Board of British Columbia).

1.14 SEISMIC RESTRAINT

- .1 Provide seismic restraints for the piping as per NFPA 13 requirements.

1.15 MISCELLANEOUS METAL

- .1 Be responsible for all miscellaneous steel work relative to this Section of the Specifications, including but not limited to:
 - .1 Support of equipment.
 - .2 Hanging, supporting, anchoring, guiding and related work as it applies to piping, ductwork and mechanical equipment.
 - .3 Earthquake restraint devices.
- .2 All steel work not galvanized shall be primed, undercoat painted and finish painted red.

1.16 SYSTEM CLEANING

- .1 Flush all fire suppression piping as per NFPA requirements.

1.17 COORDINATION

- .1 Examine all contract drawings to verify space and headroom limitations for the required work. Coordinate the work with all trades and modify without changing the design intent to facilitate a satisfactory installation. Make no changes involving extra cost to the Owner without the Engineer's prior written approval.
- .2 Work out jointly all interference problems on the site and coordinate all work before fabricating, or installing any material or equipment. No consideration of payment will be made for additional work due to fabrication or installation of materials before a coordination issue was identified and resolved.
- .3 Coordinate deliveries with the General Contractor.

1.18 EQUIPMENT INSTALLATION AND ACCESSIBILITY

- .1 Provide unions and flanges to permit equipment maintenance, disassembly or removal, to minimize disturbance to piping and duct systems and to avoid interfering with building structure or other equipment.
- .2 All work shall be readily accessible for adjustment, operation and maintenance. Supply access doors where required in building surfaces for installation by building trades.
- .3 Pipe equipment drains to floor drains.

1.19 CUTTING, PATCHING, DIGGING, CANNING AND CORING

- .1 Lay out and be responsible for all cutting, patching, digging, canning and coring required to accommodate the mechanical services. Coordinate with other Divisions. Be responsible for correct location and sizing of all openings required under this Section.
- .2 Verify the location of existing service runs and structural components within existing concrete floor and walls prior to core drilling and/or cutting. The Contractor is responsible to repair existing services and structural components damaged as a result of core drilling and cutting.
- .3 Openings through structural members of the building shall not be made without the approval of the Engineer.

1.20 SERVICE PENETRATIONS IN RATED FIRE SEPARATIONS

- .1 Scope:
 - .1 All new piping, wiring, conduits, etc. installed under this Section
- .2 Service penetrations through rated fire separations shall be firestopped with ULC approved materials. Only tested firestop systems shall be used. The firestop system installation must be in accordance with the requirements of CAN4-S115-M or ULC S-115-M tested assemblies that provide the required rating.
- .3 For those firestop applications that exist for which no ULC or cUL tested system is available through the manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other test shall be submitted to the local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International

Firestop Council. This Contractor shall allow for all costs associated with obtaining the seal of a B. C. registered professional engineer on each engineered judgement.

- .4 All smoke and fire stopping shall be installed as per the manufacturer's instructions by qualified Contractor applicators who are certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install the manufacturer's products per specified requirements. Each installer must have a written certification card available on-site for review at the Engineer's request.
- .5 Notify the Engineer and allow for review before firestopping is concealed.
- .6 A qualified Contractor applicator shall submit a letter certifying that all work is complete and in accordance with this specification.
- .7 Acceptable Manufacturers: Hilti (Canada) Corporation; 3M Fire Protection Products; PFP Partners; Specified Technologies Inc. (STI).

1.21 SERVICE PENETRATIONS OF NON-RATED SEPARATIONS

- .1 All piping, tubing, ducts, wiring, conduits, etc. shall be tightly fitted and sealed with silicon sealant on both sides of non-rated walls and floors to resist the passage of smoke and sound.

1.22 PIPE SLEEVES

- .1 Provide pipe sleeves of minimum 24 ga. galvanized sheet steel with lock seam joints for all piping passing through rated interior walls and floors.
- .2 Insulated pipes passing through non-rated fire rated separations shall be wrapped with 24 ga. galvanized sheet steel band to which the flexible caulking compound shall be applied.

1.23 ESCUTCHEONS AND PLATES

- .1 Provide on pipes passing through walls, partitions, floors and ceilings where exposed to view in finished areas.
- .2 Plates shall be stamped steel, split type, chrome plated or stainless steel, concealed hinge, complete with springs, suitable for external dimensions of piping/insulation. Secure to pipe or finished surface. Outside diameter shall cover opening or sleeve.

1.24 SIGNS

- .1 Attach properly lettered and approved metal signs to each valve and alarm device to NFPA 13.
- .2 Permanently fix hydraulic design data nameplates to riser of each system.

1.25 EXISTING SERVICES

- .1 Arrange work to avoid shutdowns of existing services. Where shutdowns are unavoidable, obtain the Owner's approval of the schedule of shutdowns.
- .2 Shutdowns of existing services will be carried out by the Owner's maintenance staff.
- .3 To avoid interrupting of existing services, temporary relocations and/or bypasses of piping may be required.
- .4 Before interrupting any services complete all preparatory work as far as reasonably possible and have all necessary materials on site and prefabricated (where practical) and work continuously to keep the length of interruption to a minimum.

1.26 GRADING AND DRAINING OF PIPING

- .1 Grade all fire protection piping so that it can be drained through drain cocks.
- .2 All main drains shall be directed to the outside of the building wherever possible.

1.27 PIPING EXPANSION

- .1 All piping systems, including all take-offs shall be so installed within the building that the piping and connected equipment will in no way be distorted by expansion, contraction or settling.
- .2 If circumstances on the job require additional changes in direction from those shown on the drawings, the configuration shall be adjusted to suit at no extra cost.
- .3 Anchors shall be installed where necessary to control expansion.

1.28 BACKFLOW PREVENTION STATIONS

- .1 Pipe differential relief outlet to drain.
- .2 Installation shall comply with CSA B64.10.
- .3 Test all backflow prevention devices and submit signed declarations to that effect prior to Substantial Completion.

1.29 DEMOLITION, SALVAGE AND RE-USED EQUIPMENT

- .1 All piping, ducting and equipment which become redundant and is no longer required due to the work shall become the property of the Contractor and shall be completely removed from the site.

1.30 PAINTING AND IDENTIFICATION

- .1 Apply a coat of rust inhibiting primer to all exposed, bare steel provided under this Section.
- .2 Make good any damage to factory finishes on equipment supplied under this Section.
- .3 Identify all piping in mechanical equipment rooms to denote system and/or zone served and indicate water flow direction with an arrow.
- .4 Piping Identification
 - .1 Each fire suppression system shall be painted red to differentiate it from other piping.
- .5 Valve Tags
 - .1 Provide valve identification tags appropriately secured. Tags may be of brass, aluminum, metal photo, laminated plastic or fiberglass, stamped or engraved, 25 mm [1"] minimum diameter.
- .6 Secure engraved laminated plastic identification tags (black face and white letters) on the following items:
 - .1 Flow and pressure switches supplied under this Section.

1.31 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Manuals:

- .1 Provide maintenance data for Fire Suppression Systems for incorporation into Operational and Maintenance manual.
- .2 Provide one suitably sized 3-ring binder with suitable label with all required materials inside to the Engineers as a draft copy for review. Make all required changes and resubmit the one binder to the Engineer. Repeat until accepted. Then submit three (four) manuals identical to the accepted copy to the Owner. Obtain a receipt and send a copy of the receipt to the Engineer.
- .3 Provide an index and tab each section.
- .4 The manual shall include:
 - .1 Operation instruction for systems and component.
 - .2 List of local source of supply.
 - .3 NFPA 25-[2014], Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
 - .4 Fire Alarm Verification report.
 - .5 Copy of any required approvals, certifications, acceptance by Authorities Having Jurisdiction.
 - .6 All shop drawings.
 - .7 Manufacturer's operating and maintenance literature and wiring and control diagrams.
- .5 Site records:
 - .1 Keep a set of contract prints on site for the sole purpose of keeping an up-to-date record marked in red of the installation of the mechanical work where they vary from the drawings.
 - .2 Changes for all mechanical work and piped site service trades, including sketches for Change Orders and Site Instructions shall be kept on this set of drawings.
 - .3 Services shall not be concealed until the Record Drawings are up-to-date for the services.
 - .4 All inaccessible concealed services shall be accurately located.
 - .5 Minor changes in the routing of services within a space which are readily observable and obvious after all construction is complete, need not be recorded.
 - .6 Identify each drawing in lower right hand corner in letters at least 10 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW FIRE PROTECTION SYSTEMS AS INSTALLED" and under this add the Contractor's name, an authorized signature and the date.
 - .7 Submit the prints for review by the Engineer. Make any additional changes identified by the Engineer including returning to the site if necessary to make measurements and/or to confirm installation locations and details. Resubmit to the Engineer.
- .6 Record drawings:
 - .1 Prior to start of Fire Alarm Verification , finalize production of as-built drawings.
 - .2 Upon completion of the Engineer's review, submit final Record Drawings to the Engineer. Final record drawings shall include revised

CAD files to be prepared by a qualified draftsman to the same standards as the original drawings.

1.32 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

1.33 DEMONSTRATION AND INSTRUCTION TO OWNER

- .1 Provide certified personnel to demonstrate and provide maintenance instructions for the fire protection system to the Owner's operating staff. .
- .2 Finalize demonstration and instructions by obtaining a signed statement from the Owner that the demonstration and instructions have been given satisfactorily.

1.34 SUBSTANTIAL PERFORMANCE

- .1 The work will not be considered to be ready for use or substantially complete until the following requirements have been met:
 - .1 All reported deficiencies have been corrected.
 - .2 Testing completed.
 - .3 Operation and Maintenance Manuals completed.
 - .4 Record Drawings ready for review.
 - .5 System Commissioning has been completed and verified.
 - .6 All demonstrations to the Owner have been completed.
- .2 Work under this Section which is still outstanding when substantial performance is certified will be considered deficient and hold-back will be established to be withheld until Total Performance and will be equal to at least twice the Engineer's cost estimate of completing that work.

Part 2 Fire Protection System

2.1 SUMMARY

- .1 Section includes materials and installation for wet and dry pipe fire protection and sprinkler systems for heated and unheated areas.
- .2 This is a performance specification clarified in this Section and on the Project sprinkler drawings to establish a minimum standard of equipment, design and installation.
- .3 The specification describes the basic system and design required but not all of the details or components.

- .4 This Trade shall have the experience to design the sprinkler system. Materials and work necessary to achieve the specification requirements will not be considered an extra to the Contract.
- .5 The system design shall meet the requirements of the building, based on the Contract Drawings and Specifications.
- .6 Provide hydraulically calculations for each fire suppression system including, but not to exclude other areas as required, the BUOY Maintenance shop, Marine Emergencies Storage, Flight Services Station building , Admin/Stores building exterior overhang and 2nd level to NFPA 13.

2.2 SPRINKLER DESIGN ENGINEER

- .1 Retain the services of a Fire Protection Engineer to provide services as described in Division C, Appendix A, Scenario 2 of the current B.C. Building Code for the Sprinkler Design Engineer for the scope of the new fire protection system as shown on the Drawings.
- .2 The Sprinkler Design Engineer shall:
 - .1 Produce the working fire protection drawings to NFPA 13 for Sprinkler Systems.
 - .2 Perform hydraulic calculations. Software shall meet NFPA calculation requirements.
 - .3 Seal all documents submitted for construction and permits.
 - .4 Assume full responsibility for the sprinkler system design, and submit Schedules B and C to the Municipality.
 - .5 Submit a copy of the Schedules, calculations, working drawings and all relevant shop drawings to the Engineer for review prior to start of construction.
 - .6 Provide assistance to the fire suppression contractor as required.
 - .7 Witness sprinkler and standpipe testing.
 - .8 Inspect the completed installation.
 - .9 On project completion, submit a sealed statutory declaration to the Engineer stating that the fire protection system is installed in accordance with the Sprinkler Design Engineer drawings, instructions and the regulatory requirements.

2.3 DESIGN REQUIREMENTS

- .1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by hydraulic calculations for uniform distribution of water over design area.
- .2 Confirm with the Engineer any interpretive aspects of the listed Codes, Standards or approvals that differ from the Contract Documents. Such interpretations shall not be used without the Engineer's approval.
- .3 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
- .4 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
- .5 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.

- .6 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .7 Design systems for earthquake protection for buildings in seismic zones for Prince Rupert BC.
- .8 Location of Sprinkler Heads:
 - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 .
 - .2 Uniformly space sprinklers on branch.
- .9 Water Distribution:
 - .1 Make distribution uniform throughout the area in which sprinkler heads will open.
- .10 Density of Application of Water:
 - .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.
 - .2 Maintain existing piping sizes for existing building modifications.
 - .3 Application to horizontal surfaces below sprinklers shall be :
 - .1 Area: hydraulically most remote area as defined in NFPA 13. In general:
 - .1 Light hazard occupancy with a density of 4.1 (L/min)/m² [0.10 gpm/ft²] for the most remote 139 m² [1500 ft²] in all unless indicated otherwise.
 - .1 Flight Services Station
 - .2 Ordinary Hazard Group 2 occupancy with a density of 8.2 (L/min)/m² [0.2 gpm/ft²] for the most remote 139 m² [1500 ft²] in the following areas:
 - .1 BUOY Maintenance shop
 - .3 Provide hydraulically calculated suppression systems for the Marine Emergencies Storage area to NFPA 13, 2013 Edition form existing service. Provide coverage as per chapters Miscellaneous storage of commodities I-IV, non-encapsulated/ (encapsulated non-combustible), maximum storage height of 6.10m (20ft), 9.14m (30ft) to underside of roof deck, with semi-solid shelves and no in-rack sprinklers. Provide new 150 diameter water entry station to accommodate larger water flows for storage applications.
- .11 Outside Hose Allowances:
 - .1 Include allowance in hydraulic calculations for inside and outside hose streams as required by NFPA.
- .12 Friction Losses:
 - .1 Calculate losses in piping in accordance with Hazen-Williams formula with 'C' value of 120 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping.
- .13 Water Supply:
 - .1 Perform on site flow tests to obtain required water data.

- .2 Include in the design a safety factor, reducing flow test data, by the greater of the following values of a 10psi as per AHJ, reduction of 10% or IAO's (Insurers' advisory Organization of Canada) calculated safety factor from the design water supply curve.

2.4 EXISTING SPRINKLER SYSTEM

- .1 Modify the existing sprinkler system, relocate heads and provide new heads to match the building standards as required to suit the new room layout and to comply with Codes. Confirm pipe sizes and configuration prior to installation. Maintain existing sprinkler layout densities for all field modifications
- .2 Except in service rooms and where specifically noted, all sprinkler piping shall run concealed in walls or above dropped ceilings.
- .3 Locate heads in the centre of ceiling tiles.
- .4 Provide fittings for changes in direction of piping and for connections.
- .5 Conceal piping in areas with suspended ceiling.
- .6 Sprinkler deflector elevations for exposed sprinklers in the same room shall be within 12 mm [1/2"] of each other where under a common ceiling elevation.
- .7 Provide sheet metal shields where required to prevent cold soldering of sprinkler heads. Colour of shields as per Architects direction.

2.5 PIPE, FITTINGS AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13.
- .2 Black steel pipe to ASTM A53 and ANSI Standard B36.10:
 - .1 Schedule 40 standard wall pipe for pressure to 2070 kPa [300 psi].
 - .2 "Light wall" pipe for welded or roll grooved pipe only shall conform to the following wall thicknesses:
 - .1 Up to 125 mm [5"] Schedule 10.
 - .2 150 mm [6"] 3.40 mm [0.134"].
 - .3 Acceptable Products: Victaulic #005, Firdok, Rimco, Gruvlok (rolled grooved fittings).
- .3 Dry Pipe Exterior System - Hot dipped galvanized steel to ASTM A53 and ANSI Standard B36.10:
 - .1 Schedule 40 standard wall pipe for pressure to 2070 kPa [300 psi].
 - .2 "Light wall" pipe for welded or roll grooved pipe only shall conform to the following wall thicknesses:
 - .1 Up to 125 mm [5"] Schedule 10.
- .4 Fittings and joints to NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts.

- Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
- .2 Provide threaded type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .3 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
 - .4 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes [32] mm and larger.
 - .5 Fittings: ULC approved for use in wet pipe sprinkler systems.
 - .6 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
 - .7 Side outlet tees using rubber gasketed fittings are not permitted.
 - .8 Sprinkler pipe and fittings: metal.
 - .9 Compatible with piping material.
 - .10 Suitable for maximum pressures in system but not less than 1210 kPa [175 psi] working pressure.
 - .11 Welding fittings shall comply with the latest edition of the following standards: ANSI B16.9 and B16.25 and ASTM A234.
 - .12 All grooved end fittings shall be of one manufacturer.
 - .13 Acceptable Products: Grinnel "Easy Tees", Victaulic "Hooker" or "Snap-let" fittings are acceptable for single sprinkler head branch lines only.
 - .14 Flexible connections shall be ULC listed.
- .5 Valves:
- .1 ULC listed for fire protection service.
 - .2 Gate valves: open by counterclockwise rotation.
 - .3 Provide rising stem A valve rising stem with outside screw and yoke must be installed under each valve alarm, on each riser, where more than one alarm valve is powered by the same supply line 100cm and larger.
 - .4 Gate - 1210 kPa [175 psi]:
 - .1 Open by counter-clockwise rotation.
 - .2 Acceptable Products: Darling, Crane, Jenkins, Kennedy, Nibco.
 - .5 Butterfly - 1210 kPa [175 psi]:
 - .1 12 mm [1/2"] - 50 mm [2"]:
 - .1 Slow closing with indicator and integral supervisory switch.
 - .2 Standard of Acceptance: Milwaukee #BB-SCS.
 - .3 Acceptable Product: Nibco KT-5058.
 - .2 50 mm [2"] - 75 mm [3"]:
 - .1 Groove end with integral supervisory switch.
 - .2 Victaulic style 727.
 - .3 Acceptable Products: Nibco, Sprink Inc.
 - .3 100 mm [4"] - 200 mm [8"]:
 - .1 Groove end with integral supervisory switch.
 - .2 Victaulic Style 708.
 - .3 Acceptable Products: Nibco, Sprink Inc.

- .4 100 mm [4"] - 300 mm [12"]:
 - .1 Tapped lug end design.
 - .2 Gear operated and indicator.
 - .3 Acceptable Products: Demco #NE-H, Nibco #L-002-N6, Pratt IBV, Grinnell or Mission.
- .6 Check - 1210 kPa [175 psi]:
 - .1 Provide spool piece to ensure full check valve opening where adjacent an alarm or gate valve.
 - .2 Acceptable Products: Crane, Jenkins, Mission, Nibco, Victaulic, Kennedy.
- .7 Drain Valve: 25 mm [1"] complete with hose end adaptor, cap and chain.
- .8 Groove end valves shall be used wherever groove end pipe is employed. All groove end valves shall be of one manufacturer.
- .6 Pipe hangers:
 - .1 All hangers and supports shall be ULC listed for fire protection services in accordance with NFPA.
 - .2 Toggle hangers are unacceptable.

2.6 PRESSURE GAUGES

- .1 ULC listed Pressure Gauges:
 - .1 Case stainless steel, size 115 mm [4-1/2"] diameter with gasketted clear window.
 - .2 Phosphor bronze bourdon tube, silver brazed tip and socket 6 mm [1/4"] lower connection.
 - .3 Rotary type bushed movement, silicone dampened to prevent pointer oscillation.
 - .4 White background with black numerals.
 - .5 Dual kPa and psig scale.
 - .6 Accurate within 1% of scale range.
- .2 Select thermometers and pressure gauges so that the operating range is at the midpoint of the scale or range.
- .3 Maximum limit of not less than twice normal working pressure at point where installed.

2.7 ALARM CHECK VALVES

- .1 Cast iron, flanged type, sized to suit water main.
- .2 Dry Pipe Valve
 - .1 1210 kPa [175 psi]:
 - .2 Manufacturers alarm check valve trim.
 - .3 Standard of Acceptance: Central AF & AG 7.96.
 - .4 Acceptable Products: Astra, Automatic, Central, Grinnell, Reliable, Star, Viking.

2.8 BACKFLOW PREVENTION STATIONS

- .1 Backflow prevention stations for fire service shall be listed by Underwriters' Laboratories Canada (ULC).

- .2 Double check valve (DCV) assembly complete with OS&Y Inlet and outlet valves.
Standard of Acceptance:
 - .1 75 mm [3"] to 300 mm [12"]: Ames Model 2000SS
 - .2 Acceptable Products: Watts, Febco, Ames.

2.9 BURIED WATER PIPING SYSTEM

- .1 Pipe and Fittings:
 - .1 Outside-coated, cement-mortar lined, ductile-iron pipe, and fittings, in accordance with NFPA 24, for piping under building and outside of building walls.
 - .2 Canon "Blue Brute" Polyvinyl chloride Ring-Tite Class 150 pipe to AWWA Standard C-900. PVC piping is not to pass into the building space. Transition to ductile iron before entering interior space if used. Provide fitting to NFPA 24 listing. Fitting to be compatible with piping pressure and class ratings.
 - .3 Anchor joints in accordance with NFPA 24.
 - .4 Provide concrete thrust block at elbow where pipe turns up toward the floor, and restrain pipe riser with steel rods from elbow to flange above floor.
 - .5 Minimum pipe size: 150 mm.
 - .6 Minimum depth of cover: 1.0metre at finish grade.
- .2 Ductile Iron Pipes:
 - .1 Ductile iron cement lined class 50 or class 52 pipe with push-on rubber ring, or mechanical joints for 1380 kPa [200 psi] working pressure ASA A21-51 (AWWA-C151).
- .3 Fittings for Ductile Cast Iron Pipes:
 - .1 Cast iron with push-on or mechanical joints for 1380 kPa 200 psi] working pressure.
 - .2 Fittings: painted with tar epoxy resin paint.
- .4 Rubber Gasket for Pipe Connection:
 - .1 AWWA C111, Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings 1380 kPa 200 psi working pressure.
- .5 Bolt and Nut for Flange:
 - .1 Galvanized Hexagon Head bolts and Hexagon nuts.
- .6 Valves:
 - .1 In accordance with NFPA 24.
 - .2 Gate valves: ULC listed and opened by counterclockwise rotation.
- .7 Post Indicator Valves:
 - .1 Provide with operating nut located about 1.5]m above finish grade.
 - .2 Gate valves for use with indicator post, ULC listed.
 - .3 Indicator posts: ULC listed.
 - .4 Provide each indicator post with 1 coat of primer and two coats of red enamel paint.
- .8 Valve Boxes:

- .1 Except where indicator posts are provided, for each buried valve, provide cast-iron valve box of suitable size.
 - .2 Provide cast-iron cover for valve box with word English wording for "WATER" cast on cover.
 - .3 Minimum box shaft diameter: 13.3 cm.
 - .4 Coat cast-iron boxes with bituminous paint applied to minimum dry-film thickness of 10 ml.
- .9 Buried Utility Warning and Identification Tape:
- .1 Provide detectable detectable magnetic plastic tape manufactured specifically for warning and identification of buried piping detectable by electronic detection instrument.
 - .2 Provide tape in rolls, 7.6 cm minimum width, colour coded in accordance with local utility, with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length.
 - .3 Warning and identification: to read "CAUTION BURIED WATER PIPING BELOW".
 - .4 Use permanent code and letter colouring unaffected by moisture and other substances contained in trench backfill material.

2.10 SUPERVISORY SWITCHES

- .1 General: to NFPA 13 and ULC listed for fire service.
- .2 Valves:
 - .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
- .3 Flow Switch Type:
 - .1 Two sets of SPDT contacts or one set normally open and one set normally closed contacts and supervisory capability.
 - .2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.
 - .3 Connect into building fire alarm system.
 - .4 Connection of switch: Section [28 31 00 - Fire Detection and Alarm].
 - .5 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and instantly recycle.
 - .6 Time delay feature and paddle indicator.
 - .7 Provide a sight glass in accordance with NFPA with drain connection. Alternatively, provide a Victaulic "Testmaster".
 - .8 Standard of Acceptance: Potter VSR-F with retard.
- .4 Approved valves with integral supervisors are acceptable alternatives.
- .5 24V DC contact rating unless noted otherwise.
- .6 Looped cable devices are not acceptable

2.11 FIRE DEPARTMENT CONNECTION

- .1 Provide connections approximately [1.5] m above finish grade, location as indicated.

- .2 To NFPA 13 and ULC listed, Siamese type.
- .3 Polished bronze exposed of approved two-way type with 2.5 inch National Standard female hose threads with plug, chain, and identifying fire department connection escutcheon plate.
- .4 Flush mount type with double clapper valves.
- .5 Integral ball drip.
- .6 Escutcheon marked "sprinklers" with plugs and chains.
- .7 Bronze finish.
- .8 Thread specifications: compatible with local fire department.
- .9 Install a 90-degree elbow with drain connection at the low-point near each fire department connection to allow for system drainage to prevent freezing.
- .10 Standard of Acceptance: National Fire Equipment Model 229.
- .11 Acceptable Product: Impaction.

2.12 AUTOMATIC AIR COMPRESSOR

- .1 Air compressors for each dry pipe system shall be sized to suit the system.
- .2 Air compressors may serve more than one system in which case it shall be sized for the single largest system volume.
- .3 Air Compressors shall be sized as follows:

System Volume	Litres [USgal]	Compressor Size
Up to 700	[185]	250 watts [1/3 hp], 1201/60
701 - 950	[185 - 249]	375 watts [1/2 hp], 208/3/60
951 - 1450	[250 - 384]	560 watts [3/4 hp], 208/3/60
1451 - 2080	[385 - 549]	750 watts [1.0 hp], 600/3/60
2081 - 3210	[550 - 849]	1120 watts [1.5 hp], 600/3/60
3211 - 5100	[850 - 1,349]	1490 watts [2.0 hp], 600/3/60
5101 - 7200	[1,350 - 1,900]	2240 watts [3.0 hp], 600/3/60

- .4 Automatic Air Maintenance Device. Provide all necessary piping, valves, fittings to provide a complete workable automatic compressed air pressure maintenance system.
- .5 Provide a control panel with starter and transformer for low voltage wiring to pressure switch.
- .6 Acceptable Products: Central Model "D" Automatic Air Maintenance Device, Viking, Grinnell, Automatic, Star, Astra, Reliable.

2.13 PIPE SLEEVES

- .1 Provide pipe sleeves where piping passes through walls and floors.
- .2 Secure sleeves in position and location during construction.
- .3 Provide sleeves of sufficient length to pass through entire thickness of walls and floors.
- .4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.
 - .1 Firmly pack space with mineral wool insulation.

- .2 Seal space at both ends of sleeve or core-drilled hole with [plastic waterproof cement which will dry to firm but pliable mass,] [provide mechanically adjustable segmented elastomeric seal].
- .3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.
- .5 Sleeves in Masonry and Concrete Walls and Floors:
 - .1 Provide cast-iron sleeves.
 - .2 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.
- .6 Sleeves in Other Than Masonry and Concrete Walls and Floors:
 - .1 Provide 0.61 mm thick galvanized steel sheet.

2.14 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler heads shall be ULC listed for use in occupancies and hazard type for which they are installed. Temperature rating on releasing element, glass bulb and fusible link, shall suit the specific hazard they serve.
- .3 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
- .4 Provide wire guards on sprinkler heads in Mechanical and Electrical Rooms and in areas susceptible to mechanical damage or vandalism, i.e. Storage Rooms.
- .5 Provide sheet metal sheets, to prevent cold soldering of sprinkler head, as indicated on drawings and as required by NFPA 13. Colour of shields to match general area. Size and install as per NFPA 13 requirements.
- .6 Sprinkler deflector elevations shall be within 12 mm [1/2"] of each other in the same room. Deflector: not more than 75 mm [3"] below suspended ceilings.
- .7 All sprinklers except where noted shall be in satin chrome finish with polished chrome escutcheons except natural brass finish may be used in the following areas:
 - .1 Warehouse, Mechanical rooms, Electrical rooms, Concealed spaces, Service spaces.
- .8 Escutcheons used on T-bar ceilings shall allow ceiling panel removal without removing the sprinkler head.
- .9 Escutcheons shall be provided by the sprinkler manufacturer to suit the model of sprinkler and maintain the approvals.
- .10 Ceiling plates: not more than 25 mm deep.
- .11 Baffles: Baffles to be located and installed as per NFPA 13 requirements.
- .12 Sprinkler Head Type:
 - .1 Wet System sprinkler head finishes:
 - .1 Upright - Glass bulb, brass finish.
 - .2 Pendent - Glass bulb, brass finish.
 - .3 Pendent Recessed - Glass bulb, chrome plate finish.
 - .4 Horizontal Sidewall (finished areas) - Glass bulb, chrome plate finish.

- .5 Horizontal Sidewall (unfinished areas) - Glass bulb, brass body.
- .2 Acceptable Products: Astra, Automatic, Grinnell, Reliable, Star, Gem, Tyco.
- .13 Provide nominal [1.2] cm orifice sprinkler heads unless otherwise noted.

2.15 SPARE PARTS CABINET

- .1 Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to new BUOY Maintenance fire water entry station.
- .2 Spare Sprinkler Heads
 - .1 Number and types of extra sprinkler heads as specified in NFPA 13 (minimum 6 heads).
 - .2 Provide a minimum of two spare sprinklers for each type installed.
- .3 Provide a special sprinkler wrench to be kept in the cabinet for maintenance use in the removal and installation of sprinklers.

2.16 INSPECTOR'S TEST CONNECTION

- .1 Locate inspector's test connection after each wet system flow switch , provide test connections approximately 3 m above floor for each sprinkler system or portion of each sprinkler system equipped with alarm device.
- .2 Provide test connection piping to location where discharge will be readily visible and where water may be discharged without property damage.
- .3 Provide discharge orifice of same size as corresponding sprinkler orifice.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PIPE INSTALLATION

- .1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.
- .2 All grooved end valves, fittings and couplings etc. shall be of one manufacturer.
- .3 Provide inspector's test valves and pipes at all water zone flow assemblies in the system.
- .4 Flanged fittings shall be used at valve stations and at fire department connections.
- .5 Install monitored valves and flow switches for all zones. Electrical Division 21 shall wire monitored valves and flow switches to the central fire alarm system. Identify which portion of the system each valve controls.
- .6 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
- .7 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.

- .8 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .9 Inspect piping before placing into position.
- .10 Field welding is permitted.
- .11 Adjust sprinkler piping up or down if conflicts occur between structure, lighting, electrical, plumbing piping or ductwork.
- .12 Arrange piping routing to provide sufficient access to mechanical and electrical equipment.
- .13 A wrap around hanger or other approved means shall be provided at the end of each branch sprinkler line to prevent excessive movement.

3.3 PRESSURE GAUGES:

- .1 Location:
 - .1 On water side and air side of dry pipe valve.
 - .2 At air receiver.
 - .3 In each independent pipe from air supply to dry pipe valve.
 - .4 At exhausters and accelerators.
- .2 Install to permit removal.
- .3 Locate so as not subjected to freezing.

3.4 FLOW SWITCHES:

- .1 Install flow switches with a tight pipe drain connection to open discharge outside the building at grade level or other acceptable discharge point as approved by the Engineer.
- .2 Install a 25 mm [1"] flow switch test drain valve with a 25 mm [1"] brass ball plug. Immediately downstream of flow switch for each flow switch. Locate flow switches where shown.

3.5 SUPERVISORY SWITCHES - VALVES:

- .1 Install supervisory switches on all valves supplying the sprinkler and standpipe system inside the building. Switches shall be compatible with the valve supervised.

3.6 SPRINKLER HEADS:

- .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13.
- .2 All sprinkler head locations shall be coordinated with existing site conditions.
- .3 Do not install any sprinkler heads until all piping systems have been flushed of all contaminants.
- .4 Provide dry pendent or sidewall heads on all wet sprinkler systems where heads are piped into cold areas.

3.7 PROTECTION OF ELECTRICAL EQUIPMENT FROM WATER:

- .1 Responsibility for water damage to electrical equipment from the sprinkler system installation whether due to testing or leakage shall be the responsibility of this section.
- .2 Provide and install in this section of the work minimum 20 gauge metal protective hoods, individually located over all electrical equipment susceptible to water damage upon release of sprinkler heads in electrical areas. Such electrical equipment shall include all transformers and all equipment with ventilation grilles that will allow water entry into the electrical equipment. Protective hoods shall be sloped to allow shedding for water, shall project horizontally beyond the equipment perimeter and shall not be mounted on the equipment unless prior approval is obtained from the electrical authorities. Holes through protective hoods shall be sealed watertight.

3.8 ELECTRICAL CONNECTIONS

- .1 Provide electrical work associated with this section as per Div 25 and 26.
- .2 Provide fire alarm system under Section Div 28.

3.9 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

- .1 Notify Contracting Officer in writing at least 15 days prior to connection date.
- .2 Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure.
- .3 Bolt sleeves around main piping.
- .4 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.
- .5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

3.10 BURIED PIPING SYSTEM

- .1 Bury tape with printed side up at depth of 30 cm below the top surface of earth or top surface of subgrade under pavements.

3.11 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
 - .1 Perform test to determine compliance with specified requirements in presence of Engineer.
 - .2 Furnish all labour, materials, instruments, etc. necessary for all required tests. All work shall be subject to inspection by the local plumbing inspector or design authority. At least forty-eight (48) hours notice shall be given in advance of making the required tests.
- .2 Test, inspect, and approve piping before covering or concealing.
- .3 Responsibility for completing "Contractor's Materials and Test Certificate" in accordance with inspection authority test procedure is included in this section.
- .4 Tests on Fire Protection systems shall consist of pressure tests and shall conform to standards of Inspection Authority as listed in separate clauses of this section of

specification. Test connections for fire pumps and Siamese connection lines shall also be hydrostatically tested.

- .1 Preliminary Tests:
 - .1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.
 - .2 Flush piping with potable water in accordance with NFPA 13.
 - .1 Provide flushing connections on all sprinkler systems.
 - .2 Flush all underground mains and Siamese supply lines before connecting to sprinkler systems.
 - .3 Flush all pipelines so effluent is clear and free of debris.
 - .4 Rate of flushing flows shall be as per NFPA 13 requirements.
 - .5 Provide proper drainage for this flushing operation.
 - .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.
 - .4 Test alarms and other devices.
 - .5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
- .2 Formal Tests and Inspections:
 - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
 - .2 Submit written request for formal inspection at least 15 days prior to inspection date.
 - .3 Repeat required tests as directed.
 - .4 Correct defects and make additional tests until systems comply with contract requirements.

END OF SECTION